We use Derive 5 to do our positron α modeling using the classical electromagnetic energy densities as in J.D. Jackson's "Classical Electrodynamics" (and NOT with J.P. Wesley's doubled electric energy density and his use of the usual magnetic energy density ... which we think is in error).

#1: CaseMode := Sensitive

#2: InputMode := Word

#3: PrecisionDigits := 25

#4: $+ 9.1093821545\cdot 10^{-31}\cdot\alpha$

This just above is the α–positron mass "α me" that is taken to be positive here even though it is an antiparticle, but it's value is the mass of the electron times α, where α is just a dimensionless positive number.

We have shown elsewhere that the positron's mass cannot be negative (using our modeling) ... as Paul Dirac famously postulated.

#5: 299792458

This just above is "c", the speed of light in a vacuum in meters per second.

#6: $+ 1.6021764874\cdot 10^{-19}\cdot\alpha$

This just above is "(q α)", the positron charge in Coulombs (note that it is positive), but the ring magnetic energy must be taken to be negative (& according to Paul Dirac as well) since any two of its charge elements have the same sign.

#7: $1.05457162853\cdot 10^{-34}\cdot\alpha$

This just above is "(hbar α)", where q is twice the experimentally determined positron spin angular momentum, and it is positive because the mass is positive (see above) and having positive charge.

#8: $4\cdot\pi\cdot 10^{-7}$

#9: $1.256637061435917295385057\cdot 10^{-6}$

This just above are "Mu0".

$$\#10:\quad b0 + \frac{r \cdot res}{Rho} + \frac{b1 \cdot Rho}{r} + \frac{b2 \cdot Rho^2}{r^2}$$

This just above is the charge density lambda[Rho] at radius Rho in the ring measured from the large circle of radius ”R”.

$$\#11:\quad \int_0^{Rho} \left(b0 + \frac{r \cdot res}{Rho} + \frac{b1 \cdot Rho}{r} + \frac{b2 \cdot Rho^2}{r^2}\right) \cdot Rho \; dRho$$

$$\#12:\quad (4 \cdot \pi^2 \cdot R) \cdot \int_0^{Rho} \left(b0 + \frac{r \cdot res}{Rho} + \frac{b1 \cdot Rho}{r} + \frac{b2 \cdot Rho^2}{r^2}\right) \cdot Rho \; dRho$$

This just above is qrho[Rho], the charge within radius ”Rho”.

Simplifying:

$$\#13:\quad \frac{\pi^2 \cdot R \cdot Rho \cdot (3 \cdot Rho^3 \cdot b2 + 4 \cdot Rho^2 \cdot b1 \cdot r + 6 \cdot Rho \cdot b0 \cdot r^2 + 12 \cdot r^3 \cdot res)}{3 \cdot r^2}$$

This just above is qrho[Rho], the charge within radius ”Rho”.

We set Rho = r in #10, the small radius of the ring so that we should obtain zero as a result since the charge density vanishes there by definition of ”r”:

$$\#14:\quad b0 + \frac{r \cdot res}{r} + \frac{b1 \cdot r}{r} + \frac{b2 \cdot r^2}{r^2}$$

Simplifying;

$$\#15:\quad b0 + b1 + b2 + res$$

$$\#16:\quad b0 + b1 + b2 + res = 0$$

$$\#17:\quad \mathrm{SOLVE}(b0 + b1 + b2 + res = 0,\ res)$$

Solving:

#18: res = -b0 - b1 - b2

#19: -b0 - b1 - b2

This just above is "res".

Substituting for "res" in qrho above at #13, we have:

#20: $$\frac{\pi^2 \cdot R \cdot Rho \cdot (3 \cdot Rho^3 \cdot b2 + 4 \cdot Rho^2 \cdot b1 \cdot r + 6 \cdot Rho \cdot b0 \cdot r^2 + 12 \cdot r^3 \cdot (-b0 - b1 - b2))}{3 \cdot r^2}$$

This just above is "qrho[Rho}", not depending upon "res".

It must equal (q α), the total electron charge at Rho = r by definition of "r":

#21: $$\frac{\pi^2 \cdot R \cdot r \cdot (3 \cdot r^3 \cdot b2 + 4 \cdot r^2 \cdot b1 \cdot r + 6 \cdot r \cdot b0 \cdot r^2 + 12 \cdot r^3 \cdot (-b0 - b1 - b2))}{3 \cdot r^2} = q$$

Solving:

#22: $$\mathrm{SOLVE}\left(\frac{\pi^2 \cdot R \cdot r \cdot (3 \cdot r^3 \cdot b2 + 4 \cdot r^2 \cdot b1 \cdot r + 6 \cdot r \cdot b0 \cdot r^2 + 12 \cdot r^3 \cdot (-b0 - b1 - b2))}{3 \cdot r^2} = q \cdot \alpha,\ b0\right)$$

Evaluating:

#23: $$b0 = - \frac{\pi^2 \cdot R \cdot r^2 \cdot (8 \cdot b1 + 9 \cdot b2) + 3 \cdot \alpha \cdot q}{6 \cdot \pi^2 \cdot R \cdot r^2}$$

$$\#24: \quad -\frac{\pi^2\cdot R\cdot r^2\cdot(8\cdot b1+9\cdot b2)+3\cdot\alpha\cdot q}{6\cdot\pi^2\cdot R\cdot r^2}$$

This just above is b0.

We next calculate the outside magnetic energy of the ring by treating it as a current loop of radius R, the large radius of the ring.

The current ”Is” of the ring is:

$$\#25: \quad Is = \frac{c\cdot(q\cdot\alpha)}{2\cdot\pi\cdot R}$$

$$\#26: \quad \frac{c\cdot(q\cdot\alpha)}{2\cdot\pi\cdot R}$$

This just above is ”Is”, the current of the ring.

The inductance ”Lso” of the ring is:

$$\#27: \quad Lso = R\cdot(Mu0\cdot(LN(8\cdot R) - LN(r) - 2))$$

$$\#28: \quad R\cdot(Mu0\cdot(LN(8\cdot R) - LN(r) - 2))$$

This just above is the ring inductance ”Lso”.

Then the outside magnetic energy ”Eso” then is about:

$$\#29: \quad \frac{Lso\cdot Is^2}{2}$$

Substituting:

$$\#30: \quad \frac{(R\cdot(Mu0\cdot(LN(8\cdot R) - LN(r) - 2)))\cdot\left(\frac{c\cdot(q\cdot\alpha)}{2\cdot\pi\cdot R}\right)^2}{2}$$

$$\#31: \quad \frac{Mu0\cdot\alpha^2\cdot c^2\cdot q^2\cdot LN(8\cdot R)}{8\cdot\pi^2\cdot R} - \frac{Mu0\cdot\alpha^2\cdot c^2\cdot q^2\cdot LN(r)}{8\cdot\pi^2\cdot R} - \frac{Mu0\cdot\alpha^2\cdot c^2\cdot q^2}{4\cdot\pi^2\cdot R}$$

This just above is the magnitude of the outside magnetic energy ”Eso” of the ring.

Next we calculate the inside magnetic energy ”Esi”.

The inside magnetic field ”Bsi” is:

$$\#32: \quad \frac{c\cdot Mu0\cdot qrho}{4\cdot \pi^2\cdot R\cdot Rho}$$

Substituting for qrho (#20):

$$\#33: \quad \frac{c\cdot Mu0\cdot \dfrac{\pi^2\cdot R\cdot Rho\cdot (3\cdot Rho^3\cdot b2 + 4\cdot Rho^2\cdot b1\cdot r + 6\cdot Rho\cdot b0\cdot r^2 + 12\cdot r^3\cdot (-b0 - b1 - b2))}{3\cdot r^2}}{4\cdot \pi^2\cdot R\cdot Rho}$$

Substituting for Rho = r rhor:

$$\#34: \quad \frac{c\cdot Mu0\cdot \dfrac{\pi^2\cdot R\cdot (r\cdot rhor)\cdot (3\cdot (r\cdot rhor)^3\cdot b2 + 4\cdot (r\cdot rhor)^2\cdot b1\cdot r + 6\cdot (r\cdot rhor)\cdot b0\cdot r^2 + 12\cdot r^3\cdot (-b0 - b1 - b2))}{3\cdot r^2}}{4\cdot \pi^2\cdot R\cdot (r\cdot rhor)}$$

Simplifying:

$$\#35: \quad \frac{Mu0\cdot c\cdot r\cdot (6\cdot b0\cdot (rhor - 2) + 4\cdot b1\cdot (rhor^2 - 3) + 3\cdot b2\cdot (rhor^3 - 4))}{12}$$

Substituting for b0 from #24:

#36:
$$\frac{Mu0\cdot c\cdot r\cdot\left(6\cdot\left(-\frac{\pi^2\cdot R\cdot r^2\cdot(8\cdot b1+9\cdot b2)+3\cdot\alpha\cdot q}{6\cdot\pi^2\cdot R\cdot r^2}\right)\cdot(rhor-2)+4\cdot b1\cdot(rhor^2-3)+3\cdot b2\cdot(rhor^3-4)\right)}{12}$$

Simplifying:

#37:
$$\frac{Mu0\cdot c\cdot(\pi^2\cdot R\cdot r^2\cdot(4\cdot b1\cdot(rhor^2-2\cdot rhor+1)+3\cdot b2\cdot(rhor^3-3\cdot rhor+2))+3\cdot\alpha\cdot q\cdot(2-rhor))}{12\cdot\pi^2\cdot R\cdot r}$$

This just above is the inside magnetic field "Bsi".

The inside magnetic energy DENSITY then is:

#38:
$$\frac{Bsi^2}{2\cdot Mu0}$$

Substituting:

#39:
$$\frac{\left(\frac{Mu0\cdot c\cdot(\pi^2\cdot R\cdot r^2\cdot(4\cdot b1\cdot(rhor^2-2\cdot rhor+1)+3\cdot b2\cdot(rhor^3-3\cdot rhor+2))+3\cdot\alpha\cdot q\cdot(2-rhor))}{12\cdot\pi^2\cdot R\cdot r}\right)^2}{2\cdot Mu0}$$

Simplifying:

#40:
$$\frac{Mu0\cdot c^2\cdot(\pi^2\cdot R\cdot r^2\cdot(4\cdot b1\cdot(rhor^2 - 2\cdot rhor + 1) + 3\cdot b2\cdot(rhor^3 - 3\cdot rhor + 2)) + 3\cdot\alpha\cdot q\cdot(2 - rhor))^2}{288\cdot\pi^4\cdot R^2\cdot r^2}$$

Now in order to get the inside magnetic energy we integrate (due to the Jacobian):

#41:
$$r^2\cdot(2\cdot\pi\cdot R)\cdot(2\cdot\pi\cdot rhor)\cdot\frac{Mu0\cdot c^2\cdot(\pi^2\cdot R\cdot r^2\cdot(4\cdot b1\cdot(rhor^2 - 2\cdot rhor + 1) + 3\cdot b2\cdot(rhor^3 - 3\cdot rhor + 2)) + 3\cdot\alpha\cdot q\cdot(2 - rhor))^2}{288\cdot\pi^4\cdot R^2\cdot r^2}$$

#42:
$$\int_0^1 r^2\cdot(2\cdot\pi\cdot R)\cdot(2\cdot\pi\cdot rhor)\cdot\frac{Mu0\cdot c^2\cdot(\pi^2\cdot R\cdot r^2\cdot(4\cdot b1\cdot(rhor^2 - 2\cdot rhor + 1) + 3\cdot b2\cdot(rhor^3 - 3\cdot rhor + 2)) + 3\cdot\alpha\cdot q\cdot(2 - rhor))^2}{288\cdot\pi^4\cdot R^2\cdot r^2}\, drhor$$

Integrating:

$$\#43: \frac{Mu0\cdot c^2\cdot(\pi^4\cdot R^2\cdot r^4\cdot(448\cdot b1^2 + 1536\cdot b1\cdot b2 + 1323\cdot b2^2) + 84\cdot\pi^2\cdot R\cdot\alpha\cdot q\cdot r^2\cdot(3 \sim}{60480\cdot\pi^2\cdot R} \sim$$

$$\frac{2\cdot b1 + 57\cdot b2) + 6930\cdot\alpha^2\cdot q^2)}{}$$

This just above is "Esi", the magnitude of the inside magnetic energy (that is actually negative as two ring current elements have the same sign).

The total magnetic energy mass is then the total magnetic energy (negative as two charge elements are of the same sign) divided by c^2:

$$\#44: \frac{\frac{Mu0\cdot c^2\cdot(\pi^4\cdot R^2\cdot r^4\cdot(448\cdot b1^2 + 1536\cdot b1\cdot b2 + 1323\cdot b2^2) + 84\cdot\pi^2 \sim\cdot R\cdot\alpha\cdot q\cdot r^2\cdot}{60480\cdot\pi^2\cdot R \sim}}{\sim}$$

$$\frac{\frac{32\cdot b1 + 57\cdot b2) + 6930\cdot\alpha^2\cdot q^2)}{} + \left(\frac{Mu0\cdot\alpha^2\cdot c^2\cdot q^2\cdot LN(8\cdot R)}{8\cdot\pi^2\cdot R} - \sim\frac{Mu0\cdot\alpha^2\cdot c^2}{8\cdot\pi^2}\right.}{c^2}$$

$$\frac{\frac{q^2\cdot LN(r)}{\cdot R} - \frac{Mu0\cdot\alpha^2\cdot c^2\cdot q^2}{4\cdot\pi^2\cdot R}\Bigg)}{}$$

Simplifying:

$$\#45: \frac{Mu0\cdot\alpha^2\cdot q^2\cdot LN(8\cdot R)}{8\cdot\pi^2\cdot R} - \frac{Mu0\cdot\alpha^2\cdot q^2\cdot LN(r)}{8\cdot\pi^2\cdot R} +$$

$$\frac{Mu0\cdot(\pi^4\cdot R^2\cdot r^4\cdot(448\cdot b1^2 + 1536\cdot b1\cdot b2 + 1323\cdot b2^2) + 84\cdot\pi^2\cdot R\cdot\alpha\cdot q\cdot r^2\cdot(32 \sim}{60480\cdot\pi^2\cdot R \sim}$$

$$\frac{\cdot b1 + 57\cdot b2) - 8190\cdot\alpha^2\cdot q^2)}{}$$

Thus the spin angular momentum must be the just above dynamic (magnetic) mass times (R c) that will also be negatice as hbar is assumed negative (#7) since the positron is an antiparticle:

$$\#46:\ \left(\frac{Mu0\cdot\alpha^2\cdot q^2\cdot LN(8\cdot R)}{8\cdot\pi^2\cdot R} - \frac{Mu0\cdot\alpha^2\cdot q^2\cdot LN(r)}{8\cdot\pi^2\cdot R} + \frac{Mu0\cdot(\pi^4\cdot R^2\cdot r^4\cdot(448\cdot b1^2 + 1536\cdot b1\cdot b2 + 1323\cdot b2^2) + 84\cdot\pi^2\cdot R \sim\cdot\alpha\cdot q\cdot r^2\cdot(3 \sim}{60480\cdot\pi^2\cdot R \sim}\right.$$

$$\left.\frac{\cdot b1 + 57\cdot b2) - 8190\cdot\alpha^2\cdot q^2)}{}\right)\cdot(R\cdot c)$$

In view of our work and Wesley’s, we set this to (hbar α/2) since it is the magnitude of the negative magnetic mass and (hbar α/2) is the magnitude of (-hbar α/2).:

$$\#47:\ \left(\frac{Mu0\cdot\alpha^2\cdot q^2\cdot LN(8\cdot R)}{8\cdot\pi^2\cdot R} - \frac{Mu0\cdot\alpha^2\cdot q^2\cdot LN(r)}{8\cdot\pi^2\cdot R} + \frac{Mu0\cdot(\pi^4\cdot R^2\cdot r^4\cdot(448\cdot b1^2 + 1536\cdot b1\cdot b2 + 1323\cdot b2^2) + 84\cdot\pi^2\cdot R \sim\cdot\alpha\cdot q\cdot r^2\cdot(3 \sim}{60480\cdot\pi^2\cdot R \sim}\right.$$

$$\left.\frac{\cdot b1 + 57\cdot b2) - 8190\cdot\alpha^2\cdot q^2)}{}\right)\cdot(R\cdot c) = \frac{hbar\cdot\alpha}{2}$$

#48: $$\mathrm{SOLVE}\left(\left(\frac{\mathrm{Mu0}\cdot\alpha^2\cdot q^2\cdot \mathrm{LN}(8\cdot R)}{8\cdot\pi^2\cdot R} - \frac{\mathrm{Mu0}\cdot\alpha^2\cdot q^2\cdot \mathrm{LN}(r)}{8\cdot\pi^2\cdot R} + \frac{\mathrm{Mu0}\cdot(\pi^4\cdot R^2\cdot r^4\cdot(448\cdot b1^2 + 1536\cdot b1\cdot b2 + 1323\cdot b2^2) + 84\cdot\pi^2\cdot R\cdot\alpha\cdot q\cdot r^2\cdot(32\cdot b1 + 57\cdot b2) - 8190\cdot\alpha^2\cdot q^2)}{60480\cdot\pi^2\cdot R}\right)\cdot(R\cdot c) = \frac{\mathrm{hbar}\cdot\alpha}{2},\ b1\right)$$

Solving:

#49: b1 = −

$$\frac{3\cdot\sqrt{(5880\cdot \mathrm{Mu0}\cdot\alpha^2\cdot c\cdot q^2\cdot \mathrm{LN}(8\cdot R) - 5880\cdot \mathrm{Mu0}\cdot\alpha^2\cdot c\cdot q^2\cdot \mathrm{LN}(r) + \mathrm{Mu0}\cdot c\cdot(5\cdot\pi^4 \sim}}{56\sim\cdot\pi^2\cdot\sqrt{\mathrm{Mu0}}\cdot R}$$

$$\frac{R^2\cdot b2^2\cdot r^4 + 140\cdot\pi^2\cdot R\cdot\alpha\cdot b2\cdot q\cdot r^2 - 9506\cdot\alpha^2\cdot q^2) - 23520\cdot\pi^2\cdot\alpha\cdot \mathrm{hbar})}{r^2\cdot\sqrt{(-c)}} -$$

$$\frac{3\cdot(4\cdot\pi^2\cdot R\cdot b2\cdot r^2 + 7\cdot\alpha\cdot q)}{7\cdot\pi^2\cdot R\cdot r^2} \vee b1 =$$

$$\frac{3\cdot\sqrt{(5880\cdot \mathrm{Mu0}\cdot\alpha^2\cdot c\cdot q^2\cdot \mathrm{LN}(8\cdot R) - 5880\cdot \mathrm{Mu0}\cdot\alpha^2\cdot c\cdot q^2\cdot \mathrm{LN}(r) + \mathrm{Mu0}\cdot c\cdot(5\cdot\pi^4 \sim}}{56\sim\cdot\pi^2\cdot\sqrt{\mathrm{Mu0}}\cdot R}$$

$$\frac{R^2\cdot b2^2\cdot r^4 + 140\cdot\pi^2\cdot R\cdot\alpha\cdot b2\cdot q\cdot r^2 - 9506\cdot\alpha^2\cdot q^2) - 23520\cdot\pi^2\cdot\alpha\cdot \mathrm{hbar})}{r^2\cdot\sqrt{(-c)}} -$$

$$\frac{3\cdot(4\cdot\pi^2\cdot R\cdot b2\cdot r^2 + 7\cdot\alpha\cdot q)}{7\cdot\pi^2\cdot R\cdot r^2}$$

There are two solutions:

#50: −

$$\frac{3\cdot\sqrt{(5880\cdot Mu0\cdot\alpha^2\cdot c\cdot q^2\cdot LN(8\cdot R) - 5880\cdot Mu0\cdot\alpha^2\cdot c\cdot q^2\cdot LN(r) + Mu0\cdot c\cdot(5\cdot\pi^4 \ldots}}{56\cdot\pi^2\cdot\sqrt{Mu0}\cdot R \ldots}$$

$$\frac{R^2\cdot b2^2\cdot r^4 + 140\cdot\pi^2\cdot R\cdot\alpha\cdot b2\cdot q\cdot r^2 - 9506\cdot\alpha^2\cdot q^2) - 23520\cdot\pi^2\cdot\alpha\cdot hbar)}{r^2\cdot\sqrt{(-c)}} -$$

$$\frac{3\cdot(4\cdot\pi^2\cdot R\cdot b2\cdot r^2 + 7\cdot\alpha\cdot q)}{7\cdot\pi^2\cdot R\cdot r^2}$$

This just above is "b11", our first solution for "b1".

#51: $$\frac{3\cdot\sqrt{(5880\cdot Mu0\cdot\alpha^2\cdot c\cdot q^2\cdot LN(8\cdot R) - 5880\cdot Mu0\cdot\alpha^2\cdot c\cdot q^2\cdot LN(r) + Mu0\cdot c\cdot(5\cdot\pi^4\cdot R \ldots}}{56\cdot\pi^2\cdot\sqrt{Mu0}\cdot R\cdot r \ldots}$$

$$\frac{\cdot b2^2\cdot r^4 + 140\cdot\pi^2\cdot R\cdot\alpha\cdot b2\cdot q\cdot r^2 - 9506\cdot\alpha^2\cdot q^2) - 23520\cdot\pi^2\cdot\alpha\cdot hbar)}{\cdot\sqrt{(-c)}} -$$

$$\frac{3\cdot(4\cdot\pi^2\cdot R\cdot b2\cdot r^2 + 7\cdot\alpha\cdot q)}{7\cdot\pi^2\cdot R\cdot r^2}$$

This just above is "b12", our second solution for b1.

We first try b11 here.

So we calculate the outside electric energy of the ring:

The ring capacitance ”Cap” is, where Epsilon0 = permitivity of space and so equal to (4 π /(Mu0 c^2)):

$$\#52: \quad \frac{4\cdot\pi^2\cdot Epsilon0\cdot R}{LN(8\cdot R) - LN(r)}$$

Then the outside energy is:

$$\#53: \quad \frac{(q\cdot\alpha)^2}{2\cdot Cap}$$

Substituting:

$$\#54: \quad \frac{(q\cdot\alpha)^2}{2\cdot\dfrac{4\cdot\pi^2\cdot\dfrac{1}{c^2\cdot Mu0}\cdot R}{LN(8\cdot R) - LN(r)}}$$

Simplifying:

$$\#55: \quad \frac{Mu0\cdot\alpha^2\cdot c^2\cdot q^2\cdot LN(8\cdot R)}{8\cdot\pi^2\cdot R} - \frac{Mu0\cdot\alpha^2\cdot c^2\cdot q^2\cdot LN(r)}{8\cdot\pi^2\cdot R}$$

This just above is the outside electric energy of the ring.

Next we calculate the inside electric energy of the ring.

The inside electric field of the ring at radius ”Rho” is:

$$\#56: \quad \frac{qrho}{4\cdot\pi^2\cdot R\cdot Epsilon0\cdot Rho}$$

Substituting for qrho from #20:

$$\#57: \frac{\dfrac{\pi^2 \cdot R \cdot Rho \cdot (3 \cdot Rho^3 \cdot b2 + 4 \cdot Rho^2 \cdot b1 \cdot r + 6 \cdot Rho \cdot b0 \cdot r^2 + 12 \cdot r^3 \cdot (-b0 - b1 - b2))}{3 \cdot r^2}}{4 \cdot \pi^2 \cdot R \cdot Epsilon0 \cdot Rho}$$

Simplifying:

$$\#58: \frac{3 \cdot Rho^3 \cdot b2 + 4 \cdot Rho^2 \cdot b1 \cdot r + 6 \cdot Rho \cdot b0 \cdot r^2 - 12 \cdot r^3 \cdot (b0 + b1 + b2)}{12 \cdot Epsilon0 \cdot r^2}$$

This just above is the inside electric field "E".

Then the inside electric energy DENSITY is:

$$\#59: \frac{E^2 \cdot Epsilon0}{2}$$

Substituting for "E":

$$\#60: \frac{\left(\dfrac{3 \cdot Rho^3 \cdot b2 + 4 \cdot Rho^2 \cdot b1 \cdot r + 6 \cdot Rho \cdot b0 \cdot r^2 - 12 \cdot r^3 \cdot (b0 + b1 + b2)}{12 \cdot Epsilon0 \cdot r^2}\right)^2 \cdot Epsilon0}{2}$$

Substituting for b0 (from #24), Rho [equalling (r rhor)], and for Epsilon0:

$$\#61:\quad \frac{\left(\dfrac{3\cdot(r\cdot rhor)^3\cdot b2 + 4\cdot(r\cdot rhor)^2\cdot b1\cdot r + 6\cdot(r\cdot rhor)\cdot\left(-\dfrac{\pi^2\cdot R\cdot r^2\cdot(8\cdot b1 + 9}{6\cdot\pi^2\cdot R\cdot}\right.}{12\cdot\dfrac{}{M}}\right.}{}$$

$$\frac{\dfrac{\cdot b2) + 3\cdot\alpha\cdot q}{r^2}\Bigg)\cdot r^2 - 12\cdot r^3\cdot\left(-\dfrac{\pi^2\cdot R\cdot r^2\cdot(8\cdot b1 + 9\cdot b2) + 3\cdot\alpha\cdot q}{6\cdot\pi^2\cdot R\cdot r^2} + b1 + b\right.}{\dfrac{1}{u0\cdot c^2}\cdot r^2}$$

$$\frac{}{2}$$

$$\frac{\left.\dfrac{2\Big)}{}\right)^2\cdot\dfrac{1}{Mu0\cdot c^2}}{}$$

Simplifying:

$$\#62:\quad \frac{Mu0\cdot c^2\cdot(\pi^2\cdot R\cdot r^2\cdot(4\cdot b1\cdot(rhor^2 - 2\cdot rhor + 1) + 3\cdot b2\cdot(rhor^3 - 3\cdot rhor + 2) + 3\cdot\alpha\cdot q\cdot(2 - rhor))^2}{288\cdot\pi^4\cdot R^2\cdot r^2}$$

This just above is the electric inside energy DENSITY as a function of b1 and b2, but not of b0.

We need to integrate the just below to obtain total inside electric energy because of the Jacobian:

$$\#63:\ r^2\cdot(2\cdot\pi\cdot R)\cdot(2\cdot\pi\cdot rhor)\cdot\frac{Mu0\cdot c^2\cdot(\pi^2\cdot R\cdot r^2\cdot(4\cdot b1\cdot(rhor^2 - 2\cdot rhor + 1) + 3\cdot \sim}{\sim\ 288\cdot\pi^4\cdot}$$

$$\frac{2\cdot(rhor^3 - 3\cdot rhor + 2)) + 3\cdot\alpha\cdot q\cdot(2 - rhor))^2}{^2\cdot r^2}$$

$$\#64:\ \int_0^1$$

$$r^2\cdot(2\cdot\pi\cdot R)\cdot(2\cdot\pi\cdot rhor)\cdot\frac{Mu0\cdot c^2\cdot(\pi^2\cdot R\cdot r^2\cdot(4\cdot b1\cdot(rhor^2 - 2\cdot rhor + 1) + \sim}{\sim\ 288\cdot\pi}$$

$$\frac{\cdot b2\cdot(rhor^3 - 3\cdot rhor + 2)) + 3\cdot\alpha\cdot q\cdot(2 - rhor))^2}{\cdot R^2\cdot r^2}\ drhor$$

Integrating:

$$\#65:\ \frac{Mu0\cdot c^2\cdot(\pi^4\cdot R^2\cdot r^4\cdot(448\cdot b1^2 + 1536\cdot b1\cdot b2 + 1323\cdot b2^2) + 84\cdot\pi^2\ \sim R\cdot\alpha\cdot q\cdot r^2\cdot(}{60480\cdot\pi^2\cdot R\ \sim}$$

$$\frac{2\cdot b1 + 57\cdot b2) + 6930\cdot\alpha^2\cdot q^2)}{}$$

This just above is the (positive) inside electric energy of the ring.

We add it to the outside electric energy:

#66:

$$\frac{Mu0\cdot c^{2}\cdot(\pi^{4}\cdot R^{2}\cdot r^{4}\cdot(448\cdot b1^{2}+1536\cdot b1\cdot b2+1323\cdot b2^{2})+84\cdot\pi^{2}\cdot R\cdot\alpha\cdot q\cdot r^{2}\cdot(3\sim}{60480\cdot\pi^{2}\cdot R}$$

$$\frac{2\cdot b1+57\cdot b2)+6930\cdot\alpha^{2}\cdot q^{2})}{} + \left(\frac{Mu0\cdot\alpha^{2}\cdot c^{2}\cdot q^{2}\cdot LN(8\cdot R)}{8\cdot\pi^{2}\cdot R}-\frac{Mu0\cdot\alpha^{2}\cdot c^{2}\cdot q^{2}\cdot LN(r)}{8\cdot\pi^{2}\cdot R}\right)$$

Substituting b1 (#50) for b1:

#67:

$$Mu0\cdot c^{2}\cdot(\pi^{4}\cdot R^{2}\cdot r^{4}\cdot(448\cdot(-\ \frac{3\cdot\sqrt{(}5880\cdot Mu0\cdot\alpha^{2}\cdot c\cdot q^{2}\cdot LN(8\cdot R)-5880\cdot Mu0\cdot\alpha^{2}\cdot}{}\sim$$

$$\frac{\cdot q^{2}\cdot LN(r)+Mu0\cdot c\cdot(5\cdot\pi^{4}\cdot R^{2}\cdot b2^{2}\cdot r^{4}+140\cdot\pi^{2}\cdot R\cdot\alpha\cdot b2\cdot q\cdot r^{2}-9506\cdot\alpha^{2}\cdot q^{2})}{56\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}}\sim$$

$$\frac{-\ 23520\cdot\pi^{2}\cdot\alpha\cdot hbar)}{}-\frac{3\cdot(4\cdot\pi^{2}\cdot R\cdot b2\cdot r^{2}+7\cdot\alpha\cdot q)}{7\cdot\pi^{2}\cdot R\cdot r^{2}}\Bigg)^{2}+1536\cdot\Bigg(-\ \frac{3\cdot\sqrt{(}588}{}\sim$$

$$\frac{0\cdot Mu0\cdot\alpha^{2}\cdot c\cdot q^{2}\cdot LN(8\cdot R)-5880\cdot Mu0\cdot\alpha^{2}\cdot c\cdot q^{2}\cdot LN(r)+Mu0\cdot c\cdot(5\cdot\pi^{4}\cdot R^{2}\cdot b2^{2}\cdot}{56\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}}\sim$$

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4          2               2           2  2             2                   2    ~
  + 140·π ·R·α·b2·q·r  − 9506·α ·q ) − 23520·π ·α·hbar)      3·(4·π ·R ~
───────────────────────────────────────────────────────────── − ────────── ~
                                                                           ~
                                                                         7 ~
──────────────────────────────────────────────────────────────────────────── ~
                   2                                                       ~
             60480·π ·R                                                    ~

      2            ⎞                ⎞                                 ⎛   ⎛           ~
·b2·r  + 7·α·q)    ⎟              2 ⎟        2          2  ⎜   ⎜    3·√(5880·Mu ~
───────────────    ⎟·b2 + 1323·b2   ⎟  + 84·π ·R·α·q·r  · ⎜32·⎜− ──────────── ~
  2    2           ⎟                ⎟                     ⎜   ⎜              ~
·π ·R·r            ⎠                ⎠                     ⎝   ⎝              ~
──────────────────────────────────────────────────────────────────────────── ~
                                                                           ~
                                                                           ~

   2    2                         2    2                      4  2   2  4    ~
0·α ·c·q ·LN(8·R) − 5880·Mu0·α ·c·q ·LN(r) + Mu0·c·(5·π ·R ·b2 ·r  +  ~
──────────────────────────────────────────────────────────────────────────── ~
                                              2         2              ~
                                         56·π ·√Mu0·R·r ·√(−c)         ~
──────────────────────────────────────────────────────────────────────────── ~
                                                                           ~
                                                                           ~

      2            2         2  2           2                 2     ~
140·π ·R·α·b2·q·r  − 9506·α ·q ) − 23520·π ·α·hbar)      3·(4·π ·R·b2· ~
────────────────────────────────────────────────────── − ───────────── ~
                                                                  2  ~
                                                            7·π · ~
──────────────────────────────────────────────────────────────────────────── ~
                                                                           ~
                                                                           ~

 2              ⎞          ⎞             ⎞
r  + 7·α·q)     ⎟          ⎟        2  2 ⎟
───────────     ⎟ + 57·b2  ⎟ + 6930·α ·q ⎟
   2            ⎟          ⎟             ⎟      ⎛       2  2  2
R·r             ⎠          ⎠             ⎠      ⎜ Mu0·α ·c ·q ·LN(8·R)
──────────────────────────────────────────── +  ⎜ ──────────────────── −
                                                ⎜           2
                                                ⎝      8·π ·R


      2  2  2        ⎞
 Mu0·α ·c ·q ·LN(r)  ⎟
 ──────────────────  ⎟
          2          ⎟
     8·π ·R          ⎠
```

Simplifying:

#68: $$\frac{\alpha\cdot c\cdot(Mu0\cdot\alpha\cdot c\cdot q^{2} + 2\cdot\pi^{2}\cdot hbar)}{4\cdot\pi^{2}\cdot R}$$

This just above is the total ring electric energy of the ring using b11 for b1, and it is not a function of "r".

Next we calculate this total electric energy using b12 (#51) for b1 and then compare:

#69: $$Mu0\cdot c^{2}\cdot\left(\pi^{4}\cdot R^{2}\cdot r^{4}\cdot\left(448\cdot\left(\frac{3\cdot\sqrt{(}5880\cdot Mu0\cdot\alpha^{2}\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 5880\cdot Mu0\cdot\alpha^{2}\cdot c\cdot}{}\right.\right.\right.$$

$$\frac{{}^{2}\cdot LN(r) + Mu0\cdot c\cdot(5\cdot\pi^{4}\cdot R^{2}\cdot b2^{2}\cdot r^{4} + 140\cdot\pi^{2}\cdot R\cdot\alpha\cdot b2\cdot q\cdot r^{2} - 9506\cdot\alpha^{2}\cdot q^{2}) -}{56\cdot\pi^{2}\cdot\sqrt{Mu0\cdot R\cdot r^{2}}\cdot\sqrt{(-c)}}$$

$$\frac{23520\cdot\pi^{2}\cdot\alpha\cdot hbar)}{} - \left.\frac{3\cdot(4\cdot\pi^{2}\cdot R\cdot b2\cdot r^{2} + 7\cdot\alpha\cdot q)}{7\cdot\pi^{2}\cdot R\cdot r^{2}}\right)^{2} + 1536\cdot\left(\frac{3\cdot\sqrt{(}5880\cdot Mu}{}\right.$$

$$\frac{0\cdot\alpha^{2}\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 5880\cdot Mu0\cdot\alpha^{2}\cdot c\cdot q^{2}\cdot LN(r) + Mu0\cdot c\cdot(5\cdot\pi^{4}\cdot R^{2}\cdot b2^{2}\cdot r^{4} +}{56\cdot\pi^{2}\cdot\sqrt{Mu0\cdot R\cdot r^{2}}\cdot\sqrt{(-c)}}$$

$$\frac{\dfrac{140\cdot\pi^{2}\cdot R\cdot\alpha\cdot b2\cdot q\cdot r^{2} - 9506\cdot\alpha^{2}\cdot q^{2}) - 23520\cdot\pi^{2}\cdot\alpha\cdot hbar)}{} - \dfrac{3\cdot(4\cdot\pi^{2}\cdot R\cdot b2\cdot}{7\cdot\pi^{2}\cdot}}{60480\cdot\pi^{2}\cdot R} \sim$$

$$\frac{\dfrac{r^{2} + 7\cdot\alpha\cdot q)}{R\cdot r^{2}}\Bigg)\cdot b2 + 1323\cdot b2^{2}\Bigg) + 84\cdot\pi^{2}\cdot R\cdot\alpha\cdot q\cdot r^{2}\cdot\Bigg(32\cdot\Bigg(\dfrac{3\cdot\sqrt{(}5880\cdot Mu0\cdot\alpha^{2}\cdot c}{}}{} \sim$$

$$\frac{\dfrac{\cdot q^{2}\cdot LN(8\cdot R) - 5880\cdot Mu0\cdot\alpha^{2}\cdot c\cdot q^{2}\cdot LN(r) + Mu0\cdot c\cdot(5\cdot\pi^{4}\cdot R^{2}\cdot b2^{2}\cdot r^{4} + 140\cdot\pi^{2}}{56\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}}}{} \sim$$

$$\frac{\dfrac{\cdot R\cdot\alpha\cdot b2\cdot q\cdot r^{2} - 9506\cdot\alpha^{2}\cdot q^{2}) - 23520\cdot\pi^{2}\cdot\alpha\cdot hbar)}{} - \dfrac{3\cdot(4\cdot\pi^{2}\cdot R\cdot b2\cdot r^{2} + 7}{7\cdot\pi^{2}\cdot R\cdot r^{2}}}{} \sim$$

$$\frac{\dfrac{\cdot\alpha\cdot q)}{}\Bigg) + 57\cdot b2\Bigg) + 6930\cdot\alpha^{2}\cdot q^{2}\Bigg)}{} + \Bigg(\frac{Mu0\cdot\alpha^{2}\cdot c^{2}\cdot q^{2}\cdot LN(8\cdot R)}{8\cdot\pi^{2}\cdot R} -$$

$$\frac{Mu0\cdot\alpha^{2}\cdot c^{2}\cdot q^{2}\cdot LN(r)}{8\cdot\pi^{2}\cdot R}\Bigg)$$

Simplifying:

#70:
$$\frac{\alpha\cdot c\cdot(Mu0\cdot\alpha\cdot c\cdot q^2 + 2\cdot\pi^2\cdot hbar)}{4\cdot\pi^2\cdot R}$$

We obtain the total ring electric energy using b12 for b1 and our result is the same as when we used b11 for b1.

We recall the inside and the outside ring magnetic energy and add them to obtain:

#71:
$$\frac{Mu0\cdot c^2\cdot(\pi^4\cdot R^2\cdot r^4\cdot(448\cdot b1^2 + 1536\cdot b1\cdot b2 + 1323\cdot b2^2) + 84\cdot\pi^2\cdot R\cdot\alpha\cdot q\cdot r^2\cdot(\sim}{60480\cdot\pi^2\cdot R \sim}$$

$$\frac{2\cdot b1 + 57\cdot b2) + 6930\cdot\alpha^2\cdot q^2)}{} + \left(\frac{Mu0\cdot\alpha^2\cdot c^2\cdot q^2\cdot LN(8\cdot R)}{8\cdot\pi^2\cdot R} - \frac{Mu0\cdot\alpha^2\cdot c^2\cdot q^2\cdot LN(r)}{8\cdot\pi^2\cdot R} - \frac{Mu0\cdot\alpha^2\cdot c^2\cdot q^2}{4\cdot\pi^2\cdot R}\right)$$

Substituting b11 (#50) for b1:

#72:
$$\frac{Mu0\cdot c^2\cdot\left(\pi^4\cdot R^2\cdot r^4\cdot\left(448\cdot\left(-\frac{3\cdot\sqrt{(5880\cdot Mu0\cdot\alpha^2\cdot c\cdot q^2\cdot LN(8\cdot R) - 5880\cdot Mu0\cdot\alpha^2\cdot \sim}}{\sim}\right.\right.\right.}{\sim}$$

$$\frac{\cdot q^2\cdot LN(r) + Mu0\cdot c\cdot(5\cdot\pi^4\cdot R^2\cdot b2^2\cdot r^4 + 140\cdot\pi^2\cdot R\cdot\alpha\cdot b2\cdot q\cdot r^2 - 9506\cdot\alpha^2\cdot q^2) \sim}{56\cdot\pi^2\cdot\sqrt{Mu0\cdot R\cdot r^2}\cdot\sqrt{(-c)} \sim}$$

```
                 2                         2       2                  ⎞2          ⎛      3·√(588 ~
− 23520·π  ·α·hbar)     3·(4·π  ·R·b2·r   + 7·α·q)⎟   + 1536·⎜−  ──────── ~
──────────────────── − ────────────────────────────── ⎟          ⎜            ~
                                     2     2          ⎟          ⎜            ~
                              7·π  ·R·r               ⎠          ⎝            ~
────────────────────────────────────────────────────────────────────────────── ~
                                                                               ~
                                                                               ~

         2     2                             2     2                       4   2    2  ~
0·Mu0·α  ·c·q  ·LN(8·R) − 5880·Mu0·α  ·c·q  ·LN(r) + Mu0·c·(5·π  ·R  ·b2  ·r ~
────────────────────────────────────────────────────────────────────────────── ~
                                                        2           2        ~
                                                 56·π  ·√Mu0·R·r  ·√(−c) ~
────────────────────────────────────────────────────────────────────────────── ~
                                                                               ~
                                                                               ~

4        2                2          2   2             2                2  ~
  + 140·π  ·R·α·b2·q·r   − 9506·α  ·q  ) − 23520·π  ·α·hbar)     3·(4·π  ·R ~
─────────────────────────────────────────────────────────────── − ────────── ~
                                                                               ~
                                                                            7 ~
────────────────────────────────────────────────────────────────────────────── ~
                    2                                                          ~
          60480·π  ·R                                                          ~

      2                 ⎞                 ⎞          2            2  ⎛    ⎛                   ~
·b2·r   + 7·α·q)        ⎟                2⎟                            ⎜    ⎜     3·√(5880·Mu ~
────────────────────────⎟·b2 + 1323·b2  ⎟  + 84·π  ·R·α·q·r  ·⎜32·⎜− ──────────── ~
   2     2              ⎟                 ⎟                            ⎜    ⎜                 ~
·π  ·R·r                ⎠                 ⎠                            ⎝    ⎝                 ~
────────────────────────────────────────────────────────────────────────────── ~
                                                                               ~
                                                                               ~

   2     2                                2     2                    4   2    2   4      ~
0·α  ·c·q  ·LN(8·R) − 5880·Mu0·α  ·c·q  ·LN(r) + Mu0·c·(5·π  ·R  ·b2  ·r   + ~
────────────────────────────────────────────────────────────────────────────── ~
                                                  2           2               ~
                                           56·π  ·√Mu0·R·r  ·√(−c)           ~
────────────────────────────────────────────────────────────────────────────── ~
                                                                               ~
                                                                               ~

      2                 2          2   2              2                     2         ~
140·π  ·R·α·b2·q·r   − 9506·α  ·q  ) − 23520·π  ·α·hbar)     3·(4·π  ·R·b2· ~
──────────────────────────────────────────────────────── − ───────────────── ~
                                                                           2  ~
                                                                    7·π  · ~
────────────────────────────────────────────────────────────────────────────── ~
                                                                               ~
                                                                               ~
```

$$\frac{\left.\left.\left.\frac{r^2 + 7\cdot\alpha\cdot q)}{R\cdot r^2}\right) + 57\cdot b2\right) + 6930\cdot\alpha^2\cdot q^2\right)}{} + \left(\frac{Mu0\cdot\alpha^2\cdot c^2\cdot q^2\cdot LN(8\cdot R)}{8\cdot\pi^2\cdot R} -\right.$$

$$\left.\frac{Mu0\cdot\alpha^2\cdot c^2\cdot q^2\cdot LN(r)}{8\cdot\pi^2\cdot R} - \frac{Mu0\cdot\alpha^2\cdot c^2\cdot q^2}{4\cdot\pi^2\cdot R}\right)$$

Simplifying:

#73:
$$\frac{\alpha\cdot c\cdot hbar}{2\cdot R}$$

This just above is our total magnetic energy using b11 for b1.

Using b12 (#51) for b1 in #72:

#74:
$$\frac{Mu0\cdot c^2\cdot\left(\pi^4\cdot R^2\cdot r^4\cdot\left(448\cdot\left(\frac{3\cdot\sqrt{(5880\cdot Mu0\cdot\alpha^2\cdot c\cdot q^2\cdot LN(8\cdot R) - 5880\cdot Mu0\cdot\alpha^2\cdot c\cdot}}{}\right.\right.\right.}{}$$

$$\frac{\frac{{}^2\cdot LN(r) + Mu0\cdot c\cdot(5\cdot\pi^4\cdot R^2\cdot b2^2\cdot r^4 + 140\cdot\pi^2\cdot R\cdot\alpha\cdot b2\cdot q\cdot r^2 - 9506\cdot\alpha^2\cdot q^2) -}{56\cdot\pi^2\cdot\sqrt{Mu0}\cdot R\cdot r^2\cdot\sqrt{(-c)}}}{}$$

$$\frac{\left.\frac{23520\cdot\pi^2\cdot\alpha\cdot hbar)}{} - \frac{3\cdot(4\cdot\pi^2\cdot R\cdot b2\cdot r^2 + 7\cdot\alpha\cdot q)}{7\cdot\pi^2\cdot R\cdot r^2}\right)^2 + 1536\cdot\left(\frac{3\cdot\sqrt{(5880\cdot Mu}}{}\right.}{}$$

```
   2    2                                  2    2                           4   2    2   4    ~
0•α  •c•q  •LN(8•R) - 5880•Mu0•α  •c•q  •LN(r) + Mu0•c•(5•π  •R  •b2  •r  +  ~
─────────────────────────────────────────────────────────────────────────────── ~
                                                 2            2                  ~
                                             56•π  •√Mu0•R•r  •√(-c)             ~
─────────────────────────────────────────────────────────────────────────────── ~
                                                                                 ~
                                                                                 ~

     2             2          2  2              2                        2       ~
140•π  •R•α•b2•q•r  - 9506•α  •q ) - 23520•π  •α•hbar)         3•(4•π  •R•b2•   ~
─────────────────────────────────────────────────────────────  - ─────────────── ~
                                                                            2    ~
                                                                        7•π  •   ~
─────────────────────────────────────────────────────────────────────────────── ~
                    2                                                            ~
           60480•π  •R                                                           ~

 2                                                                            2  ~
r  + 7•α•q)                      2          2          2                  2      ~
───────────── •b2 + 1323•b2  ) + 84•π  •R•α•q•r  • 32• 3•√(5880•Mu0•α  •c       ~
    2                                                  ─────────────────────────  ~
R•r                                                                              ~
─────────────────────────────────────────────────────────────────────────────── ~
                                                                                 ~
                                                                                 ~

  2                            2    2                       4  2    2   4        2 ~
•q  •LN(8•R) - 5880•Mu0•α  •c•q  •LN(r) + Mu0•c•(5•π  •R  •b2  •r  + 140•π      ~
─────────────────────────────────────────────────────────────────────────────── ~
                                               2           2                     ~
                                           56•π  •√Mu0•R•r  •√(-c)               ~
─────────────────────────────────────────────────────────────────────────────── ~
                                                                                 ~
                                                                                 ~

              2          2  2              2                   2         2       ~
•R•α•b2•q•r  - 9506•α  •q ) - 23520•π  •α•hbar)         3•(4•π  •R•b2•r  + 7    ~
──────────────────────────────────────────────────  - ─────────────────────────── ~
                                                               2    2            ~
                                                           7•π  •R•r             ~
─────────────────────────────────────────────────────────────────────────────── ~
                                                                                 ~
                                                                                 ~

•α•q)                              2  2
─────── ) + 57•b2 ) + 6930•α  •q  )
                                              2  2  2
                                       Mu0•α  •c  •q  •LN(8•R)
──────────────────────────────────── + (─────────────────────── -
                                                  2
                                              8•π  •R
```

$$\left.\frac{Mu0\cdot\alpha^2\cdot c^2\cdot q^2\cdot LN(r)}{8\cdot\pi^2\cdot R} - \frac{Mu0\cdot\alpha^2\cdot c^2\cdot q^2}{4\cdot\pi^2\cdot R}\right)$$

Simplifying:

#75: $$\frac{\alpha\cdot c\cdot hbar}{2\cdot R}$$

This just above is the total ring magnetic energy using b12 for b1 this time.

And the result is the same as when using b11 for b1 as with the total electric energy of the ring.

The total ring EM energy (after changing the total magnetic energy that is negative by the magnitude of the total magnetic energy) using either b11 or b12 for b1 is then:

#76: $$\frac{\alpha\cdot c\cdot hbar}{2\cdot R} + \frac{\alpha\cdot c\cdot(Mu0\cdot\alpha\cdot c\cdot q^2 + 2\cdot\pi^2\cdot hbar)}{4\cdot\pi^2\cdot R}$$

Simplifying:

#77: $$\frac{\alpha\cdot c\cdot(Mu0\cdot\alpha\cdot c\cdot q^2 + 4\cdot\pi^2\cdot hbar)}{4\cdot\pi^2\cdot R}$$

This just above is the sum of the magnitudes of the four EM energies of the ring, and it does not depend upon res, b0, b1, b2, or ”r”.

Thus we can solve for ”R” using the above since the above total EM energy must equal ((me α) c^2), where me is the positron rest mass.

#78: $$SOLVE\left(\frac{\alpha\cdot c\cdot(Mu0\cdot\alpha\cdot c\cdot q^2 + 4\cdot\pi^2\cdot hbar)}{4\cdot\pi^2\cdot R} = (me\cdot\alpha)\cdot c^2,\ R\right)$$

Solving:

#79: $$R = \frac{Mu0\cdot\alpha\cdot c\cdot q^2 + 4\cdot\pi^2\cdot hbar}{4\cdot\pi^2\cdot c\cdot me}$$

Here we lose an α in the numerator due to (me α) in the denomerator.

Now R is a linear function of α.

#80: $$\frac{Mu0\cdot\alpha\cdot c\cdot q^2 + 4\cdot\pi^2\cdot hbar}{4\cdot\pi^2\cdot c\cdot me}$$

This just above is "R" and holds for b11 and fo b12.

We next calculate b01 for b0 using b11 for b1,

and so we substitute into b0 from #24 using b11 (#50) for b1:

#81: $$-\frac{\pi^2\cdot R\cdot r^2\cdot\left(8\cdot\left(-\frac{\dfrac{3\cdot\sqrt{(5880\cdot Mu0\cdot\alpha^2\cdot c\cdot q^2\cdot LN(8\cdot R) - 5880\cdot Mu0\cdot\alpha^2\cdot c\cdot q^2\cdot LN(r)}}{} \sim}{\dfrac{+ Mu0\cdot c\cdot(5\cdot\pi^4\cdot R^2\cdot b2^2\cdot r^4 + 140\cdot\pi^2\cdot R\cdot\alpha\cdot b2\cdot q\cdot r^2 - 9506\cdot\alpha^2\cdot q^2) - 23520\cdot}{56\cdot\pi^2\cdot\sqrt{Mu0\cdot R\cdot r^2}\cdot\sqrt{(-c)}}}\right.\right.}{6\cdot\pi^2\cdot R\cdot r^2}$$

$$\frac{{}^{2}\cdot\alpha\cdot hbar)}{\quad} - \frac{3\cdot(4\cdot\pi^{2}\cdot R\cdot b2\cdot r^{2} + 7\cdot\alpha\cdot q)}{7\cdot\pi^{2}\cdot R\cdot r^{2}}\Bigg) + 9\cdot b2\Bigg) + 3\cdot\alpha\cdot q$$

Simplifying:

$$\#82:\ \frac{\sqrt{(5880\cdot Mu0\cdot\alpha^{2}\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 5880\cdot Mu0\cdot\alpha^{2}\cdot c\cdot q^{2}\cdot LN(r) + Mu0\cdot\tilde{c}\cdot(5\cdot\pi^{4}\cdot R^{2}\cdot}}{14\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}}$$

$$\frac{2^{2}\cdot r^{4} + 140\cdot\pi^{2}\cdot R\cdot\alpha\cdot b2\cdot q\cdot r^{2} - 9506\cdot\alpha^{2}\cdot q^{2}) - 23520\cdot\pi^{2}\cdot\alpha\cdot hbar)}{\sqrt{(-c)}} +$$

$$\frac{11\cdot\pi^{2}\cdot R\cdot b2\cdot r^{2} + 49\cdot\alpha\cdot q}{14\cdot\pi^{2}\cdot R\cdot r^{2}}$$

This just above is b01 that comes from b0 using b11 for b1.

Now for user-friendlyness, we need to have the rhor derivative of the charge density lambda[rhor] vanish at rhor = 1, that is, at the ring rim:

$$\#83:\ b0 + b1\cdot rhor + b2\cdot rhor^{2} + \frac{res}{rhor}$$

Partial differentiating:

$$\#84:\ \frac{d}{d\ rhor}\left(b0 + b1\cdot rhor + b2\cdot rhor^{2} + \frac{res}{rhor}\right)$$

Evaluating

$$\#85:\ b1 + 2\cdot b2\cdot rhor - \frac{res}{rhor^{2}}$$

This just above is the rhor derivative of the charge density,

and it vanishes at rhor = 1:

#86: $$b1 + 2\cdot b2\cdot 1 - \frac{res}{1^2}$$

#87: $$\text{SOLVE}\left(b1 + 2\cdot b2\cdot 1 - \frac{res}{1^2} = 0,\ b2\right)$$

Evaluating:

#88: $$b2 = \frac{res - b1}{2}$$

Subsituting for res using #19:

#89: $$b2 = \frac{(-b0 - b1 - b2) - b1}{2}$$

Substituting for b0 from #24:

#90: $$b2 = \frac{\left(-\dfrac{\pi^2\cdot R\cdot r^2\cdot(8\cdot b1 + 9\cdot b2) + 3\cdot\alpha\cdot q}{6\cdot\pi^2\cdot R\cdot r^2} - b1 - b2\right) - b1}{2}$$

Substituting into b1 using the first solution, b11 above (#50), into the equation for b2 above:

#91:

b2 =

$$\left(-- \frac{\pi^{2} \cdot R \cdot r^{2} \cdot \left(8 \cdot \left(- \frac{3 \cdot \sqrt{(5880 \cdot Mu0 \cdot \alpha^{2} \cdot c \cdot q^{2} \cdot LN(8 \cdot R) - 5880 \cdot Mu0 \cdot \alpha^{2} \cdot c \cdot q^{2} \cdot}}{} \right.\right.}{} \right.$$

$$\frac{\dfrac{LN(r) + Mu0 \cdot c \cdot (5 \cdot \pi^{4} \cdot R^{2} \cdot b2^{2} \cdot r^{4} + 140 \cdot \pi^{2} \cdot R \cdot \alpha \cdot b2 \cdot q \cdot r^{2} - 9506 \cdot \alpha^{2} \cdot q^{2}) - 23}{56 \cdot \pi^{2} \cdot \sqrt{Mu0} \cdot R \cdot r^{2} \cdot \sqrt{(-c)}}}{6 \cdot \pi^{2} \cdot R \cdot r^{2}}$$

$$\frac{\dfrac{520 \cdot \pi^{2} \cdot \alpha \cdot hbar)}{} - \dfrac{3 \cdot (4 \cdot \pi^{2} \cdot R \cdot b2 \cdot r^{2} + 7 \cdot \alpha \cdot q)}{7 \cdot \pi^{2} \cdot R \cdot r^{2}} \left.\right) + 9 \cdot b2 \left.\right) + 3 \cdot \alpha \cdot q}{} - \left(- - \right.$$

$$\frac{\dfrac{3 \cdot \sqrt{(5880 \cdot Mu0 \cdot \alpha^{2} \cdot c \cdot q^{2} \cdot LN(8 \cdot R) - 5880 \cdot Mu0 \cdot \alpha^{2} \cdot c \cdot q^{2} \cdot LN(r) + Mu0 \cdot c \cdot (5 \cdot \pi^{4} \cdot R}}{56 \cdot \pi^{2} \cdot \sqrt{Mu0} \cdot R \cdot r}}{2}$$

$$\frac{\dfrac{{}^{2} \cdot b2^{2} \cdot r^{4} + 140 \cdot \pi^{2} \cdot R \cdot \alpha \cdot b2 \cdot q \cdot r^{2} - 9506 \cdot \alpha^{2} \cdot q^{2}) - 23520 \cdot \pi^{2} \cdot \alpha \cdot hbar)}{{}^{2} \cdot \sqrt{(-c)}} - \dfrac{3 \cdot}{}}{}$$

$$\frac{\left.\frac{(4\cdot\pi^{2}\cdot R\cdot b2\cdot r^{2} + 7\cdot\alpha\cdot q)}{7\cdot\pi^{2}\cdot R\cdot r^{2}}\right) - b2 \Bigg) - \Bigg(- \frac{3\cdot\sqrt{(5880\cdot Mu0\cdot\alpha^{2}\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 5}}{}}{}$$

$$\frac{\frac{880\cdot Mu0\cdot\alpha^{2}\cdot c\cdot q^{2}\cdot LN(r) + Mu0\cdot c\cdot(5\cdot\pi^{4}\cdot R^{2}\cdot b2^{2}\cdot r^{4} + 140\cdot\pi^{2}\cdot R\cdot\alpha\cdot b2\cdot q\cdot r^{2} -}{56\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}}}{}$$

$$\frac{\frac{9506\cdot\alpha^{2}\cdot q^{2}) - 23520\cdot\pi^{2}\cdot\alpha\cdot hbar)}{} - \left.\frac{3\cdot(4\cdot\pi^{2}\cdot R\cdot b2\cdot r^{2} + 7\cdot\alpha\cdot q)}{7\cdot\pi^{2}\cdot R\cdot r^{2}}\right)}{}$$

Simplifying:

#92: b2 =

$$\frac{\sqrt{(5880\cdot Mu0\cdot\alpha^{2}\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 5880\cdot Mu0\cdot\alpha^{2}\cdot c\cdot q^{2}\cdot LN(r) + Mu0\cdot c\cdot(5\cdot\pi^{4}\cdot R}}{56\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r}$$

$$\frac{\cdot b2^{2}\cdot r^{4} + 140\cdot\pi^{2}\cdot R\cdot\alpha\cdot b2\cdot q\cdot r^{2} - 9506\cdot\alpha^{2}\cdot q^{2}) - 23520\cdot\pi^{2}\cdot\alpha\cdot hbar)}{{}^{2}\cdot\sqrt{(-c)}} +$$

$$\frac{23\cdot\pi^2\cdot R\cdot b2\cdot r^2 + 35\cdot\alpha\cdot q}{28\cdot\pi^2\cdot R\cdot r^2}$$

#93: SOLVE $\Bigg(b2 =$

$$\frac{\sqrt{(5880\cdot Mu0\cdot\alpha^2\cdot c\cdot q^2\cdot LN(8\cdot R) - 5880\cdot Mu0\cdot\alpha^2\cdot c\cdot q^2\cdot LN(r) + Mu0\cdot c\cdot(5\cdot\pi^4\cdot R^2 \sim}}{56\cdot\pi^2\cdot\sqrt{Mu0}\cdot R\cdot r \sim}$$

$$\frac{\cdot b2^2\cdot r^4 + 140\cdot\pi^2\cdot R\cdot\alpha\cdot b2\cdot q\cdot r^2 - 9506\cdot\alpha^2\cdot q^2) - 23520\cdot\pi^2\cdot\alpha\cdot hbar)}{^2\cdot\sqrt{(-c)}} +$$

$$\frac{23\cdot\pi^2\cdot R\cdot b2\cdot r^2 + 35\cdot\alpha\cdot q}{28\cdot\pi^2\cdot R\cdot r^2}, b2\Bigg)$$

Solving, there are two solutions:

#94: $b2 = \dfrac{6\cdot\alpha\cdot q}{\pi^2\cdot R\cdot r^2} -$

$$\frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(r) - \sim 599\cdot Mu0\cdot\alpha\cdot c}}{15\cdot\pi^2\cdot\sqrt{Mu0}\cdot R\cdot r^2\cdot\sqrt{(-c)} \sim}$$

$$\frac{\cdot q^2 - 1680\cdot\pi^2\cdot hbar)}{} \vee b2 =$$

$$\frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(r) - \sim 599\cdot Mu0\cdot\alpha\cdot c}}{15\cdot\pi^2\cdot\sqrt{Mu0}\cdot R\cdot r^2\cdot\sqrt{(-c)} \sim}$$

$$\frac{\cdot q^2 - 1680\cdot\pi^2\cdot hbar)}{} + \frac{6\cdot\alpha\cdot q}{\pi^2\cdot R\cdot r^2}$$

#95: $\frac{6\cdot\alpha\cdot q}{\pi^2\cdot R\cdot r^2} -$

$$\frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c}}{15\cdot\pi^2\cdot\sqrt{Mu0}\cdot R\cdot r^2\cdot\sqrt{(-c)}} \sim$$

$$\frac{\cdot q^2 - 1680\cdot\pi^2\cdot hbar)}{}$$

This just above is "b211", the first solution for b2 using b11.

#96: $\frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c\cdot}}{15\cdot\pi^2\cdot\sqrt{Mu0}\cdot R\cdot r^2\cdot\sqrt{(-c)}} \sim$

$$\frac{{}^2 - 1680\cdot\pi^2\cdot hbar)}{} + \frac{6\cdot\alpha\cdot q}{\pi^2\cdot R\cdot r^2}$$

This just above is "b212", the second solution for b2 from "b11".

We use first "b212" here.

Now we can calculate our coefficients: res12 for res, b012 for b0, b112 for b1, and b212 for b2 ... in terms of only our known constants:

#97: −

$$\frac{3\cdot\sqrt{(5880\cdot Mu0\cdot\alpha^{2}\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 5880\cdot Mu0\cdot\alpha^{2}\cdot c\cdot q^{2}\cdot LN(r) + Mu0\cdot c\cdot(5\cdot\pi^{4}\cdot}}{56\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot} \sim$$

$$\frac{R^{2}\cdot b2^{2}\cdot r^{4} + 140\cdot\pi^{2}\cdot R\cdot\alpha\cdot b2\cdot q\cdot r^{2} - 9506\cdot\alpha^{2}\cdot q^{2}) - 23520\cdot\pi^{2}\cdot\alpha\cdot hbar)}{r^{2}\cdot\sqrt{(-c)}} -$$

$$\frac{3\cdot(4\cdot\pi^{2}\cdot R\cdot b2\cdot r^{2} + 7\cdot\alpha\cdot q)}{7\cdot\pi^{2}\cdot R\cdot r^{2}}$$

Substituting into b11 just above, b212 for b2:

#98: $-$

$$\frac{3\cdot\sqrt{\left(5880\cdot Mu0\cdot\alpha^{2}\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 5880\cdot Mu0\cdot\alpha^{2}\cdot c\cdot q^{2}\cdot LN(r) + Mu0\cdot c\cdot\left(5\cdot\pi^{4}\right.\right.}}{} \sim$$

$$\frac{R^{2}\cdot\left(\frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0}}{15\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}}\right.}{} \sim$$

$$\frac{\frac{\cdot\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar)}{} + \left.\frac{6\cdot\alpha\cdot q}{\pi^{2}\cdot R\cdot r^{2}}\right)^{2}\cdot r^{4} + 140\cdot\pi^{2}\cdot R\cdot\alpha\cdot\left(\frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420}}{}\right.}{56\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}} \sim$$

$$\frac{\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}}{15\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}} \sim$$

$$\frac{\frac{\cdot hbar)}{} + \frac{6\cdot\alpha\cdot q}{\pi^{2}\cdot R\cdot r^{2}}\Bigg)\cdot q\cdot r^{2} - 9506\cdot\alpha^{2}\cdot q^{2}\Bigg) - 23520\cdot\pi^{2}\cdot\alpha\cdot hbar\Bigg)}{} -$$

$$\frac{3\cdot\Bigg(4\cdot\pi^{2}\cdot R\cdot\Bigg(\frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) -} \sim}{15\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}}}{7\cdot\pi^{2}\cdot R\cdot r^{2}} \sim$$

$$\frac{\frac{599\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar)}{} + \frac{6\cdot\alpha\cdot q}{\pi^{2}\cdot R\cdot r^{2}}\Bigg)\cdot r^{2} + 7\cdot\alpha\cdot q\Bigg)}{}$$

Simplifying:

#99: −

$$\frac{\sqrt{15}\cdot\sqrt{(-\ \alpha\cdot(-\ 840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) + 840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) + 2\cdot\sqrt{30}\cdot} \sim}{} \sim$$

$$\frac{Mu0\cdot\sqrt{\alpha}\cdot q\cdot\sqrt{(-c)}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599} \sim}{28\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}} \sim$$

$$\frac{Mu0\cdot\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar) + 1213\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} + 3360\cdot\pi^{2}\cdot hbar))}{} -$$

$$\frac{4\cdot\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(}420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot\alpha}{35\cdot\pi^{2}\cdot\sqrt{Mu0\cdot R\cdot r^{2}}\cdot\sqrt{(-c)}} \sim$$

$$\frac{\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar)}{} - \frac{93\cdot\alpha\cdot q}{7\cdot\pi^{2}\cdot R\cdot r^{2}}$$

This just above is "b112" for b1 using b212 for b2, and it is not a function of res, b0, b1, or b2.

Recalling b0 from #24:

$$\#100:- \frac{\pi^{2}\cdot R\cdot r^{2}\cdot(8\cdot b1 + 9\cdot b2) + 3\cdot\alpha\cdot q}{6\cdot\pi^{2}\cdot R\cdot r^{2}}$$

Substituting b112 for b1 and b212 for b2:

#101: −

$$\frac{\pi^{2}\cdot R\cdot r^{2}\cdot\left(8\cdot\left(- \frac{\sqrt{15}\cdot\sqrt{(}- \alpha\cdot(- 840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) + 840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}}{} \sim\right.\right.}{} \sim$$

$$\frac{\mathrm{LN}(r) + 2\cdot\sqrt{30}\cdot\sqrt{\mathrm{Mu0}}\cdot\sqrt{\alpha}\cdot q\cdot\sqrt{(-c)}\cdot\sqrt{(420\cdot\mathrm{Mu0}\cdot\alpha\cdot c\cdot q^{2}\cdot\mathrm{LN}(8\cdot R) - 420\cdot\mathrm{Mu0}\cdot\alpha\cdot c\cdot}}{28\cdot\pi^{2}\cdot\sqrt{\mathrm{Mu0}}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}} \sim$$

$$q^{2}\cdot\mathrm{LN}(r) - 599\cdot\mathrm{Mu0}\cdot\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot\mathrm{hbar}) + 1213\cdot\mathrm{Mu0}\cdot\alpha\cdot c\cdot q^{2} + 3360\cdot\pi^{2} \sim$$

$$\frac{\cdot\mathrm{hbar}))}{} - \frac{4\cdot\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot\mathrm{Mu0}\cdot\alpha\cdot c\cdot q^{2}\cdot\mathrm{LN}(8\cdot R) - 420\cdot\mathrm{Mu0}\cdot\alpha\cdot c\cdot q^{2}\cdot\mathrm{LN}(r)}}{35\cdot\pi^{2}\cdot\sqrt{\mathrm{Mu0}}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}} \sim$$

$$6\cdot\pi^{2}\cdot R\cdot r^{2}$$

$$\left.\frac{- 599\cdot\mathrm{Mu0}\cdot\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot\mathrm{hbar})}{} - \frac{93\cdot\alpha\cdot q}{7\cdot\pi^{2}\cdot R\cdot r^{2}}\right) + 9\cdot\left(\frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot\mathrm{M}}}{}\right. \sim$$

$$\frac{\mathrm{u0}\cdot\alpha\cdot c\cdot q^{2}\cdot\mathrm{LN}(8\cdot R) - 420\cdot\mathrm{Mu0}\cdot\alpha\cdot c\cdot q^{2}\cdot\mathrm{LN}(r) - 599\cdot\mathrm{Mu0}\cdot\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot\mathrm{h}}{15\cdot\pi^{2}\cdot\sqrt{\mathrm{Mu0}}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}} \sim$$

$$\left.\left.\frac{\mathrm{bar})}{} + \frac{6\cdot\alpha\cdot q}{\pi^{2}\cdot R\cdot r^{2}}\right)\right) + 3\cdot\alpha\cdot q$$

Simplifying:

#102: $\dfrac{\sqrt{15}\cdot\sqrt{(-\ \alpha\cdot(-\ 840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) + 840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) + 2\cdot\sqrt{30}\cdot\sqrt{Mu}}}{}$ ~

$\dfrac{0\cdot\sqrt{\alpha}\cdot q\cdot\sqrt{(-c)}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu}}{21\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}}$ ~

$\dfrac{0\cdot\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar) + 1213\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} + 3360\cdot\pi^{2}\cdot hbar))}{} +$

$\dfrac{11\cdot\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot}}{210\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}}$ ~

$\dfrac{\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar)}{} + \dfrac{115\cdot\alpha\cdot q}{14\cdot\pi^{2}\cdot R\cdot r^{2}}$

This just above is "b012" for b0, and it is not a function of res, b0, b1, or b2.

Recalling res:

#103: $-b0 - b1 - b2$

Substituting into the just above for b0 using #102, b112 for b1, and b212 for b2:

#104: $-$

$\left(\dfrac{\sqrt{15}\cdot\sqrt{(-\ \alpha\cdot(-\ 840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) + 840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) + 2\cdot\sqrt{30}}}{}\right.$ ~

$$\frac{\sqrt{Mu0}\cdot\sqrt{\alpha}\cdot q\cdot\sqrt{(-c)}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599}}{21\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}} \sim$$

$$\frac{\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar) + 1213\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} + 3360\cdot\pi^{2}\cdot hbar))}{} +$$

$$\frac{11\cdot\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot}}{210\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}} \sim$$

$$\left.\frac{\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar)}{} + \frac{115\cdot\alpha\cdot q}{14\cdot\pi^{2}\cdot R\cdot r^{2}}\right) - \left(-\right.$$

$$\frac{\sqrt{15}\cdot\sqrt{(-\ \alpha\cdot(-\ 840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) + 840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) + 2\cdot\sqrt{30}\cdot\sqrt{}}}{} \sim$$

$$\frac{Mu0\cdot\sqrt{\alpha}\cdot q\cdot\sqrt{(-c)}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot}}{28\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}} \sim$$

$$\frac{Mu0\cdot\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar) + 1213\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} + 3360\cdot\pi^{2}\cdot hbar))}{} -$$

$$\frac{4\cdot\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot\alpha}}{35\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}} \sim$$

$$\left.\frac{\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar)}{} - \frac{93\cdot\alpha\cdot q}{7\cdot\pi^{2}\cdot R\cdot r^{2}}\right) -$$

$$\left(\frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c\cdot q^2 - 1680\cdot\pi^2\cdot hbar)}}{15\cdot\pi^2\cdot\sqrt{Mu0\cdot R\cdot r^2}\cdot\sqrt{(-c)}} + \frac{6\cdot\alpha\cdot q}{\pi^2\cdot R\cdot r^2}\right)$$

Simplifying:

#105:-

$$\frac{\sqrt{15}\cdot\sqrt{(-\alpha\cdot(-840\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(8\cdot R) + 840\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(r) + 2\cdot\sqrt{30}\cdot Mu0\cdot\sqrt{\alpha}\cdot q\cdot\sqrt{(-c)}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c\cdot q^2 - 1680\cdot\pi^2\cdot hbar)} + 1213\cdot Mu0\cdot\alpha\cdot c\cdot q^2 + 3360\cdot\pi^2\cdot hbar))}}{84\cdot\pi^2\cdot\sqrt{Mu0\cdot R\cdot r^2}\cdot\sqrt{(-c)}} - \frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c\cdot q^2 - 1680\cdot\pi^2\cdot hbar)}}{210\cdot\pi^2\cdot\sqrt{Mu0\cdot R\cdot r^2}\cdot\sqrt{(-c)}} - \frac{13\cdot\alpha\cdot q}{14\cdot\pi^2\cdot R\cdot r^2}$$

This just above is "res12" from b012, b112, and b212, and it is not a function of res, b0, b1, or b2.

We need to extend our user-friendlyness to specify that the second rhor derivative also vanishes at rhor = 1; that is, at the ring rim.

#106: $b1 + 2\cdot b2\cdot rhor - \frac{res}{rhor^2}$

This just above is the first rhor derivative of lambda[rhor], the charge density function recalled from above:

#107: $\frac{d}{d\ rhor}\left(b1 + 2\cdot b2\cdot rhor - \frac{res}{rhor^2}\right)$

Simplifying and substituting rhor = 1:

#108: $2\cdot b2 + \frac{2\cdot res}{rhor^3}$

Simplifying:

#109: $2\cdot b2 + 2\cdot res$

We set the first rhor derivative of #106 (which is actually the 2nd rhor derivative of the charge density) to zero for user friendlyness:

#110: SOLVE$(2\cdot b2 + 2\cdot res = 0, b2)$

Solve:

#111: $b2 = -res$

Substituting res12 for res and b212 for b2 into #111, we obtain our desired relation for "r" after substituting for our known constants (including "R" from #80 in terms of our given fundamental constants):

#112: $\frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c\cdot q^2 - 1680\cdot\pi^2\cdot hbar)}}{15\cdot\pi^2\cdot\sqrt{Mu0\cdot R\cdot r^2}\cdot\sqrt{(-c)}} + \frac{6\cdot\alpha\cdot q}{\pi^2\cdot R\cdot r^2} = -$

$$\left(\frac{\sqrt{15}\cdot\sqrt{(-\ \alpha\cdot(-\ 840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R)\ +\ 840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r)\ +\ 2\cdot\sqrt{30}\cdot\ \sim}{}\right.$$

$$\frac{\sqrt{Mu0}\cdot\sqrt{\alpha}\cdot q\cdot\sqrt{(-c)}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R)\ -\ 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r)\ -\ 599\ \sim}}{21\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}}$$

$$\frac{\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\ -\ 1680\cdot\pi^{2}\cdot hbar)\ +\ 1213\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\ +\ 3360\cdot\pi^{2}\cdot hbar))}{}\ +$$

$$\frac{11\cdot\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R)\ -\ 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r)\ -\ 599\cdot Mu0\cdot\ \sim}}{210\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}}$$

$$\left.\frac{\alpha\cdot c\cdot q^{2}\ -\ 1680\cdot\pi^{2}\cdot hbar)}{}\ +\ \frac{115\cdot\alpha\cdot q}{14\cdot\pi^{2}\cdot R\cdot r^{2}}\right)$$

Multiplying the just above through by r^2 to simplify the algebra and reduce the calculation error:

$$\#113{:}\ r^{2}\cdot\left(\frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R)\ -\ 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r)\ \sim-\ 599\cdot Mu0\cdot}}{15\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}}\right.$$

$$\frac{\cdot c\cdot q^{2}\ -\ 1680\cdot\pi^{2}\cdot hbar)}{}\ +\ \frac{6\cdot\alpha\cdot q}{\pi^{2}\cdot R\cdot r^{2}}\ =\ -$$

$$\left(\frac{\sqrt{15}\cdot\sqrt{(-\ \alpha\cdot(-\ 840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R)\ +\ 840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r)\ +\ 2\cdot\sqrt{30}}}{}\right.$$

```
                                              2                                   2              ~
√Mu0·√α·q·√(−c)·√(420·Mu0·α·c·q ·LN(8·R) − 420·Mu0·α·c·q ·LN(r) − 599~
────────────────────────────────────────────────────────────────────~
                           2          2                                                      ~
                   21·π ·√Mu0·R·r ·√(−c)                                                  ~

               2             2                              2          2
·Mu0·α·c·q  − 1680·π ·hbar) + 1213·Mu0·α·c·q  + 3360·π ·hbar))
───────────────────────────────────────────────────────────── +


                                        2                              2                    ~
 11·√30·√α·√(420·Mu0·α·c·q ·LN(8·R) − 420·Mu0·α·c·q ·LN(r) − 599·Mu0·~
────────────────────────────────────────────────────────────────────~
                                                2          2                                 ~
                                      210·π ·√Mu0·R·r ·√(−c)                              ~

         2             2                         ))
α·c·q  − 1680·π ·hbar)         115·α·q   ||
──────────────────── + ─────────── ||
                                        2      2   ||
                                 14·π ·R·r   ))
```

Simplifying:

```
                                       2                                 2                 ~
       √30·√α·√(420·Mu0·α·c·q ·LN(8·R) − 420·Mu0·α·c·q ·LN(r) − 599·Mu0·α·c·
#114:──────────────────────────────────────────────────────────────────────
                                                          2                                 ~
                                                  15·π ·√Mu0·R·√(−c)                    ~

2            2
  − 1680·π ·hbar)        6·α·q
─────────────────── + ──────── = −
                                  2
                                π ·R

                                               2                                  2          ~
 √15·√(− α·(− 840·Mu0·α·c·q ·LN(8·R) + 840·Mu0·α·c·q ·LN(r) + 2·√30·
───────────────────────────────────────────────────────────────────────
                                                                                              ~
                                                                                              ~

                                                2                                   2       ~
Mu0·√α·q·√(−c)·√(420·Mu0·α·c·q ·LN(8·R) − 420·Mu0·α·c·q ·LN(r) − 599
───────────────────────────────────────────────────────────────────────
                                2                                                          ~
                        21·π ·√Mu0·R·√(−c)                                             ~

               2              2                             2           2
Mu0·α·c·q  − 1680·π ·hbar) + 1213·Mu0·α·c·q  + 3360·π ·hbar))
────────────────────────────────────────────────────────────── −
```

$$\frac{11\cdot\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot}}{210\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot\sqrt{(-c)}} \sim$$

$$\frac{\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar)}{} - \frac{115\cdot\alpha\cdot q}{14\cdot\pi^{2}\cdot R}$$

Moving the right side of the just above equation to the left side with a minus sign (so that the expression set to zero gives us our required equation for ”r” (after substituting for our knowns) when this is set equal to zero:

#115: $$\frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c\cdot}}{15\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot\sqrt{(-c)}} \sim$$

$$\frac{{}^{2} - 1680\cdot\pi^{2}\cdot hbar)}{} + \frac{6\cdot\alpha\cdot q}{\pi^{2}\cdot R} - -$$

$$\frac{\sqrt{15}\cdot\sqrt{(-\ \alpha\cdot(-\ 840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) + 840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) + 2\cdot\sqrt{30}\cdot}}{} \sim$$

$$\frac{Mu0\cdot\sqrt{\alpha}\cdot q\cdot\sqrt{(-c)}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599}}{21\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot\sqrt{(-c)}} \sim$$

$$\frac{Mu0\cdot\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar) + 1213\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} + 3360\cdot\pi^{2}\cdot hbar))}{} -$$

$$\frac{11\cdot\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0}}{210\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot\sqrt{(-c)}} \sim$$

$$\frac{\alpha\cdot c\cdot q^2 - 1680\cdot\pi^2\cdot hbar)}{} - \frac{115\cdot\alpha\cdot q}{14\cdot\pi^2\cdot R}$$

We set our precision:

#116:PrecisionDigits := 18

Substituting for R in #115 from #80:

$$\#117: \frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{\left(420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN\left(8\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^2 + 4\cdot\pi^2\cdot hbar}{4\cdot\pi^2\cdot c\cdot me}\right) - 420\cdot Mu0\cdot\alpha\cdot c\cdot\right.}}{15\cdot\pi^2\cdot\sqrt{Mu0}\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^2 + 4\cdot\pi^2\cdot hbar}{4\cdot\pi^2\cdot c\cdot me}}$$

$$\frac{{}^2\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c\cdot q^2 - 1680\cdot\pi^2\cdot hbar\Big)}{\cdot\sqrt{(-c)}} +$$

$$\frac{6\cdot\alpha\cdot q}{\pi^2\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^2 + 4\cdot\pi^2\cdot hbar}{4\cdot\pi^2\cdot c\cdot me}} - -$$

$$\sqrt{15}\cdot\sqrt{\Big(-\ \alpha\cdot\Big(-\ 840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN\Big(8\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^{2}+4\cdot\pi^{2}\cdot hbar}{4\cdot\pi^{2}\cdot c\cdot me}\Big)+840\cdot Mu0} \sim$$

———

$$\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r)+2\cdot\sqrt{30}\cdot\sqrt{Mu0}\cdot\sqrt{\alpha}\cdot q\cdot\sqrt{(-c)}\cdot\sqrt{\Big(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN\Big(8\cdot\frac{Mu0\cdot\alpha\cdot c\cdot}{4}} \sim$$

———

$$21\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^{2}+4\cdot\pi^{2}\cdot hbar}{4\cdot\pi^{2}\cdot c\cdot me} \sim$$

$$\frac{q^{2}+4\cdot\pi^{2}\cdot hbar}{\cdot\pi^{2}\cdot c\cdot me}\Big)-420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r)-599\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}-1680\cdot\pi^{2}\cdot hb \sim$$

———

$$\cdot\sqrt{(-c)} \sim$$

$$ar\Big)+1213\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}+3360\cdot\pi^{2}\cdot hbar\Big)\Big)$$

——— −

$$\frac{11\cdot\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{\left(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN\left(8\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^{2}+4\cdot\pi^{2}\cdot hbar}{4\cdot\pi^{2}\cdot c\cdot me}\right)-420\cdot Mu0\cdot\right.}\ \sim}{210\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^{2}+4\cdot\pi^{2}\cdot h}{4\cdot\pi^{2}\cdot c\cdot me}\ \sim}$$

$$\frac{\left.\alpha\cdot c\cdot q^{2}\cdot LN(r)-599\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}-1680\cdot\pi^{2}\cdot hbar\right)}{\frac{bar}{\quad}\cdot\sqrt{(-c)}}-$$

$$\frac{115\cdot\alpha\cdot q}{14\cdot\pi^{2}\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^{2}+4\cdot\pi^{2}\cdot hbar}{4\cdot\pi^{2}\cdot c\cdot me}}$$

Simplifying:

#118: $-$

$$\frac{4\cdot\sqrt{15}\cdot me\cdot\sqrt{(-c)}\cdot\sqrt{\left(-\alpha\cdot\left(-840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN\left(\frac{2\cdot(Mu0\cdot\alpha\cdot c\cdot q^{2}\ \sim + 4\cdot\pi^{2}\cdot hba}{\pi^{2}\cdot c\cdot me}\right.\right.\right.}}{\sim}$$

$$\frac{\left.\frac{)}{}\right) + 840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) + 2\cdot\sqrt{30}\cdot\sqrt{Mu0}\cdot\sqrt{\alpha}\cdot q\cdot\sqrt{(-c)}\cdot\sqrt{\left(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot L\right.} \sim}{21\cdot\sqrt{Mu0}\cdot(Mu0\cdot\alpha\cdot c\cdot q^{2} + 4 \sim}$$

$$\frac{N\left(\frac{2\cdot(Mu0\cdot\alpha\cdot c\cdot q^{2} + 4\cdot\pi^{2}\cdot hbar)}{\pi^{2}\cdot c\cdot me}\right) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c\cdot \sim}{\cdot\pi^{2}\cdot hbar)}$$

$$\frac{\left.q^{2} - 1680\cdot\pi^{2}\cdot hbar\right) + 1213\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} + 3360\cdot\pi^{2}\cdot hbar\Big)\Big)}{} -$$

$$\frac{2\cdot\sqrt{30}\cdot\sqrt{\alpha}\cdot me\cdot\sqrt{(-c)}\cdot\sqrt{\left(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN\left(\frac{Mu0\cdot\alpha\cdot c\cdot q^{2} + 4\cdot\pi^{2}\cdot hbar}{c\cdot me}\right) - 42 \sim\right.}}{35\cdot\sqrt{Mu0}\cdot(Mu0\cdot\alpha\cdot c\cdot q^{2} + \sim}$$

$$\frac{\left.0\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN\left(\frac{\pi^{2}\cdot r}{2}\right) - 599\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar\right)}{4\cdot\pi^{2}\cdot hbar)} -$$

$$\frac{62\cdot\alpha\cdot c\cdot me\cdot q}{7\cdot(Mu0\cdot\alpha\cdot c\cdot q^{2} + 4\cdot\pi^{2}\cdot hbar)}$$

Substituting for our above numerical constants with $\alpha = 0.95$:

#119:

```
 -

                                                                                 ~
                                     -31                                  -7     ~
  4·√15·(+ 9.1093821545·10   )·√(-299792458)·√⎛- α·⎛- 840·(4·π·10  )·α~
                                                                                 ~
 ________________________________________________________________________________~
                                                                                 ~
                                                                                 ~

                                                                 -7              ~
                                           -19 2        ⎛ 2·((4·π·10  )·α·299792458·(+ 1~
 ·299792458·(+ 1.6021764874·10    ) ·LN⎜________________________________________~
                                                        ⎜                    2             ~
                                                        ⎝                   π ·29979~
 ________________________________________________________________________________~
                                                                                 ~
                                                                                 ~

                -19 2        2                          -34 ⎞                    ~
 .6021764874·10    )  + 4·π ·(1.05457162853·10    ))⎟              -7  ~
 ___________________________________________________________ ⎟ + 840·(4·π·10  )·~
                                 -31                        ⎟                    ~
 2458·(+ 9.1093821545·10    )                               ⎠                    ~
 ________________________________________________________________________________~
                                                                                 ~
                                                                                 ~

                                                                                 ~
                                              -19 2                 -7           ~
 α·299792458·(+ 1.6021764874·10    ) ·LN(r) + 2·√30·√(4·π·10  )·√α·(+ 1~
                                                                                 ~
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                                                                                 ~
                                                                                 ~

                                               ⎛                                 ~
                -19                            ⎜              -7                 ~
 .6021764874·10    )·√(-299792458)·√⎜420·(4·π·10  )·α·299792458·(+ 1.60~
                                               ⎝                                 ~
 ________________________________________________________________________________~
                               -7             -7                                 ~
                  21·√(4·π·10  )·((4·π·10  )·α·299792458·(+ 1.602176~
```

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                     ⎛                    -7                                           -19 ~
              -19 2  ⎜ 2·((4·π·10  )·α·299792458·(+ 1.6021764874·10    ) ~
21764874·10    ) ·LN ⎜─────────────────────────────────────────────────────────────────── ~
                     ⎜                                    2                             ~
                     ⎝                                   π ·299792458·(+ 9.10938215 ~
────────────────────────────────────────────────────────────────────────────────────── ~
      -19 2       2                      -34                                            ~
4874·10    )  + 4·π ·(1.05457162853·10    ))                                            ~

2       2                       -34  ⎞                                                  ~
  + 4·π ·(1.05457162853·10    ))     ⎟                       -7                         ~
─────────────────────────────────────⎟ - 420·(4·π·10  )·α·299792458·(+ 1.6 ~
     -31                             ⎟                                                  ~
45·10    )                           ⎠                                                  ~
────────────────────────────────────────────────────────────────────────────────────── ~
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                                                                                        ~
         -19 2                                       -7                                 ~
021764874·10    ) ·LN(r) - 599·(4·π·10  )·α·299792458·(+ 1.6021764874· ~
                                                                                        ~
                                                                                        ~
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                                                                                        ~
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                                                        ⎞                               ~
  -19 2           2                            -34      ⎟                  -7           ~
10    )  - 1680·π ·(1.05457162853·10    )      ⎟ + 1213·(4·π·10  )·α·29979245 ~
                                                        ⎟                               ~
                                                        ⎠                               ~
────────────────────────────────────────────────────────────────────────────────────── ~
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                                 -19 2          2                      -34 ⎟⎟
8·(+ 1.6021764874·10    )  + 3360·π ·(1.05457162853·10    )⎟⎟
                                                                          ⎠⎠
───────────────────────────────────────────────────────────────────────────── -

                                                                  ⎛                     ~
                                 -31                              ⎜               -7    ~
 2·√30·√α·(+ 9.1093821545·10    )·√(-299792458)·√⎜420·(4·π·10  )·α·299 ~
                                                                  ⎜                     ~
                                                                  ⎝                     ~
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                                                           -7                             ~
                                      -19 2        (4·π·10   )·α·299792458·(+ 1.602176~
792458·(+ 1.6021764874·10     ) ·LN ─────────────────────────────────────────────────────~
                                                                                         ~
                                                                       299792458·(+ ~
─────────────────────────────────────────────────────────────────────────────────────~
                                                                             -7          ~
                                                                    35·√(4·π·10   )·((4~

       -19 2        2                         -34                                        ~
4874·10     )  + 4·π  ·(1.05457162853·10     )                        -7                 ~
──────────────────────────────────────────────    - 420·(4·π·10   )·α·299792~
                   -31                                                                   ~
 9.1093821545·10     )                                                                   ~
─────────────────────────────────────────────────────────────────────────────────────~
     -7                                                 -19 2       2                    ~
·π·10   )·α·299792458·(+ 1.6021764874·10     )  + 4·π  ·(1.05457162853·10~

                                                 2                                       ~
                                        -19 2   π ·r                  -7                 ~
458·(+ 1.6021764874·10     ) ·LN ──────   - 599·(4·π·10   )·α·299792458·( ~
                                                  2                                      ~
                                                                                         ~
─────────────────────────────────────────────────────────────────────────────────────~
-34                                                                                      ~
   ))                                                                                    ~

                              -19 2          2                      -34
+ 1.6021764874·10     )  - 1680·π  ·(1.05457162853·10     )

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                                                                -31                   -1 ~
           62·α·299792458·(+ 9.1093821545·10     )·(+ 1.6021764874·10   ~
─────────────────────────────────────────────────────────────────────────────────────~
          -7                                                 -19 2       2               ~
 7·((4·π·10   )·α·299792458·(+ 1.6021764874·10     )  + 4·π  ·(1.05457162~


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      -34
853·10     ))
```

Setting α = 0.95:

#120:
 -

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                                  -31                                           ⎛          ⎛                 -7 ~
 4·√15·(+ 9.1093821545·10    )·√(-299792458)·√⎜- 0.95·⎜- 840·(4·π·10   ~
                                                                                ⎝          ⎝                      ~
─────────────────────────────────────────────────────────────────────────────────────~

                                                                   ⎛                 -7                  ~
                                                       -19 2       ⎜ 2·((4·π·10   )·0.95·29979~
)·0.95·299792458·(+ 1.6021764874·10    ) ·LN⎜───────────────────────────~
                                                                   ⎝                                     ~
─────────────────────────────────────────────────────────────────────────────────────~

                        -19 2        2                         -34 ⎞          ~
2458·(+ 1.6021764874·10    )  + 4·π ·(1.05457162853·10    ))⎟ + 840·(4~
─────────────────────────────────────────────────────────────⎟          ~
 2                                  -31                            ⎟          ~
π ·299792458·(+ 9.1093821545·10    )                               ⎠          ~
─────────────────────────────────────────────────────────────────────────────────────~

     -7                                          -19 2                                      ~
·π·10   )·0.95·299792458·(+ 1.6021764874·10    ) ·LN(r) + 2·√30·√(4·π·1~
─────────────────────────────────────────────────────────────────────────────────────~

 -7                            -19                          ⎛                  -7       ~
0   )·√0.95·(+ 1.6021764874·10    )·√(-299792458)·√⎜420·(4·π·10   )·0.95~
                                                              ⎝                         ~
─────────────────────────────────────────────────────────────────────────────────────~
                                     -7             -7               ~
                     21·√(4·π·10   )·((4·π·10   )·0.95·29979~
```

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                                                ⎛                   -7                       ~
                                    -19 2       ⎜ 2·((4·π·10  )·0.95·299792458·(           ~
·299792458·(+ 1.6021764874·10    ) ·LN ⎜ ───────────────────────────────────────────────── ~
                                                ⎜                                        2   ~
                                                ⎝                                    π ·299 ~
──────────────────────────────────────────────────────────────────────────────────────────── ~
                                 -19 2       2                      -34                      ~
2458·(+ 1.6021764874·10    )  + 4·π ·(1.05457162853·10    ))                                 ~

                        -19 2       2                      -34 ⎞                            ~
+ 1.6021764874·10    )  + 4·π ·(1.05457162853·10    ))⎟                              -  ~
───────────────────────────────────────────────────────────────⎟ - 420·(4·π·10        ~
                                        -31                    ⎟                            ~
792458·(+ 9.1093821545·10    )                                 ⎠                            ~
──────────────────────────────────────────────────────────────────────────────────────────── ~
                                                                                            ~
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                                                                                            ~
7                                                -19 2                         -7           ~
 )·0.95·299792458·(+ 1.6021764874·10    ) ·LN(r) - 599·(4·π·10  )·0.95 ~
                                                                                            ~
                                                                                            ~
──────────────────────────────────────────────────────────────────────────────────────────── ~
                                                                                            ~
                                                                                            ~

                                                                                     ⎞      ~
                                    -19 2          2                           -34 ⎟      ~
·299792458·(+ 1.6021764874·10    )  - 1680·π ·(1.05457162853·10    )⎟ +  ~
                                                                                     ⎟      ~
                                                                                     ⎠      ~
──────────────────────────────────────────────────────────────────────────────────────────── ~
                                                                                            ~
                                                                                            ~

                                                                                            ~
             -7                                          -19 2            2                 ~
 1213·(4·π·10  )·0.95·299792458·(+ 1.6021764874·10    )  + 3360·π ·(1. ~
                                                                                            ~
                                                                                            ~
──────────────────────────────────────────────────────────────────────────────────────────── ~
                                                                                            ~
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                  ⎞⎞
           -34    ⎟⎟
05457162853·10    )⎟⎟
                  ⎟⎟
                  ⎠⎠
────────────────────── -
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                                                               ⎛                    ~
                                         -31                   ⎜              -7    ~
 2·√30·√0.95·(+ 9.1093821545·10   )·√(-299792458)·√⎜420·(4·π·10  )·0.   ~
                                                               ⎜                    ~
                                                               ⎝                    ~
─────────────────────────────────────────────────────────────────────────────────── ~
                                                                                    ~
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                                                       ⎛                            ~
                                                       ⎜            -7              ~
                                         -19 2         ⎜ (4·π·10  )·0.95·299792458·(+ ~
95·299792458·(+ 1.6021764874·10   ) ·LN⎜─────────────────────────────────── ~
                                                       ⎜                            ~
                                                       ⎜                      29979 ~
                                                       ⎝                            ~
─────────────────────────────────────────────────────────────────────────────────── ~
                                                                                  _ ~
                                                                   35·√(4·π·10  ~

                    -19 2       2                        -34  ⎞                     ~
 1.6021764874·10    )  + 4·π  ·(1.05457162853·10    )  ⎟                 -7  ~
──────────────────────────────────────────────────────────⎟ - 420·(4·π·10  ) ~
                          -31                                 ⎟                     ~
2458·(+ 9.1093821545·10    )                                 ⎠                     ~
─────────────────────────────────────────────────────────────────────────────────── ~
7          -7                                           -19 2       2               ~
 )·((4·π·10  )·0.95·299792458·(+ 1.6021764874·10   )  + 4·π  ·(1.05457 ~
                                                      ⎛  2  ⎞                       ~
                                           -19 2      ⎜π ·r ⎟                -7     ~
·0.95·299792458·(+ 1.6021764874·10    ) ·LN⎜─────⎟ - 599·(4·π·10  )·0 ~
                                                      ⎜  2  ⎟                       ~
                                                      ⎝     ⎠                       ~
─────────────────────────────────────────────────────────────────────────────────── ~
          -34                                                                       ~
162853·10    ))                                                                     ~

                                                                                    ~
                                          -19 2          2                      -34 ~
.95·299792458·(+ 1.6021764874·10    )  - 1680·π  ·(1.05457162853·10    ) ~
                                                                                    ~
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─────────────────────────────────────────────────────────────────────────────────── ~
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$$\frac{62\cdot 0.95\cdot 299792458\cdot(+\ 9.1093821545\cdot 10^{-31})\cdot(+\ 1.6021764874\cdot 1\sim}{7\cdot((4\cdot\pi\cdot 10^{-7})\cdot 0.95\cdot 299792458\cdot(+\ 1.6021764874\cdot 10^{-19})^{2} + 4\cdot\pi^{2}\cdot(1.05457\sim}$$

$$\frac{0^{-19})}{162853\cdot 10^{-34}))}$$

Simplifying:

$$\#121{:}-\ 2.27969170950431674\cdot 10^{-45}\cdot\hat{\imath}\cdot\sqrt{(-\ 8.72972658963434942\cdot 10^{75}\cdot LN(r) - 4.19999985115872094\cdot 10^{78} - 1.93359639726655723\cdot 10^{61}\cdot\hat{\imath}\cdot\sqrt{(- 1.45593367780608073\cdot 10^{28}\cdot LN(r) - 7.00445106126299473\cdot 10^{30})})} - 8.82356564754472201\cdot 10^{-8} - 8.70614783745709959\cdot 10^{-23}\cdot\hat{\imath}\cdot\sqrt{(- 5.38695460788249870\cdot 10^{29}\cdot LN(r) - 2.59164689266730805\cdot 10^{32})}$$

#122:PrecisionDigits := 18

This just above equals zero. But we must use Newton's method to solve for r > 0:

We generate values of the just above to check for zeros:

Setting r = 10^−n in #120:

$$\#123{:}-\ 2.27969170950431674\cdot 10^{-45}\cdot\hat{\imath}\cdot\sqrt{(-\ 8.72972658963434942\cdot 10^{75}\cdot LN(10^{-n}) - 4.19999985115872094\cdot 10^{78} - 1.93359639726655723\cdot 10^{61}\cdot\hat{\imath}\cdot\sqrt{(- 1.45593367780608073\cdot 10^{28}\cdot LN(10^{-n}) - 7.00445106126299473\cdot 10^{30})} -$$

$8.82356564754472201 \cdot 10^{-8} - 8.70614783745709959 \cdot 10^{-23} \cdot \hat{\imath} \cdot \sqrt{(- 5.3869546078824987 \cdot 10^{29} \cdot LN(10^{-n}) - 2.59164689266730805 \cdot 10^{32})}$

Defining the function "FUN":

#124:FFUN(n) := $- 2.27969170950431674 \cdot 10^{-45} \cdot \hat{\imath} \cdot \sqrt{(- 8.72972658963434942 \cdot 10^{75} \cdot LN(10^{-n}) - 4.19999985115872094 \cdot 10^{78} - 1.93359639726655723 \cdot 10^{61} \cdot \hat{\imath} \cdot \sqrt{(- 1.45593367780608073 \cdot 10^{28} \cdot LN(10^{-n}) - 7.00445106126299473 \cdot 10^{30})})} - 8.82356564754472201 \cdot 10^{-8} - 8.70614783745709959 \cdot 10^{-23} \cdot \hat{\imath} \cdot \sqrt{(- 5.3869546078824987 \cdot 10^{29} \cdot LN(10^{-n}) - 2.59164689266730805 \cdot 10^{32})}$

We generate FUN(n) for n = 50, 51, 52, ... , 300:

#125:VECTOR([FFUN(n), n], n, 50, 225)

Reducing precision for this next step:

#126:PrecisionDigits := 18

Generating:

#127:

$5.180437058967559 \cdot 10^{-6}$	50
$5.1637465758414112 \cdot 10^{-6}$	51
$5.14700316972880349 \cdot 10^{-6}$	52
$5.13020633398191524 \cdot 10^{-6}$	53
$5.11335555381713752 \cdot 10^{-6}$	54
$5.09645030613098651 \cdot 10^{-6}$	55
$5.0794900593106268 \cdot 10^{-6}$	56
$5.0624742730388102 \cdot 10^{-6}$	57
$5.0454023980930277 \cdot 10^{-6}$	58
$5.02827387613866329 \cdot 10^{-6}$	59
$5.01108813951592926 \cdot 10^{-6}$	60
$4.99384461102035294 \cdot 10^{-6}$	61
$4.97654270367657478 \cdot 10^{-6}$	62
$4.95918182050520683 \cdot 10^{-6}$	63
$4.94176135428248978 \cdot 10^{-6}$	64
$4.92428068729247477 \cdot 10^{-6}$	65
$4.9067391910714437 \cdot 10^{-6}$	66
$4.88913622614426904 \cdot 10^{-6}$	67
$4.87147114175240008 \cdot 10^{-6}$	68

−6

$4.8537432755731484 \cdot 10^{-6}$	69
$4.83595195342992982 \cdot 10^{-6}$	70
$4.81809648899310424 \cdot 10^{-6}$	71
$4.80017618347103785 \cdot 10^{-6}$	72
$4.78219032529099412 \cdot 10^{-6}$	73
$4.7641381897694414 \cdot 10^{-6}$	74
$4.74601903877134482 \cdot 10^{-6}$	75
$4.72783212035798941 \cdot 10^{-6}$	76
$4.70957666842285893 \cdot 10^{-6}$	77
$4.69125190231507151 \cdot 10^{-6}$	78
$4.67285702644984853 \cdot 10^{-6}$	79
$4.65439122990546666 \cdot 10^{-6}$	80
$4.63585368600611539 \cdot 10^{-6}$	81
$4.61724355189005297 \cdot 10^{-6}$	82
$4.59855996806242239 \cdot 10^{-6}$	83
$4.57980205793205609 \cdot 10^{-6}$	84
$4.56096892733156327 \cdot 10^{-6}$	85
$4.54205966401995613 \cdot 10^{-6}$	86
$4.52307333716703247 \cdot 10^{-6}$	87
$4.5040089968186899 \cdot 10^{-6}$	88

$4.48486567334230267 \cdot 10^{-6}$	89
$4.46564237685124487 \cdot 10^{-6}$	90
$4.4463380966075936 \cdot 10^{-6}$	91
$4.42695180040199237 \cdot 10^{-6}$	92
$4.40748243390959795 \cdot 10^{-6}$	93
$4.38792892002097381 \cdot 10^{-6}$	94
$4.36829015814672845 \cdot 10^{-6}$	95
$4.34856502349462839 \cdot 10^{-6}$	96
$4.3287523663178423 \cdot 10^{-6}$	97
$4.30885101113289465 \cdot 10^{-6}$	98
$4.28885975590582344 \cdot 10^{-6}$	99
$4.26877737120494784 \cdot 10^{-6}$	100
$4.24860259931855582 \cdot 10^{-6}$	101
$4.22833415333571994 \cdot 10^{-6}$	102
$4.20797071618834049 \cdot 10^{-6}$	103
$4.187510939652398 \cdot 10^{-6}$	104
$4.16695344330627195 \cdot 10^{-6}$	105
$4.14629681344384818 \cdot 10^{-6}$	106
$4.12553960193999318 \cdot 10^{-6}$	107

$4.10468032506581887 \cdot 10^{-6}$	108
$4.08371746225099488 \cdot 10^{-6}$	109
$4.06264945479018663 \cdot 10^{-6}$	110
$4.04147470449050497 \cdot 10^{-6}$	111
$4.02019157225664606 \cdot 10^{-6}$	112
$3.99879837661017657 \cdot 10^{-6}$	113
$3.97729339213917882 \cdot 10^{-6}$	114
$3.95567484787421031 \cdot 10^{-6}$	115
$3.93394092558625144 \cdot 10^{-6}$	116
$3.91208975800201203 \cdot 10^{-6}$	117
$3.89011942693163865 \cdot 10^{-6}$	118
$3.86802796130350964 \cdot 10^{-6}$	119
$3.84581333510041953 \cdot 10^{-6}$	120
$3.82347346519103689 \cdot 10^{-6}$	121
$3.80100620905006614 \cdot 10^{-6}$	122
$3.77840936236005131 \cdot 10^{-6}$	123
$3.75568065648722399 \cdot 10^{-6}$	124
$3.73281775582321439 \cdot 10^{-6}$	125
$3.70981825498380896 \cdot 10^{-6}$	126
-6	

$3.68667967585524487 \cdot 10$	127
$3.66339946447777496 \cdot 10^{-6}$	128
$3.63997498775540938 \cdot 10^{-6}$	129
$3.61640352997983534 \cdot 10^{-6}$	130
$3.592682289155525 \cdot 10^{-6}$	131
$3.56880837311195448 \cdot 10^{-6}$	132
$3.54477879538766375 \cdot 10^{-6}$	133
$3.52059047086957543 \cdot 10^{-6}$	134
$3.4962402111695473 \cdot 10^{-6}$	135
$3.4717247197185429 \cdot 10^{-6}$	136
$3.4470405865570504 \cdot 10^{-6}$	137
$3.4221842827984418 \cdot 10^{-6}$	138
$3.3971521547398209 \cdot 10^{-6}$	139
$3.37194041759253421 \cdot 10^{-6}$	140
$3.34654514880188514 \cdot 10^{-6}$	141
$3.32096228092266627 \cdot 10^{-6}$	142
$3.29518759401386986 \cdot 10^{-6}$	143
$3.26921670751231026 \cdot 10^{-6}$	144
$3.24304507154084521 \cdot 10^{-6}$	145
$3.21666795760235894 \cdot 10^{-6}$	146

$3.19008044860560562 \cdot 10^{-6}$	147
$3.16327742816333008 \cdot 10^{-6}$	148
$3.13625356909670033 \cdot 10^{-6}$	149
$3.10900332107290003 \cdot 10^{-6}$	150
$3.08152089729462582 \cdot 10^{-6}$	151
$3.05380026015107599 \cdot 10^{-6}$	152
$3.02583510572964716 \cdot 10^{-6}$	153
$2.99761884707578865 \cdot 10^{-6}$	154
$2.96914459607508269 \cdot 10^{-6}$	155
$2.94040514381636772 \cdot 10^{-6}$	156
$2.91139293927729841 \cdot 10^{-6}$	157
$2.88210006615378437 \cdot 10^{-6}$	158
$2.85251821763184379 \cdot 10^{-6}$	159
$2.82263866887404389 \cdot 10^{-6}$	160
$2.79245224696227302 \cdot 10^{-6}$	161
$2.76194929800337438 \cdot 10^{-6}$	162
$2.73111965106329725 \cdot 10^{-6}$	163
$2.69995257854783425 \cdot 10^{-6}$	164
$2.66843675259243549 \cdot 10^{-6}$	165

$2.63656019695846665 \cdot 10^{-6}$	166
$2.60431023385670594 \cdot 10^{-6}$	167
$2.57167342502851925 \cdot 10^{-6}$	168
$2.5386355063081321 \cdot 10^{-6}$	169
$2.50518131476215905 \cdot 10^{-6}$	170
$2.47129470735060765 \cdot 10^{-6}$	171
$2.43695846987137195 \cdot 10^{-6}$	172
$2.40215421473075456 \cdot 10^{-6}$	173
$2.36686226581692138 \cdot 10^{-6}$	174
$2.33106152843007736 \cdot 10^{-6}$	175
$2.29472934182803936 \cdot 10^{-6}$	176
$2.25784131146003219 \cdot 10^{-6}$	177
$2.22037111736058087 \cdot 10^{-6}$	178
$2.18229029442740006 \cdot 10^{-6}$	179
$2.14356797937004485 \cdot 10^{-6}$	180
$2.1041706179336685 \cdot 10^{-6}$	181
$2.06406162449912842 \cdot 10^{-6}$	182
$2.02320098423460601 \cdot 10^{-6}$	183
$1.98154478548468091 \cdot 10^{-6}$	184
$^{-6}$	

$1.93904466683620699 \cdot 10$	185
$1.89564715902411264 \cdot 10^{-6}$	186
$1.85129289614787929 \cdot 10^{-6}$	187
$1.80591566300472896 \cdot 10^{-6}$	188
$1.75944123489619782 \cdot 10^{-6}$	189
$1.71178595182547395 \cdot 10^{-6}$	190
$1.66285494875372191 \cdot 10^{-6}$	191
$1.61253993472392645 \cdot 10^{-6}$	192
$1.56071637178953108 \cdot 10^{-6}$	193
$1.50723984272498659 \cdot 10^{-6}$	194
$1.45194130276967873 \cdot 10^{-6}$	195
$1.39462076534138725 \cdot 10^{-6}$	196
$1.33503873999166097 \cdot 10^{-6}$	197
$1.27290435965125424 \cdot 10^{-6}$	198
$1.2078584835624417 \cdot 10^{-6}$	199
$1.1394489036447308 \cdot 10^{-6}$	200
$1.06709261282589451 \cdot 10^{-6}$	201
$9.90015781325893168 \cdot 10^{-7}$	202
$9.07152858995668976 \cdot 10^{-7}$	203
$8.16964562416560796 \cdot 10^{-7}$	204

$7.17077146196778309\cdot 10^{-7}$ 205

$6.03466029612308642\cdot 10^{-7}$ 206

$4.68187884690539266\cdot 10^{-7}$ 207

$2.90176467873931136\cdot 10^{-7}$ 208

$-1.16698771467526885\cdot 10^{-7} - 1.04868869419987315\cdot 10^{-7}\cdot \hat{\imath}$ 209

$-1.16698771467526962\cdot 10^{-7} - 4.33061681445058763\cdot 10^{-7}\cdot \hat{\imath}$ 210

$-1.16698771467526965\cdot 10^{-7} - 6.03396519793258941\cdot 10^{-7}\cdot \hat{\imath}$ 211

$-1.16698771467526966\cdot 10^{-7} - 7.35277022802434583\cdot 10^{-7}\cdot \hat{\imath}$ 212

$-1.16698771467526966\cdot 10^{-7} - 8.46863176920455722\cdot 10^{-7}\cdot \hat{\imath}$ 213

$-1.16698771467526967\cdot 10^{-7} - 9.45368806649765804\cdot 10^{-7}\cdot \hat{\imath}$ 214

$-1.16698771467526967\cdot 10^{-7} - 1.03453715290896994\cdot 10^{-6}\cdot \hat{\imath}$ 215

$-1.16698771467526967\cdot 10^{-7} - 1.11660738888455893\cdot 10^{-6}\cdot \hat{\imath}$ 216

$-1.16698771467526967\cdot 10^{-7} - 1.19304526363176507\cdot 10^{-6}\cdot \hat{\imath}$ 217

$-1.16698771467526967\cdot 10^{-7} - 1.26487230234390974\cdot 10^{-6}\cdot \hat{\imath}$ 218

$-1.16698771467526967\cdot 10^{-7} - 1.33283415374883689\cdot 10^{-6}\cdot \hat{\imath}$ 219

$-1.16698771467526967\cdot 10^{-7} - 1.39749483775861347\cdot 10^{-6}\cdot \hat{\imath}$ 220

$-1.16698771467526967\cdot 10^{-7} - 1.45929324048477952\cdot 10^{-6}\cdot \hat{\imath}$ 221

$-1.16698771467526967\cdot 10^{-7} - 1.51857884282876921\cdot 10^{-6}\cdot \hat{\imath}$ 222

$-1.16698771467526967\cdot 10^{-7} - 1.57563531378608004\cdot 10^{-6}\cdot \hat{\imath}$ 223

$$\begin{bmatrix} -1.16698771467526967\cdot 10^{-7} - 1.63069665548573261\cdot 10^{-6}\cdot \hat{\imath} & 224 \\ -1.16698771467526968\cdot 10^{-7} - 1.68395858689427077\cdot 10^{-6}\cdot \hat{\imath} & 225 \end{bmatrix}$$

This may indicate a zero for #120 in this range of values between n = 208 & 209 by the intermediate value theorem, with res12, b012, b112, and b212 because although the real part of the nth value does change sign between n = 208 & 209, there is a complex part appearing here of non-neglable size. And further calculation shows apparently a zero:

Set r = 10^-(190 - n/1000) so we can investigate the region betewwn 10^-208 and 10^-209 for zeros of r:

#128: $- 2.27969170950431674\cdot 10^{-45}\cdot \hat{\imath}\cdot \sqrt{(- 8.72972658963434942\cdot 10^{75}\cdot LN(10^{- (209 - n/1000)}) - 4.19999985115872094\cdot 10^{78} - 1.93359639726655723\cdot 10^{61}\cdot \hat{\imath}\cdot \sqrt{(- 1.45593367780608073\cdot 10^{28}\cdot LN(10^{- (209 - n/1000)}) - 7.00445106126299473\cdot 10^{30}))} - 8.82356564754472201\cdot 10^{-8} - 8.70614783745709959\cdot 10^{-23}\cdot \hat{\imath}\cdot \sqrt{(- 5.3869546078824987\cdot 10^{29}\cdot LN(10^{- (209 - n/1000)}) - 2.59164689266730805\cdot 10^{32})}$

Generate 100 values:

#129: VECTOR([$- 2.27969170950431674\cdot 10^{-45}\cdot \hat{\imath}\cdot \sqrt{(- 8.72972658963434942\cdot 10^{75}\cdot LN(10^{- (209 - n/1000)}) - 4.19999985115872094\cdot 10^{78} - 1.93359639726655723\cdot 10^{61}\cdot \hat{\imath}\cdot \sqrt{(- 1.45593367780608073\cdot 10^{28}\cdot LN(10^{- (209 - n/1000)}) - 7.00445106126299473\cdot 10^{30}))} - 8.82356564754472201\cdot 10^{-8} - 8.70614783745709959\cdot 10^{-23}\cdot \hat{\imath}\cdot \sqrt{(- 5.3869546078824987\cdot 10^{29}\cdot LN(10^{- (209 -$

```
n/1000)                                  32      ⎤
       ) - 2.59164689266730805·10   ), n⎦, n, 0, 1000, 10)
```

#130:

$$\left[\begin{array}{cc}
- 1.16698771467526885\cdot 10^{-7} - 1.04868869419987315\cdot 10^{-7}\cdot \hat{\imath} & 0 \\
- 1.16698771467526872\cdot 10^{-7} - 9.60834552449088305\cdot 10^{-8}\cdot \hat{\imath} & 10 \\
- 1.16698771467526852\cdot 10^{-7} - 8.64093801052550414\cdot 10^{-8}\cdot \hat{\imath} & 20 \\
- 1.16698771467526824\cdot 10^{-7} - 7.55058379765994698\cdot 10^{-8}\cdot \hat{\imath} & 30 \\
- 1.16698771467526776\cdot 10^{-7} - 6.27350154771841652\cdot 10^{-8}\cdot \hat{\imath} & 40 \\
- 1.1669877146752668\cdot 10^{-7} - 4.65857571076888093\cdot 10^{-8}\cdot \hat{\imath} & 50 \\
- 1.16698771467526393\cdot 10^{-7} - 2.01192287046647318\cdot 10^{-8}\cdot \hat{\imath} & 60 \\
- 7.96348836975494354\cdot 10^{-8} & 70 \\
- 6.0787096125241375\cdot 10^{-8} & 80 \\
- 4.67590485540985405\cdot 10^{-8} & 90 \\
- 3.51082435685538349\cdot 10^{-8} & 100 \\
- 2.49247901631339881\cdot 10^{-8} & 110 \\
- 1.57635791603587615\cdot 10^{-8} & 120 \\
- 7.3673375259976674\cdot 10^{-9} & 130 \\
4.28560310060016271\cdot 10^{-10} & 140 \\
7.73700012152571651\cdot 10^{-9} & 150 \\
1.46393823667219945\cdot 10^{-8} & 160 \\
2.11966963848096312\cdot 10^{-8} & 170 \\
2.74560392598322245\cdot 10^{-8} & 180 \\
{}^{-8} &
\end{array}\right.$$

$3.34546795666290828 \cdot 10$	190
$3.92227096025701471 \cdot 10^{-8}$	200
$4.4784842749887069 \cdot 10^{-8}$	210
$5.01616704063472921 \cdot 10^{-8}$	220
$5.53705647431137762 \cdot 10^{-8}$	230
$6.04263421262163549 \cdot 10^{-8}$	240
$6.53417604675957341 \cdot 10^{-8}$	250
$7.01278986544028451 \cdot 10^{-8}$	260
$7.47944505286427337 \cdot 10^{-8}$	270
$7.93499558226553631 \cdot 10^{-8}$	280
$8.3801983827125814 \cdot 10^{-8}$	290
$8.81572811044002015 \cdot 10^{-8}$	300
$9.24218914928274232 \cdot 10^{-8}$	310
$9.66012545020075273 \cdot 10^{-8}$	320
$1.0070028667263619 \cdot 10^{-7}$	330
$1.04723449372785245 \cdot 10^{-7}$	340
$1.08674805695994898 \cdot 10^{-7}$	350
$1.12558068528814027 \cdot 10^{-7}$	360
$1.1637664140722018 \cdot 10^{-7}$	370
$1.20133653441647579 \cdot 10^{-7}$	380

$1.2383198933030893 \cdot 10^{-7}$	390
$1.2747431527958303 \cdot 10^{-7}$	400
$1.3106310149366465 4 \cdot 10^{-7}$	410
$1.34600641772662686 \cdot 10^{-7}$	420
$1.38089070660957569 \cdot 10^{-7}$	430
$1.41530378509998823 \cdot 10^{-7}$	440
$1.44926424757418961 \cdot 10^{-7}$	450
$1.48278949674019972 \cdot 10^{-7}$	460
$1.5158958478930607 \cdot 10^{-7}$	470
$1.54859862172833128 \cdot 10^{-7}$	480
$1.58091222721208491 \cdot 10^{-7}$	490
$1.61285023577923867 \cdot 10^{-7}$	500
$1.64442544794414814 \cdot 10^{-7}$	510
$1.67564995325082625 \cdot 10^{-7}$	520
$1.70653518435910362 \cdot 10^{-7}$	530
$1.73709196595291587 \cdot 10^{-7}$	540
$1.76733055906398152 \cdot 10^{-7}$	550
$1.79726070132543619 \cdot 10^{-7}$	560
$1.82689164360309775 \cdot 10^{-7}$	570

$1.85623218339497895 \cdot 10^{-7}$	580
$1.88529069534084146 \cdot 10^{-7}$	590
$1.91407515914166603 \cdot 10^{-7}$	600
$1.94259318515281966 \cdot 10^{-7}$	610
$1.97085203788352932 \cdot 10^{-7}$	620
$1.99885865760827182 \cdot 10^{-7}$	630
$2.02661968027224565 \cdot 10^{-7}$	640
$2.05414145585267585 \cdot 10^{-7}$	650
$2.08143006531988445 \cdot 10^{-7}$	660
$2.10849133632646748 \cdot 10^{-7}$	670
$2.13533085773924465 \cdot 10^{-7}$	680
$2.1619539931166272 \cdot 10^{-7}$	690
$2.18836589322346058 \cdot 10^{-7}$	700
$2.21457150766604863 \cdot 10^{-7}$	710
$2.24057559572179709 \cdot 10^{-7}$	720
$2.26638273643058376 \cdot 10^{-7}$	730
$2.29199733800845165 \cdot 10^{-7}$	740
$2.31742364663843173 \cdot 10^{-7}$	750
$2.342665754688137 \cdot 10^{-7}$	760

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$2.36772760839916319\cdot 10$	770
$2.39261301508920592\cdot 10^{-7}$	780
$2.41732564990411407\cdot 10^{-7}$	790
$2.44186906215378276\cdot 10^{-7}$	800
$2.46624668126281411\cdot 10^{-7}$	810
$2.49046182236419149\cdot 10^{-7}$	820
$2.51451769156179906\cdot 10^{-7}$	830
$2.53841739088543801\cdot 10^{-7}$	840
$2.56216392296001887\cdot 10^{-7}$	850
$2.58576019540882623\cdot 10^{-7}$	860
$2.60920902500913732\cdot 10^{-7}$	870
$2.63251314161700651\cdot 10^{-7}$	880
$2.65567519187669768\cdot 10^{-7}$	890
$2.67869774272903163\cdot 10^{-7}$	900
$2.70158328473181439\cdot 10^{-7}$	910
$2.72433423520450356\cdot 10^{-7}$	920
$2.74695294120835211\cdot 10^{-7}$	930
$2.76944168237242928\cdot 10^{-7}$	940
$2.79180267357514967\cdot 10^{-7}$	950
$2.81403806749023911\cdot 10^{-7}$	960

$$\begin{bmatrix} 2.83614995700542036\cdot 10^{-7} & 970 \\ 2.8581403775215105\cdot 10^{-7} & 980 \\ 2.88001130913907842\cdot 10^{-7} & 990 \\ 2.90176467873931136\cdot 10^{-7} & 1000 \end{bmatrix}$$

We see a zero between 130 & 140 by the intermediate value theorem. This means that our zero is between 10^-(208.86) and 10 ^-(208.87)

Using Newton’s method:

#131:NEWTON(- $2.27969170950431674\cdot 10^{-45}\cdot\hat{\imath}\cdot\sqrt{(-\ 8.72972658963434942\cdot 10^{75}\cdot LN(r)}$ $- 4.19999985115872094\cdot 10^{78} - 1.93359639726655723\cdot 10^{61}\cdot\hat{\imath}\cdot\sqrt{(-}$ $1.45593367780608073\cdot 10^{28}\cdot LN(r) - 7.00445106126299473\cdot 10^{30})) -$ $8.82356564754472201\cdot 10^{-8} - 8.70614783745709959\cdot 10^{-23}\cdot\hat{\imath}\cdot\sqrt{(-}$ $5.3869546078824987\cdot 10^{29}\cdot LN(r) - 2.59164689266730805\cdot 10^{32}$), r, $10^{-208.86}$, 20)

#132:[$1.38038426460288483\cdot 10^{-209}$, $1.37857683826383325\cdot 10^{-209}$, $1.37858132330715375\cdot 10^{-209}$, $1.37858132333498755\cdot 10^{-209}$, $1.37858132333498757\cdot 10^{-209}$, $1.37858132333498758\cdot 10^{-209}$, $1.3785813233349876\cdot 10^{-209}$, $1.37858132333498759\cdot 10^{-209}$, $1.37858132333498761\cdot 10^{-209}$, $1.3785813233349876\cdot 10^{-209}$, $1.37858132333498758\cdot 10^{-209}$, $1.3785813233349876\cdot 10^{-209}$,

$$1.37858132333498758 \cdot 10^{-209}, 1.37858132333498759 \cdot 10^{-209},$$

$$1.37858132333498761 \cdot 10^{-209}, 1.37858132333498757 \cdot 10^{-209},$$

$$1.37858132333498759 \cdot 10^{-209}, 1.3785813233349876 \cdot 10^{-209},$$

$$1.37858132333498757 \cdot 10^{-209}, 1.37858132333498759 \cdot 10^{-209},$$

$$1.3785813233349876 \cdot 10^{-209}]$$

We have convergence, and r equals:

$$\#133{:}\ 1.3785813233349876 \cdot 10^{-209}$$

Checking via sunstitution into #121:

$$\#134{:} - 3.94854186645502622 \cdot 10^{-45} \cdot \hat{\imath} \cdot \sqrt{(- 2.9099088632114498 \cdot 10^{75} \cdot LN(1.3785813233349876 \cdot 10^{-209}) - 1.39999995038624031 \cdot 10^{78}} - 6.44532132422185743 \cdot 10^{60} \cdot \hat{\imath} \cdot \sqrt{(- 1.45593367780608073 \cdot 10^{28} \cdot LN(1.3785813233349876 \cdot 10^{-209}) - 7.00445106126299473 \cdot 10^{30}))} - 8.82356564754472201 \cdot 10^{-8} - 8.70614783745709959 \cdot 10^{-23} \cdot \hat{\imath} \cdot \sqrt{(- 5.38695460788249 87 \cdot 10^{29} \cdot LN(1.3785813233349876 \cdot 10^{-209}) - 2.59164689266730804 \cdot 10^{32})}$$

Simplifying:

$$\#135{:}\quad - 1.33990364058248448 \cdot 10^{-22}$$

Since we are using 18 digit precision, this may be taken to vanish & so this confirms our above (#133) value of r using res12, b012, b112, b212, and α = 0.95.

We next calculate our completely normalized ring charge density function in terms of "r" from res12, b012, b112, and b212 from above since we have obtained an admissable value of "r" there.

$$\#136: \frac{q\cdot\alpha}{(2\cdot\pi\cdot R)\cdot(\pi\cdot r^2)}$$

This just above is the (positive) average charge density of the positron ring for since the volume of the toroid is the surface area of a ring cross section times the circumference of the circle made having the large radius by a theorem of Pappas.

Thus, to completely normalize lambda[Rho} and make it dimensionless, we must divide it (#10) by this average ring density. And, further, we can make the variable "Rho" also dimensionless too, by noting that Rho = (r rhor), where rhor is dimensionless.

Thus we set NVDlambda[rhor], the normalized ring charge density function, as:

$$\#137: \frac{b0 + \frac{r\cdot res}{Rho} + \frac{b1\cdot Rho}{r} + \frac{b2\cdot Rho^2}{r^2}}{\frac{q\cdot\alpha}{(2\cdot\pi\cdot R)\cdot(\pi\cdot r^2)}}$$

and then we set Rho = (r rhor):

$$\#138: \frac{b0 + \frac{r\cdot res}{r\cdot rhor} + \frac{b1\cdot(r\cdot rhor)}{r} + \frac{b2\cdot(r\cdot rhor)^2}{r^2}}{\frac{q\cdot\alpha}{(2\cdot\pi\cdot R)\cdot(\pi\cdot r^2)}}$$

Simplifying:

This just below is NVDlambda(rhor), the normalized interior charge density.

#139: $$\frac{2\cdot\pi^{2}\cdot R\cdot r^{2}\cdot(b0\cdot rhor + b1\cdot rhor^{2} + b2\cdot rhor^{3} + res)}{\alpha\cdot q\cdot rhor}$$

Substituting for res using res12 (from #105), b0 using b012 from (#102), b1 using b112 (from #99), and b2 using b212 (from #96):

#140: $$2\cdot\pi^{2}\cdot R\cdot r^{2}\cdot((\sqrt{15}\cdot\sqrt{(-\ \alpha\cdot(-\ 840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) + 840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(}}$$

$$) + 2\cdot\sqrt{30}\cdot\sqrt{Mu0}\cdot\sqrt{\alpha}\cdot q\cdot\sqrt{(-c)}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot L}$$

$$21\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}$$

$$N(r) - 599\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar) + 1213\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} + 3360\cdot\pi^{2}\cdot hba$$

$$r)) + \frac{11\cdot\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 5}}{210\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}}$$

$$99\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar) + \frac{115\cdot\alpha\cdot q}{14\cdot\pi^{2}\cdot R\cdot r^{2}})\cdot rhor + (-\ \sqrt{15}\cdot\sqrt{(-\ \alpha\cdot}$$

$$-\ 840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) + 840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) + 2\cdot\sqrt{30}\cdot\sqrt{Mu0}\cdot\sqrt{\alpha}\cdot q\cdot\sqrt{(-}$$

$$\frac{c)\cdot\sqrt{(}420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} -}{28\cdot\pi^{2}\cdot\sqrt{Mu0\cdot R\cdot r^{2}}\cdot\sqrt{(-c)}} \sim$$

$$\frac{1680\cdot\pi^{2}\cdot hbar) + 1213\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} + 3360\cdot\pi^{2}\cdot hbar))}{} - \frac{4\cdot\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(}420\cdot}{} \sim$$

$$\alpha\cdot q\cdot rhor \sim$$

$$\frac{Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot}{35\cdot\pi^{2}\cdot\sqrt{Mu0\cdot R\cdot r^{2}}\cdot\sqrt{(-c)}} \sim$$

$$\frac{hbar)}{} - \left.\frac{93\cdot\alpha\cdot q}{7\cdot\pi^{2}\cdot R\cdot r^{2}}\right)\cdot rhor^{2} + \left(\frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(}420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420}{15\cdot\pi}\right. \sim$$

$$\left.\frac{\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar)}{^{2}\cdot\sqrt{Mu0\cdot R\cdot r^{2}}\cdot\sqrt{(-c)}} + \frac{6\cdot\alpha\cdot q}{\pi^{2}\cdot R\cdot r^{2}}\right)\cdot rhor \sim$$

$$^{3} + \left(- \frac{\sqrt{15}\cdot\sqrt{(}- \alpha\cdot(- 840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) + 840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) +}{}\right. \sim$$

$$\frac{2\cdot\sqrt{30}\cdot\sqrt{Mu0}\cdot\sqrt{\alpha}\cdot q\cdot\sqrt{(-c)}\cdot\sqrt{(}420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r)}{84\cdot\pi^{2}\cdot\sqrt{Mu0\cdot R\cdot r^{2}}\cdot\sqrt{(-c)}} \sim$$

```
                       2            2                        2            2          ~
 - 599·Mu0·α·c·q  - 1680·π ·hbar) + 1213·Mu0·α·c·q  + 3360·π ·hbar))  ~
──────────────────────────────────────────────────────────────────────~
                                                                      ~
                                                                      ~
──────────────────────────────────────────────────────────────────────~
                                                                      ~

                                          2                        2                 ~
    √30·√α·√(420·Mu0·α·c·q ·LN(8·R) - 420·Mu0·α·c·q ·LN(r) - 599·Mu0·~
 - ───────────────────────────────────────────────────────────────────~
                                         2          2                ~
                              210·π ·√Mu0·R·r ·√(-c)                 ~
──────────────────────────────────────────────────────────────────────~
                                                                      ~

      2            2
α·c·q  - 1680·π ·hbar)        13·α·q    ))
──────────────────────── - ──────────── ))
                               2    2   ))
                          14·π ·R·r     ))
──────────────────────────────────────────
```

Simplifying:

#141:-

```
                  2                                             2                  ~
 √15·(3·rhor  - 4·rhor + 1)·√(- α·(- 840·Mu0·α·c·q ·LN(8·R) + 840·Mu
────────────────────────────────────────────────────────────────────
                                                                   ~

         2                                                          2         ~
·α·c·q ·LN(r) + 2·√30·√Mu0·√α·q·√(-c)·√(420·Mu0·α·c·q ·LN(8·R) - 420
────────────────────────────────────────────────────────────────────
                                  42·√Mu0·α·q·rhor·√(-c)           ~

           2                       2           2                  ~          2
Mu0·α·c·q ·LN(r) - 599·Mu0·α·c·q  - 1680·π ·hbar) + 1213·Mu0·α·c·q  -
────────────────────────────────────────────────────────────────────
                                                                   ~

            2
 3360·π ·hbar))
──────────────── +

                 3             2                                    2 ~
 √30·(14·rhor  - 24·rhor  + 11·rhor - 1)·√(420·Mu0·α·c·q ·LN(8·R) - 4
────────────────────────────────────────────────────────────────────
                                               105·√Mu0·√α·q·rhor·
```

$$\frac{20\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar)}{(-c)} +$$

$$\frac{84\cdot rhor^{3} - 186\cdot rhor^{2} + 115\cdot rhor - 13}{7\cdot rhor}$$

Substituting for R from #80:

#142:

$$-$$

$$\frac{\sqrt{15}\cdot(3\cdot rhor^{2} - 4\cdot rhor + 1)\cdot\sqrt{\left(-\alpha\cdot\left(-840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN\left(8\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^{2}}{4\cdot\pi^{2}}\right.\right.\right.}}{}$$

$$\left.\frac{+ 4\cdot\pi^{2}\cdot hbar}{\cdot c\cdot me}\right) + 840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) + 2\cdot\sqrt{30}\cdot\sqrt{Mu0}\cdot\sqrt{\alpha}\cdot q\cdot\sqrt{(-c)}\cdot\sqrt{\left(420\cdot Mu\right.}$$

$$42\cdot\sqrt{Mu0\cdot\alpha\cdot q\cdot rh}$$

$$\frac{0\cdot\alpha\cdot c\cdot q^{2}\cdot LN\left(8\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^{2} + 4\cdot\pi^{2}\cdot hbar}{4\cdot\pi^{2}\cdot c\cdot me}\right) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599}{or\cdot\sqrt{(-c)}}$$

$$\frac{\left.\left.\left.Mu0\cdot\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar\right) + 1213\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} + 3360\cdot\pi^{2}\cdot hbar\right)\right)}{} +$$

$$\frac{\sqrt{30}\cdot(14\cdot rhor^{3} - 24\cdot rhor^{2} + 11\cdot rhor - 1)\cdot\sqrt{\left(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN\left(8\cdot\frac{Mu0\cdot\alpha}{}\right.\right.}}{105\cdot\sqrt{Mu0}} \sim$$

$$\frac{\left.\frac{\cdot c\cdot q^{2} + 4\cdot\pi^{2}\cdot hbar}{4\cdot\pi^{2}\cdot c\cdot me}\right) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}}{\cdot\sqrt{\alpha}\cdot q\cdot rhor\cdot\sqrt{(-c)}} \sim$$

$$\frac{\left.\cdot hbar\right)}{} + \frac{84\cdot rhor^{3} - 186\cdot rhor^{2} + 115\cdot rhor - 13}{7\cdot rhor}$$

Substituting for our constants but not as yet for r and α:

#143: –

$$\frac{\sqrt{15}\cdot(3\cdot rhor^{2} - 4\cdot rhor + 1)\cdot\sqrt{\left(-\ \alpha\cdot\left(-\ 840\cdot(4\cdot\pi\cdot10^{-7})\cdot\alpha\cdot299792458\cdot(+\ 1\right.\right.}}{} \sim$$

$$\frac{6021764874\cdot10^{-19})^{2}\cdot LN\left(8\cdot\frac{(4\cdot\pi\cdot10^{-7})\cdot\alpha\cdot299792458\cdot(+\ 1.6021764874\cdot10^{-19}}{4\cdot\pi^{2}\cdot299792458\cdot(+\ 9.10938}\right.}{} \sim$$

```
 2       2                          -34 ⎞                                                      ~
)  + 4·π ·(1.05457162853·10     )       ⎟                         -7                          ~
────────────────────────────────────────⎟ + 840·(4·π·10   )·α·299792458·(+ 1.6               ~
        -31                             ⎟                                                      ~
21545·10    )                           ⎠                                                      ~
────────────────────────────────────────────────────────────────────────────────────────────────~
                                                                                               ~
                                                                                               ~

                                                                                               ~
            -19 2                                 -7                                 -19      ~
021764874·10     ) ·LN(r) + 2·√30·√(4·π·10   )·√α·(+ 1.6021764874·10     )                     ~
                                                                                               ~
                                                                                               ~
────────────────────────────────────────────────────────────────────────────────────────────────~
                                                                                               ~
                                                                                               ~

                           ⎛                                                                   ~
                           ⎜               -7                                      -19 2       ~
·√(-299792458)·√           ⎜420·(4·π·10   )·α·299792458·(+ 1.6021764874·10     ) ·L           ~
                           ⎜                                                                   ~
                           ⎝                                                                   ~
────────────────────────────────────────────────────────────────────────────────────────────────~
                                            -7                             -19                 ~
                              42·√(4·π·10   )·α·(+ 1.6021764874·10     )·rho                   ~
 ⎛                                                                                             ~
 ⎜          -7                                     -19 2        2                              ~
 ⎜ (4·π·10    )·α·299792458·(+ 1.6021764874·10     )  + 4·π ·(1.0545716                      ~
N⎜8·───────────────────────────────────────────────────────────────────────────────────────────~
 ⎜                          2                                -31                               ~
 ⎝                      4·π ·299792458·(+ 9.1093821545·10      )                               ~
────────────────────────────────────────────────────────────────────────────────────────────────~
                                                                                               ~
r·√(-299792458)                                                                                ~

        -34 ⎞                                                                                  ~
2853·10    )⎟                    -7                                        -19 2               ~
────────────⎟ - 420·(4·π·10    )·α·299792458·(+ 1.6021764874·10     ) ·LN                      ~
            ⎟                                                                                  ~
            ⎠                                                                                  ~
────────────────────────────────────────────────────────────────────────────────────────────────~
                                                                                               ~
                                                                                               ~

                                                                                               ~
                   -7                                    -19 2          2                     ~
(r) - 599·(4·π·10    )·α·299792458·(+ 1.6021764874·10     )  - 1680·π ·(1                     ~
                                                                                               ~
                                                                                               ~
────────────────────────────────────────────────────────────────────────────────────────────────~
                                                                                               ~
                                                                                               ~
```

```
                          -34                 -7
.05457162853·10    ) + 1213·(4·π·10   )·α·299792458·(+ 1.6021764874·10~
___________________________________________________________________

-19 2          2                  -34
    )  + 3360·π  ·(1.05457162853·10    )))
_______________________________________ +

              3            2                                   -7
√30·(14·rhor   - 24·rhor   + 11·rhor - 1)·√(420·(4·π·10   )·α·299792458~
___________________________________________________________________

                               -7
                  -19 2    (4·π·10   )·α·299792458·(+ 1.6021764874~
·(+ 1.6021764874·10    ) ·LN(8·_____________________________________
                                          2
                                      4·π  ·299792458·(+ 9~
___________________________________________________________________
                                                        105·√(~
   -19 2      2                  -34
·10    )  + 4·π  ·(1.05457162853·10    )                 -7
________________________________________) - 420·(4·π·10   )·α·299792458·~
                 -31
.1093821545·10    )
___________________________________________________________________
     -7                          -19
4·π·10   )·√α·(+ 1.6021764874·10    )·rhor·√(-299792458)

                 -19 2                          -7
(+ 1.6021764874·10    ) ·LN(r) - 599·(4·π·10   )·α·299792458·(+ 1.60217~
___________________________________________________________________
```

$$\frac{64874\cdot 10^{-19})^{2} - 1680\cdot\pi^{2}\cdot(1.05457162853\cdot 10^{-34})\Big)}{} +$$

$$\frac{84\cdot rhor^{3} - 186\cdot rhor^{2} + 115\cdot rhor - 13}{7\cdot rhor}$$

Substituting for α = 0.95 andd r = #133:

#144: $-$

$$\frac{\sqrt{15}\cdot(3\cdot rhor^{2} - 4\cdot rhor + 1)\cdot\sqrt{\Big(- 0.95\cdot\Big(- 840\cdot(4\cdot\pi\cdot 10^{-7})\cdot 0.95\cdot 299792458}}{}$$

$$\frac{\cdot(+ 1.6021764874\cdot 10^{-19})^{2}\cdot LN\Big(8\cdot\frac{(4\cdot\pi\cdot 10^{-7})\cdot 0.95\cdot 299792458\cdot(+ 1.602176}{4\cdot\pi^{2}\cdot 299792458\cdot(}}{}$$

$$\frac{\frac{874\cdot 10^{-19})^{2} + 4\cdot\pi^{2}\cdot(1.05457162853\cdot 10^{-34})}{9.1093821545\cdot 10^{-31})}\Big) + 840\cdot(4\cdot\pi\cdot 10^{-7})\cdot 0.95\cdot 299}{}$$

```
                              -19 2                              -209
92458·(+ 1.6021764874·10     )  ·LN(1.3785813233349876·10      ) + 2·√30·√
______________________________________________________________________________

           -7                                   -19                                          -7
(4·π·10   )·√0.95·(+ 1.6021764874·10    )·√(-299792458)·√⎛420·(4·π·10
                                                         ⎝
______________________________________________________________________________
                                                                          42·√(4
                                                    ⎛           -7
                                      -19 2         ⎜  (4·π·10   )·0.95·299792
)·0.95·299792458·(+ 1.6021764874·10      )  ·LN⎜8·──────────────────────────
                                                    ⎜
                                                    ⎝                        4
______________________________________________________________________________
      -7                             -19
·π·10   )·0.95·(+ 1.6021764874·10    )·rhor·√(-299792458)

                          -19 2        2                         -34  ⎞
458·(+ 1.6021764874·10       )  + 4·π  ·(1.05457162853·10       )   ⎟ - 420·(4·π
────────────────────────────────────────────────────────────────────⎟
  2                                   -31                             ⎟
·π  ·299792458·(+ 9.1093821545·10     )                               ⎠
______________________________________________________________________________

   -7                                          -19 2
·10   )·0.95·299792458·(+ 1.6021764874·10      )  ·LN(1.3785813233349876·1
______________________________________________________________________________

 -209               -7                                           -19 2
0     ) - 599·(4·π·10   )·0.95·299792458·(+ 1.6021764874·10      )   - 1680
______________________________________________________________________________
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```
                                        ⎞                                  ~
  2                                -34  ⎟                  -7              ~
•π •(1.05457162853•10    )⎟ + 1213•(4•π•10  )•0.95•299792458•(+ 1.6021~
                                        ⎠                                  ~
───────────────────────────────────────────────────────────────────────────~

                                                        ⎞⎞
          -19 2          2                    -34  ⎟⎟
764874•10    )  + 3360•π •(1.05457162853•10    )⎟⎟
                                                        ⎠⎠
──────────────────────────────────────────────────────────── +

                                                      ⎛                      ~
            3             2                             ⎜             -7         ~
 √30•(14•rhor  - 24•rhor  + 11•rhor - 1)•√⎜420•(4•π•10  )•0.95•299792~
                                                      ⎝                      ~
───────────────────────────────────────────────────────────────────────────~

                                          ⎛            -7                        ~
                                 -19 2    ⎜ (4•π•10  )•0.95•299792458•(+ 1.6021~
458•(+ 1.6021764874•10    ) •LN⎜8•──────────────────────────────────────────~
                                          ⎜                               2       ~
                                          ⎝                          4•π •299792458~
───────────────────────────────────────────────────────────────────────────~

          -19 2       2                    -34  ⎞                          ~
764874•10    )  + 4•π •(1.05457162853•10    )⎟                  -7      ~
─────────────────────────────────────────────⎟ - 420•(4•π•10  )•0.95•2~
                 -31                            ⎟                          ~
•(+ 9.1093821545•10    )                        ⎠                          ~
───────────────────────────────────────────────────────────────────────────~
                       -7                              -19                  ~
         105•√(4•π•10  )•√0.95•(+ 1.6021764874•10    )•rhor•√(-299792~

                                    -19 2                          -209                ~
99792458•(+ 1.6021764874•10    ) •LN(1.3785813233349876•10     ) - 599•~
───────────────────────────────────────────────────────────────────────────~

458)                                                                       ~
```

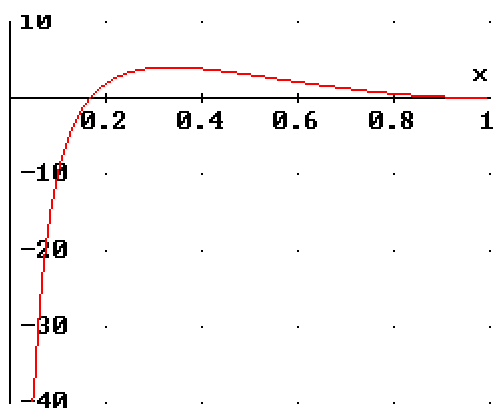
$$\frac{(4\cdot\pi\cdot 10^{-7})\cdot 0.95\cdot 299792458\cdot(+\ 1.6021764874\cdot 10^{-19})^{2}\ -\ 1680\cdot\pi^{2}\cdot(1.054571\sim}{}\sim$$

$$\frac{\left.62853\cdot 10^{-34})\right)}{} + \frac{84\cdot rhor^{3} - 186\cdot rhor^{2} + 115\cdot rhor - 13}{7\cdot rhor}$$

Simplifying:

$$\#145{:}\ 18.3076923076923076\cdot rhor^{2} - 39.6923076923076923\cdot rhor - \frac{3.07692307692307692}{rhor} + 24.4615384615384615$$

Plotting:



The plot shows both negative & positive parts and so must be rejected.

We next try b211 for b2, and return to #95 above, but with using b211 (& with using b11 for b1) to substitute rather than b212 that we just did above:

#146:
$$\frac{6\cdot\alpha\cdot q}{\pi^2\cdot R\cdot r^2} - \frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c}{15\cdot\pi^2\cdot\sqrt{Mu0}\cdot R\cdot r^2\cdot\sqrt{(-c)}}$$

$$\frac{\cdot q^2 - 1680\cdot\pi^2\cdot hbar)}{}$$

This just above is b211 (#95).

Then #97 for b11 is:

#147:−

$$\frac{3\cdot\sqrt{(5880\cdot Mu0\cdot\alpha^2\cdot c\cdot q^2\cdot LN(8\cdot R) - 5880\cdot Mu0\cdot\alpha^2\cdot c\cdot q^2\cdot LN(r) + Mu0\cdot c\cdot(5\cdot\pi^4}{56\cdot\pi^2\cdot\sqrt{Mu0}\cdot R}$$

$$\frac{R^2\cdot b2^2\cdot r^4 + 140\cdot\pi^2\cdot R\cdot\alpha\cdot b2\cdot q\cdot r^2 - 9506\cdot\alpha^2\cdot q^2) - 23520\cdot\pi^2\cdot\alpha\cdot hbar)}{r^2\cdot\sqrt{(-c)}} -$$

$$\frac{3\cdot(4\cdot\pi^2\cdot R\cdot b2\cdot r^2 + 7\cdot\alpha\cdot q)}{7\cdot\pi^2\cdot R\cdot r^2}$$

Substituting for b2 the value b211 (#128):

#148: −

$$\frac{3\cdot\sqrt{\left(5880\cdot Mu0\cdot\alpha^{2}\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 5880\cdot Mu0\cdot\alpha^{2}\cdot c\cdot q^{2}\cdot LN(r) + Mu0\cdot c\cdot\left(5\cdot\pi^{4}\cdot\right.\right.}}{} \sim$$

$$\frac{R^{2}\cdot\left(\frac{6\cdot\alpha\cdot q}{\pi^{2}\cdot R\cdot r^{2}} - \frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(}}{15\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-}}\right.}{} \sim$$

$$\frac{\left.\frac{r) - 599\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar)}{c)}\right)^{2}\cdot r^{4} + 140\cdot\pi^{2}\cdot R\cdot\alpha\cdot\left(\frac{6\cdot\alpha\cdot q}{\pi^{2}\cdot R\cdot r^{2}} - -\right.}{56\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}} \sim$$

$$\frac{\frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c\cdot}}{15\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}}}{} \sim$$

$$\frac{\left.\left.\left.\frac{q^{2} - 1680\cdot\pi^{2}\cdot hbar)}{}\right)\cdot q\cdot r^{2} - 9506\cdot\alpha^{2}\cdot q^{2}\right) - 23520\cdot\pi^{2}\cdot\alpha\cdot hbar\right)}{} -$$

$$\frac{3\cdot\left(4\cdot\pi^2\cdot R\cdot\left(\dfrac{6\cdot\alpha\cdot q}{\pi^2\cdot R\cdot r^2}-\dfrac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(8\cdot R)-420\cdot Mu0\cdot\alpha\cdot\sim}}{15\cdot\pi^2\cdot\sqrt{Mu0}\cdot\sim}\right.\right.}{7\cdot\pi^2\cdot R\cdot r^2\sim}$$

$$\frac{\left.\left.\dfrac{c\cdot q^2\cdot LN(r)-599\cdot Mu0\cdot\alpha\cdot c\cdot q^2-1680\cdot\pi^2\cdot hbar)}{R\cdot r^2\cdot\sqrt{(-c)}}\right)\cdot r^2+7\cdot\alpha\cdot q\right)}{}$$

This just above is b111.

Now we can calculate our coefficients: res11 for res, b011 for b0, b111 for b1, and b211 for b2 ... in terms of only our known constants:

Substituting into b11 (#24) the just above b211 (#129) for b2:

Recalling b0 from #24:

$$\#149{:}-\frac{\pi^2\cdot R\cdot r^2\cdot(8\cdot b1+9\cdot b2)+3\cdot\alpha\cdot q}{6\cdot\pi^2\cdot R\cdot r^2}$$

Substituting b11 for ”b1” and b211 for ”b2”:

#150: –

$$\frac{\pi^2 \cdot R \cdot r^2 \cdot \left(8 \cdot \left(- \frac{3 \cdot \sqrt{(5880 \cdot Mu0 \cdot \alpha^2 \cdot c \cdot q^2 \cdot LN(8 \cdot R) - 5880 \cdot Mu0 \cdot \alpha^2 \cdot c \cdot q^2 \cdot LN(r)} \sim}{} \right.\right.}{} \sim$$

$$\frac{+ Mu0 \cdot c \cdot (5 \cdot \pi^4 \cdot R^2 \cdot b2^2 \cdot r^4 + 140 \cdot \pi^2 \cdot R \cdot \alpha \cdot b2 \cdot q \cdot r^2 - 9506 \cdot \alpha^2 \cdot q^2) - 23520 \cdot \pi \sim}{56 \cdot \pi^2 \cdot \sqrt{Mu0} \cdot R \cdot r^2 \cdot \sqrt{(-c)}} \sim$$

$$\frac{\frac{{}^2 \cdot \alpha \cdot hbar)}{} - \frac{3 \cdot (4 \cdot \pi^2 \cdot R \cdot b2 \cdot r^2 + 7 \cdot \alpha \cdot q)}{7 \cdot \pi^2 \cdot R \cdot r^2} \Bigg) + 9 \cdot \left(\frac{6 \cdot \alpha \cdot q}{\pi^2 \cdot R \cdot r^2} - \frac{\sqrt{30} \cdot \sqrt{\alpha} \cdot \sqrt{(4} \sim}{} \right.}{6 \cdot \pi^2 \cdot R \cdot r} \sim$$

$$\frac{20 \cdot Mu0 \cdot \alpha \cdot c \cdot q^2 \cdot LN(8 \cdot R) - 420 \cdot Mu0 \cdot \alpha \cdot c \cdot q^2 \cdot LN(r) - 599 \cdot Mu0 \cdot \alpha \cdot c \cdot q^2 - 1680 \cdot \sim}{15 \cdot \pi^2 \cdot \sqrt{Mu0} \cdot R \cdot r^2 \cdot \sqrt{(-c)}} \sim$$

$$\frac{\left.\left.\frac{\pi^2 \cdot hbar)}{}\right)\right) + 3 \cdot \alpha \cdot q}{}$$

Substituting b211 for b2:

#151:

$-$

$$\frac{\pi^2 \cdot R \cdot r^2 \cdot \left(8 \cdot \left(- \frac{3 \cdot \sqrt{\left(5880 \cdot Mu0 \cdot \alpha^2 \cdot c \cdot q^2 \cdot LN(8 \cdot R) - 5880 \cdot Mu0 \cdot \alpha^2 \cdot c \cdot q^2 \cdot LN(r)\right.}}{}\right.\right.}{} \sim$$

$$\frac{+ Mu0 \cdot c \cdot \left(5 \cdot \pi^4 \cdot R^2 \cdot \left(\frac{6 \cdot \alpha \cdot q}{\pi^2 \cdot R \cdot r^2} - \frac{\sqrt{30} \cdot \sqrt{\alpha} \cdot \sqrt{(420 \cdot Mu0 \cdot \alpha \cdot c \cdot q^2 \cdot LN(8 \cdot R) - 420}}{15 \cdot \pi}\right.\right.}{} \sim$$

$$\frac{\frac{\cdot Mu0 \cdot \alpha \cdot c \cdot q^2 \cdot LN(r) - 599 \cdot Mu0 \cdot \alpha \cdot c \cdot q^2 - 1680 \cdot \pi^2 \cdot hbar)}{{}^2 \cdot \sqrt{Mu0} \cdot R \cdot r^2 \cdot \sqrt{(-c)}}\Bigg)^2 \cdot r^4 + 140 \cdot \pi^2 \cdot R \cdot \alpha}{56 \cdot \pi^2 \cdot \sqrt{Mu0} \cdot R \cdot r^2 \cdot \sqrt{(-c)}} \sim$$

$$\frac{\cdot \left(\frac{6 \cdot \alpha \cdot q}{\pi^2 \cdot R \cdot r^2} - \frac{\sqrt{30} \cdot \sqrt{\alpha} \cdot \sqrt{(420 \cdot Mu0 \cdot \alpha \cdot c \cdot q^2 \cdot LN(8 \cdot R) - 420 \cdot Mu0 \cdot \alpha \cdot c \cdot q^2 \cdot LN(r)}}{15 \cdot \pi^2 \cdot \sqrt{Mu0} \cdot R \cdot r^2 \cdot \sqrt{(-c)}}\right.}{} \sim$$

$$\frac{\frac{\frac{- 599\cdot Mu0\cdot \alpha\cdot c\cdot q^{2} - 1680\cdot \pi^{2}\cdot hbar)}{}\right)\cdot q\cdot r^{2} - 9506\cdot \alpha^{2}\cdot q^{2}\right) - 23520\cdot \pi^{2}\cdot \alpha\cdot h}{}}{6\cdot \pi^{2}\cdot R\cdot r^{2}}$$

$$\frac{bar\right)}{} - \frac{3\cdot \left(4\cdot \pi^{2}\cdot R\cdot \left(\frac{6\cdot \alpha\cdot q}{\pi^{2}\cdot R\cdot r^{2}} - \frac{\sqrt{30}\cdot \sqrt{\alpha}\cdot \sqrt{(420\cdot Mu0\cdot \alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 42}}{15\cdot}\right.\right.}{7\cdot}$$

$$\frac{\frac{\frac{0\cdot Mu0\cdot \alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot \alpha\cdot c\cdot q^{2} - 1680\cdot \pi^{2}\cdot hbar)}{\pi^{2}\cdot \sqrt{Mu0}\cdot R\cdot r^{2}\cdot \sqrt{(-c)}}\right)\cdot r^{2} + 7\cdot \alpha\cdot q\right)}{\pi^{2}\cdot R\cdot r^{2}}\right) +}{}$$

$$\frac{9\cdot \left(\frac{6\cdot \alpha\cdot q}{\pi^{2}\cdot R\cdot r^{2}} - \frac{\sqrt{30}\cdot \sqrt{\alpha}\cdot \sqrt{(420\cdot Mu0\cdot \alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot \alpha\cdot c\cdot q^{2}\cdot LN(}}{15\cdot \pi^{2}\cdot \sqrt{Mu0}\cdot R\cdot r^{2}\cdot \sqrt{(-}}\right.}{}$$

$$\left.\left.\frac{\text{r)} - 599\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar)}{\text{c)}}\right)\right) + 3\cdot\alpha\cdot q$$

Simplifying:

$$\#152: \frac{\sqrt{15}\cdot\sqrt{(\alpha\cdot(840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) + 2\cdot\sqrt{30}\cdot\sqrt{Mu0}\cdot\sqrt{}}}{}$$

$$\frac{\cdot q\cdot\sqrt{(-c)}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot\alpha}}{21\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}}$$

$$\frac{c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar) - 1213\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} - 3360\cdot\pi^{2}\cdot hbar))}{} -$$

$$\frac{11\cdot\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0}}{210\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}}$$

$$\frac{\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar)}{} + \frac{115\cdot\alpha\cdot q}{14\cdot\pi^{2}\cdot R\cdot r^{2}}$$

This just above is ”b011” for b0, and it is not a function of res, b0, b1, or b2.

Recalling res:

#153:-b0 - b1 - b2

Substituting into #135 for b011, b111 for b1, and b211 for b2:

#154:

$$-\left(\frac{\sqrt{15}\cdot\sqrt{(\alpha\cdot(840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) + 2\cdot\sqrt{30}\cdot\sqrt{Mu0}\ \sim}}{\sim}\right.$$

$$\frac{\cdot\sqrt{\alpha}\cdot q\cdot\sqrt{(-c)}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\ \sim}}{21\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}\ \sim}$$

$$\frac{\cdot\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar) - 1213\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} - 3360\cdot\pi^{2}\cdot hbar))}{} -$$

$$\frac{11\cdot\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot\ \sim}}{210\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}\ \sim}$$

$$\left.\frac{\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar)}{} + \frac{115\cdot\alpha\cdot q}{14\cdot\pi^{2}\cdot R\cdot r^{2}}\right) - \left(-\right.$$

$$3\cdot\sqrt{\left(5880\cdot Mu0\cdot\alpha^{2}\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 5880\cdot Mu0\cdot\alpha^{2}\cdot c\cdot q^{2}\cdot LN(r) + Mu0\cdot c\cdot\left(5\cdot\pi^{4}\cdot\right.\right.} \sim$$

$$R^{2}\cdot\left(\frac{6\cdot\alpha\cdot q}{\pi^{2}\cdot R\cdot r^{2}} - \frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(}}{15\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-}}\right. \sim$$

$$\frac{\left.\frac{r) - 599\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar)}{c)}\right)^{2}\cdot r^{4} + 140\cdot\pi^{2}\cdot R\cdot\alpha\cdot\left(\frac{6\cdot\alpha\cdot q}{\pi^{2}\cdot R\cdot r^{2}} - -\right.}{56\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}} \sim$$

$$\frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c\cdot}}{15\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}} \sim$$

$$\frac{\left.\left.\left.\frac{q^{2} - 1680\cdot\pi^{2}\cdot hbar)}{}\right)\cdot q\cdot r^{2} - 9506\cdot\alpha^{2}\cdot q^{2}\right) - 23520\cdot\pi^{2}\cdot\alpha\cdot hbar\right)}{} -$$

$$\frac{3\cdot\left(4\cdot\pi^{2}\cdot R\cdot\left(\frac{6\cdot\alpha\cdot q}{\pi^{2}\cdot R\cdot r^{2}} - \frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot}}{15\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot}\right.\right.}{7\cdot\pi^{2}\cdot R\cdot r^{2}} \sim$$

$$\left.\left.\frac{c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot \alpha\cdot c\cdot q^{2} - 1680\cdot \pi^{2}\cdot hbar)}{R\cdot r^{2}\cdot\sqrt{(-c)}}\right)\cdot r^{2} + 7\cdot\alpha\cdot q\right)\Bigg) -$$

$$\left(\frac{6\cdot\alpha\cdot q}{\pi^{2}\cdot R\cdot r^{2}} - \right.$$

$$\frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c}}{15\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}} \sim$$

$$\left.\frac{\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar)}{}\right)$$

Simplifying:

#155:-

$$\frac{\sqrt{15}\cdot\sqrt{(\alpha\cdot(840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) + \sim 2\cdot\sqrt{30}\cdot\sqrt{Mu0}}}{}$$

$$\frac{\sqrt{\alpha}\cdot q\cdot\sqrt{(-c)}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r)\sim - 599\cdot Mu0}}{84\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}}$$

$$\frac{\alpha\cdot c\cdot q^{2} - 1680\cdot \pi^{2}\cdot hbar) - 1213\cdot Mu0\cdot \alpha\cdot c\cdot q^{2} - 3360\cdot \pi^{2}\cdot hbar))}{} +$$

$$\frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot \alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot \alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot \alpha\cdot c}\ \tilde{}}{210\cdot \pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}}$$

$$\frac{\cdot q^{2} - 1680\cdot \pi^{2}\cdot hbar)}{} - \frac{13\cdot \alpha\cdot q}{14\cdot \pi^{2}\cdot R\cdot r^{2}}$$

This just above is "res11" from b011, b111, and b211, and it is not a function of res, b0, b1, or b2.

We recall #111 obtained from user-friendlyness:

#156:b2 = −res

Substituting res11 for res and b211 for b2 into #137, we obtain our desired relation for "r" after substituting for our known constants (including "R" from #80 in terms of our given fundamental constants):

$$\#157: \frac{6\cdot \alpha\cdot q}{\pi^{2}\cdot R\cdot r^{2}} -$$

$$\frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot \alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot \alpha\cdot c\cdot q^{2}\cdot LN(r) - \tilde{}599\cdot Mu0\cdot \alpha\cdot c}}{15\cdot \pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}}$$

$$\frac{\cdot q^{2} - 1680\cdot \pi^{2}\cdot hbar)}{} = - \left(- \right.$$

$$\frac{\sqrt{15}\cdot\sqrt{(\alpha\cdot(840\cdot Mu0\cdot \alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 840\cdot Mu0\cdot \alpha\cdot c\cdot q^{2}\cdot LN(r) + \tilde{}2\cdot\sqrt{30}\cdot\sqrt{Mu0}}}{}$$

$$\frac{\sqrt{\alpha}\cdot q\cdot\sqrt{(-c)}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(r) - 599\cdot Mu0\cdot}}{84\cdot\pi^2\cdot\sqrt{Mu0}\cdot R\cdot r^2\cdot\sqrt{(-c)}} \sim$$

$$\frac{\alpha\cdot c\cdot q^2 - 1680\cdot\pi^2\cdot hbar) - 1213\cdot Mu0\cdot\alpha\cdot c\cdot q^2 - 3360\cdot\pi^2\cdot hbar))}{} +$$

$$\frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c}}{210\cdot\pi^2\cdot\sqrt{Mu0}\cdot R\cdot r^2\cdot\sqrt{(-c)}} \sim$$

$$\left.\frac{\cdot q^2 - 1680\cdot\pi^2\cdot hbar)}{} - \frac{13\cdot\alpha\cdot q}{14\cdot\pi^2\cdot R\cdot r^2}\right)$$

Simplifying:

#158: $$\frac{6\cdot\alpha\cdot q}{\pi^2\cdot R\cdot r^2} -$$

$$\frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(r) - \sim 599\cdot Mu0\cdot\alpha\cdot c}}{15\cdot\pi^2\cdot\sqrt{Mu0}\cdot R\cdot r^2\cdot\sqrt{(-c)}} \sim$$

$$\frac{\cdot q^2 - 1680\cdot\pi^2\cdot hbar)}{} =$$

$$\frac{\sqrt{15}\cdot\sqrt{(\alpha\cdot(840\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(8\cdot R) - 840\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(r) + \sim 2\cdot\sqrt{30}\cdot\sqrt{Mu0}}}{} \sim$$

$$\frac{\sqrt{\alpha}\cdot q\cdot\sqrt{(-c)}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(r) \sim - 599\cdot Mu0}}{84\cdot\pi^2\cdot\sqrt{Mu0}\cdot R\cdot r^2\cdot\sqrt{(-c)}} \sim$$

$$\frac{\alpha \cdot c \cdot q^{2} - 1680 \cdot \pi^{2} \cdot hbar) - 1213 \cdot Mu0 \cdot \alpha \cdot c \cdot q^{2} - 3360 \cdot \pi^{2} \cdot hbar))}{} -$$

$$\frac{\sqrt{30} \cdot \sqrt{\alpha} \cdot \sqrt{(}420 \cdot Mu0 \cdot \alpha \cdot c \cdot q^{2} \cdot LN(8 \cdot R) - 420 \cdot Mu0 \cdot \alpha \cdot c \cdot q^{2} \cdot LN(r) - 599 \cdot Mu0 \cdot \alpha \cdot c}{210 \cdot \pi^{2} \cdot \sqrt{Mu0} \cdot R \cdot r^{2} \cdot \sqrt{(-c)}} \sim$$

$$\frac{\cdot q^{2} - 1680 \cdot \pi^{2} \cdot hbar)}{} + \frac{13 \cdot \alpha \cdot q}{14 \cdot \pi^{2} \cdot R \cdot r^{2}}$$

Multiplying the just above through by r^2 to simplify the algebra:

$$\#159: \left(\frac{6 \cdot \alpha \cdot q}{\pi^{2} \cdot R \cdot r^{2}} - \right.$$

$$\frac{\sqrt{30} \cdot \sqrt{\alpha} \cdot \sqrt{(}420 \cdot Mu0 \cdot \alpha \cdot c \cdot q^{2} \cdot LN(8 \cdot R) - 420 \cdot Mu0 \cdot \alpha \cdot c \cdot q^{2} \cdot LN(r) - \sim 599 \cdot Mu0 \cdot \alpha \cdot c}{15 \cdot \pi^{2} \cdot \sqrt{Mu0} \cdot R \cdot r^{2} \cdot \sqrt{(-c)}} \sim$$

$$\frac{\cdot q^{2} - 1680 \cdot \pi^{2} \cdot hbar)}{} =$$

$$\frac{\sqrt{15} \cdot \sqrt{(}\alpha \cdot (840 \cdot Mu0 \cdot \alpha \cdot c \cdot q^{2} \cdot LN(8 \cdot R) - 840 \cdot Mu0 \cdot \alpha \cdot c \cdot q^{2} \cdot LN(r) + \sim 2 \cdot \sqrt{30} \cdot \sqrt{Mu0}}{} \sim$$

$$\frac{\sqrt{\alpha} \cdot q \cdot \sqrt{(-c)} \cdot \sqrt{(}420 \cdot Mu0 \cdot \alpha \cdot c \cdot q^{2} \cdot LN(8 \cdot R) - 420 \cdot Mu0 \cdot \alpha \cdot c \cdot q^{2} \cdot LN(r) \sim - 599 \cdot Mu0}{84 \cdot \pi^{2} \cdot \sqrt{Mu0} \cdot R \cdot r^{2} \cdot \sqrt{(-c)}} \sim$$

$$\frac{\alpha \cdot c \cdot q^{2} - 1680 \cdot \pi^{2} \cdot hbar) - 1213 \cdot Mu0 \cdot \alpha \cdot c \cdot q^{2} - 3360 \cdot \pi^{2} \cdot hbar))}{} -$$

$$\frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{}(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c \sim}{210\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}}$$

$$\left.\frac{\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar)}{} + \frac{13\cdot\alpha\cdot q}{14\cdot\pi^{2}\cdot R\cdot r^{2}}\right)\cdot r^{2}$$

Simplifying:

$$\#160: \frac{6\cdot\alpha\cdot q}{\pi^{2}\cdot R} -$$

$$\frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{}(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - \sim 599\cdot Mu0\cdot\alpha\cdot c}{15\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot\sqrt{(-c)}}$$

$$\frac{\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar)}{} =$$

$$\frac{\sqrt{15}\cdot\sqrt{}(\alpha\cdot(840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) + \sim 2\cdot\sqrt{30}\cdot\sqrt{Mu0}}{}$$

$$\frac{\sqrt{\alpha}\cdot q\cdot\sqrt{(-c)}\cdot\sqrt{}(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) \sim - 599\cdot Mu0}{84\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot\sqrt{(-c)}}$$

$$\frac{\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar) - 1213\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} - 3360\cdot\pi^{2}\cdot hbar))}{} -$$

$$\frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{}(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - \sim 599\cdot Mu0\cdot\alpha\cdot c}{210\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot\sqrt{(-c)}}$$

$$\frac{\cdot q^2 - 1680\cdot\pi^2\cdot hbar)}{} + \frac{13\cdot\alpha\cdot q}{14\cdot\pi^2\cdot R}$$

Moving the left side of the just above equation to the right side with a minus sign (so that the expression set to zero gives us our required equation for "r" (after substituting for our knowns) when this is set equal to zero:

$$\#161{:}\ \frac{6\cdot\alpha\cdot q}{\pi^2\cdot R} -$$

$$\frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c}}{15\cdot\pi^2\cdot\sqrt{Mu0}\cdot R\cdot\sqrt{(-c)}}$$

$$\frac{\cdot q^2 - 1680\cdot\pi^2\cdot hbar)}{} -$$

$$\left(\frac{\sqrt{15}\cdot\sqrt{(\alpha\cdot(840\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(8\cdot R) - 840\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(r) + 2\cdot\sqrt{30}\cdot\sqrt{Mu0}}}{}\right.$$

$$\frac{\cdot\sqrt{\alpha}\cdot q\cdot\sqrt{(-c)}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(r) - 599\cdot Mu0}}{84\cdot\pi^2\cdot\sqrt{Mu0}\cdot R\cdot\sqrt{(-c)}}$$

$$\frac{\cdot\alpha\cdot c\cdot q^2 - 1680\cdot\pi^2\cdot hbar) - 1213\cdot Mu0\cdot\alpha\cdot c\cdot q^2 - 3360\cdot\pi^2\cdot hbar))}{} -$$

$$\frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c}}{210\cdot\pi^2\cdot\sqrt{Mu0}\cdot R\cdot\sqrt{(-c)}}$$

$$\frac{\cdot q^2 - 1680 \cdot \pi^2 \cdot hbar)}{} + \frac{13 \cdot \alpha \cdot q}{14 \cdot \pi^2 \cdot R}\Bigg)$$

Substituting for R in #142 from #80:

$$\#162: \frac{6 \cdot \alpha \cdot q}{\pi^2 \cdot \frac{Mu0 \cdot \alpha \cdot c \cdot q^2 + 4 \cdot \pi^2 \cdot hbar}{4 \cdot \pi^2 \cdot c \cdot me}} -$$

$$\frac{\sqrt{30} \cdot \sqrt{\alpha} \cdot \sqrt{\left(420 \cdot Mu0 \cdot \alpha \cdot c \cdot q^2 \cdot LN\left(8 \cdot \frac{Mu0 \cdot \alpha \cdot c \cdot q^2 + 4 \cdot \pi^2 \cdot hbar}{4 \cdot \pi^2 \cdot c \cdot me}\right) - 420 \cdot Mu0 \cdot \alpha \cdot c\right.}}{15 \cdot \pi^2 \cdot \sqrt{Mu0} \cdot \frac{Mu0 \cdot \alpha \cdot c \cdot q^2 + 4 \cdot \pi^2 \cdot hba}{4 \cdot \pi^2 \cdot c \cdot me}}$$

$$\frac{\left.\cdot q^2 \cdot LN(r) - 599 \cdot Mu0 \cdot \alpha \cdot c \cdot q^2 - 1680 \cdot \pi^2 \cdot hbar\right)}{} -$$

$$\frac{r}{} \cdot \sqrt{(-c)}$$

$$\left(\frac{\sqrt{15} \cdot \sqrt{\left(\alpha \cdot \left(840 \cdot Mu0 \cdot \alpha \cdot c \cdot q^2 \cdot LN\left(8 \cdot \frac{Mu0 \cdot \alpha \cdot c \cdot q^2 + 4 \cdot \pi^2 \cdot hbar}{4 \cdot \pi^2 \cdot c \cdot me}\right) - 840 \cdot Mu0 \cdot \alpha\right.\right.}}{}\right.$$

$$\frac{c \cdot q^{2} \cdot LN(r) + 2 \cdot \sqrt{30} \cdot \sqrt{Mu0} \cdot \sqrt{\alpha} \cdot q \cdot \sqrt{(-c)} \cdot \sqrt{} \Bigg(420 \cdot Mu0 \cdot \alpha \cdot c \cdot q^{2} \cdot LN \Bigg(8 \cdot \frac{Mu0 \cdot \alpha \cdot c \cdot q^{2}}{4 \cdot \pi^{2}}}{84 \cdot \pi^{2} \cdot \sqrt{Mu0} \cdot \frac{Mu0 \cdot \alpha \cdot c \cdot q^{2} + 4 \cdot \pi^{2} \cdot hbar}{4 \cdot \pi^{2} \cdot c \cdot me} \cdot}$$

$$\frac{\frac{+ 4 \cdot \pi^{2} \cdot hbar}{\cdot c \cdot me} \Bigg) - 420 \cdot Mu0 \cdot \alpha \cdot c \cdot q^{2} \cdot LN(r) - 599 \cdot Mu0 \cdot \alpha \cdot c \cdot q^{2} - 1680 \cdot \pi^{2} \cdot hbar \Bigg)}{\sqrt{(-c)}}$$

$$\frac{- 1213 \cdot Mu0 \cdot \alpha \cdot c \cdot q^{2} - 3360 \cdot \pi^{2} \cdot hbar \Bigg) \Bigg)}{} -$$

$$\frac{\sqrt{30} \cdot \sqrt{\alpha} \cdot \sqrt{} \Bigg(420 \cdot Mu0 \cdot \alpha \cdot c \cdot q^{2} \cdot LN \Bigg(8 \cdot \frac{Mu0 \cdot \alpha \cdot c \cdot q^{2} + 4 \cdot \pi^{2} \cdot hbar}{4 \cdot \pi^{2} \cdot c \cdot me} \Bigg) - 420 \cdot Mu0 \cdot \alpha \cdot c}{210 \cdot \pi^{2} \cdot \sqrt{Mu0} \cdot \frac{Mu0 \cdot \alpha \cdot c \cdot q^{2} + 4 \cdot \pi^{2} \cdot hba}{4 \cdot \pi^{2} \cdot c \cdot me}}$$

$$\frac{\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot \alpha\cdot c\cdot q^{2} - 1680\cdot \pi^{2}\cdot hbar\Big)}{\frac{r}{}\cdot \sqrt{(-c)}} +$$

$$\frac{13\cdot \alpha\cdot q}{14\cdot \pi^{2}\cdot \frac{Mu0\cdot \alpha\cdot c\cdot q^{2} + 4\cdot \pi^{2}\cdot hbar}{4\cdot \pi^{2}\cdot c\cdot me}}\Bigg)$$

Simplifying:

#163:

$$\frac{\sqrt{15}\cdot me\cdot \sqrt{\left(\alpha\cdot \left(840\cdot Mu0\cdot \alpha\cdot c\cdot q^{2}\cdot LN\left(\frac{2\cdot (Mu0\cdot \alpha\cdot c\cdot q^{2} + 4\cdot \pi^{2}\cdot hbar)}{\pi^{2}\cdot c\cdot me}\right) - 840\cdot Mu0\right.\right.}}{}$$

$$\frac{\alpha\cdot c\cdot q^{2}\cdot LN(r) + 2\cdot \sqrt{30}\cdot \sqrt{Mu0}\cdot \sqrt{\alpha}\cdot q\cdot \sqrt{(-c)}\cdot \sqrt{\left(420\cdot Mu0\cdot \alpha\cdot c\cdot q^{2}\cdot LN\left(\frac{2\cdot (Mu0\cdot \alpha\cdot c}{}\right.\right.}}{21\cdot \sqrt{Mu0}\cdot (Mu0\cdot \alpha\cdot c\cdot q^{2} + 4\cdot \pi^{2}\cdot h}$$

$$\frac{\left.\frac{q^{2} + 4\cdot \pi^{2}\cdot hbar)}{{}^{2}\cdot c\cdot me}\right) - 420\cdot Mu0\cdot \alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot \alpha\cdot c\cdot q^{2} - 1680\cdot \pi^{2}\cdot h}{bar)}$$

$$\frac{\text{bar}\Big) - 1213\cdot Mu0\cdot\alpha\cdot c\cdot q^2 - 3360\cdot\pi^2\cdot hbar\Big)\Big)\cdot\sqrt{(-c)}}{} +$$

$$\frac{26\cdot\sqrt{30}\cdot\sqrt{\alpha}\cdot me\cdot\sqrt{(-c)}\cdot\sqrt{\left(420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN\left(\frac{Mu0\cdot\alpha\cdot c\cdot q^2 + 4\cdot\pi^2\cdot hbar}{c\cdot me}\right) - 4\right.} \sim}{105\cdot\sqrt{Mu0}\cdot(Mu0\cdot\alpha\cdot c\cdot q^2 + \sim}$$

$$\frac{20\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN\left(\frac{\pi^2\cdot r}{2}\right) - 599\cdot Mu0\cdot\alpha\cdot c\cdot q^2 - 1680\cdot\pi^2\cdot hbar\Big)}{4\cdot\pi^2\cdot hbar)} +$$

$$\frac{142\cdot\alpha\cdot c\cdot me\cdot q}{7\cdot(Mu0\cdot\alpha\cdot c\cdot q^2 + 4\cdot\pi^2\cdot hbar)}$$

Setting precision:

#164:PrecisionDigits := 18

Substituting for our constants but not including α = 0.95.

$$\#165: \frac{\sqrt{15}\cdot(+\ 9.1093821545\cdot 10^{-31})\cdot\sqrt{\left(\alpha\cdot\left(840\cdot(4\cdot\pi\cdot 10^{-7})\cdot\alpha\cdot 299792458\cdot(+\ 1.60217\right.\right.} \sim}{\sim}$$

```
                  ⎛              -7                                        -19 2    ~
           -19 2  ⎜ 2·((4·π·10  )·α·299792458·(+ 1.6021764874·10    )  +  ~
4874·10     ) ·LN ⎜──────────────────────────────────────────────────────────────~
                  ⎜                         2                                     ~
                  ⎝                         π ·299792458·(+ 9.1093821545·1~
──────────────────────────────────────────────────────────────────────────~
                                                                          ~
                                                                          ~

  2                    -34      ⎞                                         ~
4·π ·(1.05457162853·10     ))   ⎟                  -7                     ~
────────────────────────────────⎟ - 840·(4·π·10  )·α·299792458·(+ 1.60217~
 -31                            ⎟                                         ~
0   )                           ⎠                                         ~
──────────────────────────────────────────────────────────────────────────~
                                                                          ~
                                                                          ~

                                                                          ~
       -19 2                              -7                      -19     ~
64874·10     ) ·LN(r) + 2·√30·√(4·π·10  )·√α·(+ 1.6021764874·10    )·√(-~
                                                                          ~
                                                                          ~
──────────────────────────────────────────────────────────────────────────~
                                                                          ~
                                                                          ~

                  ⎛                                                    ⎛  ~
                  ⎜           -7                             -19 2     ⎜ 2~
299792458)·√      ⎜420·(4·π·10  )·α·299792458·(+ 1.6021764874·10    ) ·LN⎜──~
                  ⎜                                                    ⎜  ~
                  ⎝                                                    ⎝  ~
──────────────────────────────────────────────────────────────────────────~
                        -7          -7                                    ~
          21·√(4·π·10  )·((4·π·10  )·α·299792458·(+ 1.6021764874·~

          -7                              -19 2        2                  ~
·((4·π·10  )·α·299792458·(+ 1.6021764874·10    )  + 4·π ·(1.0545716285~
──────────────────────────────────────────────────────────────────────────~
                        2                           -31                   ~
                        π ·299792458·(+ 9.1093821545·10    )              ~
──────────────────────────────────────────────────────────────────────────~
  -19 2        2                      -34                                 ~
10     )  + 4·π ·(1.05457162853·10     ))                                 ~

     -34   ⎞                                                              ~
3·10    )) ⎟              -7                                -19 2         ~
───────────⎟ - 420·(4·π·10  )·α·299792458·(+ 1.6021764874·10    ) ·LN(r~
           ⎟                                                              ~
           ⎠                                                              ~
──────────────────────────────────────────────────────────────────────────~
                                                                          ~
                                                                          ~
```

```
                                                                                              ~
               -7                                           -19 2          2                  ~
) - 599·(4·π·10   )·α·299792458·(+ 1.6021764874·10     )  - 1680·π ·(1.0~
                                                                                              ~
                                                                                              ~
──────────────────────────────────────────────────────────────────────────────~
                                                                                              ~
                                                                                              ~

                                                                                              ~
                 -34   ⎞                  -7                                          -1~
5457162853·10      )  ⎟ - 1213·(4·π·10   )·α·299792458·(+ 1.6021764874·10    ~
                       ⎟                                                                      ~
                       ⎠                                                                      ~
──────────────────────────────────────────────────────────────────────────────~
                                                                                              ~
                                                                                              ~

9 2           2                            -34  ⎞⎞
 )  - 3360·π  ·(1.05457162853·10     )⎟⎟·√(-299792458)
                                                ⎠⎠
──────────────────────────────────────────────────────── +

                                                                   ⎛                          ~
                                           -31                     ⎜             -7           ~
 26·√30·√α·(+ 9.1093821545·10    )·√(-299792458)·√⎜420·(4·π·10   )·α·29~
                                                                   ⎝                          ~
──────────────────────────────────────────────────────────────────────────────~
                                                                                              ~
                                                                                              ~

                                                   ⎛                  -7                       ~
                                    -19 2          ⎜  (4·π·10   )·α·299792458·(+ 1.60217~
9792458·(+ 1.6021764874·10     ) ·LN⎜──────────────────────────────────────~
                                                   ⎜                                           ~
                                                   ⎝                          299792458·(~
──────────────────────────────────────────────────────────────────────────────~
                                                                              -7               ~
                                                            105·√(4·π·10   )·((~
         -19 2          2                       -34   ⎞                                       ~
64874·10     )  + 4·π  ·(1.05457162853·10     )  ⎟                  -7                    ~
──────────────────────────────────────────────── ⎟ - 420·(4·π·10   )·α·29979~
                           -31                    ⎟                                          ~
+ 9.1093821545·10    )                            ⎠                                          ~
──────────────────────────────────────────────────────────────────────────────~
       -7                                          -19 2       2                              ~
4·π·10   )·α·299792458·(+ 1.6021764874·10     )  + 4·π  ·(1.05457162853·1~
```

$$\frac{2458\cdot(+\ 1.6021764874\cdot10^{-19})^2\cdot LN\left(\frac{\pi^2\cdot r}{2}\right) - 599\cdot(4\cdot\pi\cdot10^{-7})\cdot\alpha\cdot299792458\cdot \sim}{0^{-34}))} \sim$$

$$\frac{(+\ 1.6021764874\cdot10^{-19})^2 - 1680\cdot\pi^2\cdot(1.05457162853\cdot10^{-34})\bigg)}{} +$$

$$\frac{142\cdot\alpha\cdot299792458\cdot(+\ 9.1093821545\cdot10^{-31})\cdot(+\ 1.6021764874\cdot10^{-1} \sim}{7\cdot((4\cdot\pi\cdot10^{-7})\cdot\alpha\cdot299792458\cdot(+\ 1.6021764874\cdot10^{-19})^2 + 4\cdot\pi^2\cdot(1.05457162 \sim}$$

$$\frac{^9)}{853\cdot10^{-34}))}$$

Setting $\alpha = 0.95$:

#166:
$$\frac{\sqrt{15}\cdot(+\ 9.1093821545\cdot10^{-31})\cdot\sqrt{\left(0.95\cdot\left(840\cdot(4\cdot\pi\cdot10^{-7})\cdot0.95\cdot299792458\cdot(+\ 1 \sim\right.\right.}}{6021764874\cdot10^{-19})^2\cdot LN\left(\frac{2\cdot((4\cdot\pi\cdot10^{-7})\cdot0.95\cdot299792458\cdot(+\ 1.6021764874\cdot1}{\pi^2\cdot299792458\cdot(+\ 9.109}\right. \sim}$$

```
 -19 2       2                          -34 ⎞                                   ~
0    )  + 4•π •(1.05457162853•10    ))⎟                   -7                ~
─────────────────────────────────────────⎟ - 840•(4•π•10   )•0.95•29979245~
         -31                            ⎟                                   ~
821545•10   )                           ⎠                                   ~
──────────────────────────────────────────────────────────────────────────────~
                                                                              ~
                                                                              ~

                                                                              ~
                           -19 2                      -7                      ~
8•(+ 1.6021764874•10    ) •LN(r) + 2•√30•√(4•π•10   )•√0.95•(+ 1.602176~
                                                                              ~
                                                                              ~
──────────────────────────────────────────────────────────────────────────────~
                                                                              ~
                                                                              ~

                                  ⎛                                           ~
     -19                          ⎜            -7                             ~
4874•10    )•√(-299792458)•√⎜420•(4•π•10   )•0.95•299792458•(+ 1.602176~
                                  ⎜                                           ~
                                  ⎝                                           ~
──────────────────────────────────────────────────────────────────────────────~
                                           -7            -7                   ~
                          21•√(4•π•10   )•((4•π•10   )•0.95•299792458•~
                                                                              
                        ⎛              -7                              -19 2~
     -19 2              ⎜ 2•((4•π•10   )•0.95•299792458•(+ 1.6021764874•10    ) ~
4874•10    ) •LN⎜────────────────────────────────────────────────────────────~
                        ⎜                              2                      ~
                        ⎝                             π •299792458•(+ 9.1093821545~
──────────────────────────────────────────────────────────────────────────────~
                        -19 2       2                       -34               ~
(+ 1.6021764874•10    )  + 4•π •(1.05457162853•10    ))                     ~

       2                       -34 ⎞                                          ~
 + 4•π •(1.05457162853•10    ))⎟                  -7                       ~
───────────────────────────────────⎟ - 420•(4•π•10   )•0.95•299792458•(+ 1~
   -31                             ⎟                                          ~
•10   )                            ⎠                                          ~
──────────────────────────────────────────────────────────────────────────────~
                                                                              ~
                                                                              ~

                                                                              ~
                   -19 2                          -7                          ~
.6021764874•10    ) •LN(r) - 599•(4•π•10   )•0.95•299792458•(+ 1.602176~
                                                                              ~
                                                                              ~
──────────────────────────────────────────────────────────────────────────────~
                                                                              ~
                                                                              ~
```

$$4874\cdot10^{-19})^2 - 1680\cdot\pi^2\cdot(1.05457162853\cdot10^{-34})\Big) - 1213\cdot(4\cdot\pi\cdot10^{-7})\cdot0.95\cdot \sim$$

$$299792458\cdot(+\ 1.6021764874\cdot10^{-19})^2 - 3360\cdot\pi^2\cdot(1.05457162853\cdot10^{-34})\Big)\Big)\cdot\sqrt{\ } \sim$$

$$\frac{(-299792458)}{} +$$

$$26\cdot\sqrt{30}\cdot\sqrt{0.95}\cdot(+\ 9.1093821545\cdot10^{-31})\cdot\sqrt{(-299792458)}\cdot\sqrt{\Big(420\cdot(4\cdot\pi\cdot10^{-7})\cdot0} \sim$$

$$.95\cdot299792458\cdot(+\ 1.6021764874\cdot10^{-19})^2\cdot LN\left(\frac{(4\cdot\pi\cdot10^{-7})\cdot0.95\cdot299792458\cdot(}{2997}\right. \sim$$

$$105\cdot\sqrt{(4\cdot\pi\cdot10} \sim$$

$$\left.\frac{+\ 1.6021764874\cdot10^{-19})^2 + 4\cdot\pi^2\cdot(1.05457162853\cdot10^{-34})}{92458\cdot(+\ 9.1093821545\cdot10^{-31})}\right) - 420\cdot(4\cdot\pi\cdot10^{-7} \sim$$

$$^{-7})\cdot((4\cdot\pi\cdot10^{-7})\cdot0.95\cdot299792458\cdot(+\ 1.6021764874\cdot10^{-19})^2 + 4\cdot\pi^2\cdot(1.0545 \sim$$

```
                                            -19 2  ⎛  2   ⎞                  -7    ~
)·0.95·299792458·(+ 1.6021764874·10     ) ·LN⎜π ·r ⎟ - 599·(4·π·10  )·  ~
                                               ⎜──────⎟                        ~
                                               ⎝  2   ⎠                        ~
─────────────────────────────────────────────────────────────────────────────── ~
          -34                                                                  ~
7162853·10    ))                                                               ~

                                          -19 2          2                -34  ~
0.95·299792458·(+ 1.6021764874·10     )  - 1680·π  ·(1.05457162853·10      ~
─────────────────────────────────────────────────────────────────────────────── ~

⎞
)⎟
⎠
─── +

                                                          -31                  ~
         142·0.95·299792458·(+ 9.1093821545·10    )·(+ 1.6021764874·1 ~
─────────────────────────────────────────────────────────────────────────────── ~
          -7                                      -19 2       2                ~
 7·((4·π·10   )·0.95·299792458·(+ 1.6021764874·10     )  + 4·π  ·(1.05457 ~

 -19
0   )
─────────────
         -34
162853·10    ))
```

Simplifying:

$$\#167:5.69922927376079186\cdot10^{-46}\cdot\hat{\imath}\cdot\sqrt{(-\ 8.72972658963434942\cdot10^{75}\cdot LN(r) - 4.19999985115872094\cdot10^{78} + 1.93359639726655723\cdot10^{61}\cdot\hat{\imath}\cdot\sqrt{(-\ 1.45593367780608073\cdot10^{28}\cdot LN(r) - 7.00445106126299473\cdot10^{30}}})) +$$

$2.02088116443766213\cdot10^{-7} + 3.77266406289807648\cdot10^{-22}\cdot\hat{\imath}\cdot\sqrt{(-5.3869546078824987\cdot10^{29}\cdot LN(r) - 2.59164689266730805\cdot10^{32})}$

Setting r = 10^-n

#168: $5.69922927376079186\cdot10^{-46}\cdot\hat{\imath}\cdot\sqrt{(-8.72972658963434942\cdot10^{75}\cdot LN(10^{-n}) - 4.19999985115872094\cdot10^{78} + 1.93359639726655723\cdot10^{61}\cdot\hat{\imath}\cdot\sqrt{(-1.45593367780608073\cdot10^{28}\cdot LN(10^{-n}) - 7.00445106126299473\cdot10^{30})})} + 2.02088116443766213\cdot10^{-7} + 3.77266406289807648\cdot10^{-22}\cdot\hat{\imath}\cdot\sqrt{(-5.3869546078824987\cdot10^{29}\cdot LN(10^{-n}) - 2.59164689266730805\cdot10^{32})}$

Defining the function "FUNN":

#169: $FUUNN(n) := 5.69922927376079186\cdot10^{-46}\cdot\hat{\imath}\cdot\sqrt{(-8.72972658963434942\cdot10^{75}\cdot LN(10^{-n}) - 4.19999985115872094\cdot10^{78} + 1.93359639726655723\cdot10^{61}\cdot\hat{\imath}\cdot\sqrt{(-1.45593367780608073\cdot10^{28}\cdot LN(10^{-n}) - 7.00445106126299473\cdot10^{30})})} + 2.02088116443766213\cdot10^{-7} + 3.77266406289807648\cdot10^{-22}\cdot\hat{\imath}\cdot\sqrt{(-5.3869546078824987\cdot10^{29}\cdot LN(10^{-n}) - 2.59164689266730805\cdot10^{32})}$

Generating a vector of values for n = 50 to n = 225:

#170:VECTOR([FUUNN(n), n], n, 50, 225)

#171:

$$
\left[\begin{array}{cc}
-6.12084346013070238\cdot 10^{-6} & 50 \\
-6.10094326871106462\cdot 10^{-6} & 51 \\
-6.08097997680757081\cdot 10^{-6} & 52 \\
-6.06095298034012713\cdot 10^{-6} & 53 \\
-6.04086166552827677\cdot 10^{-6} & 54 \\
-6.02070540867171211\cdot 10^{-6} & 55 \\
-6.00048357592436014\cdot 10^{-6} & 56 \\
-5.98019552306180958\cdot 10^{-6} & 57 \\
-5.95984059524183814\cdot 10^{-6} & 58 \\
-5.93941812675778826\cdot 10^{-6} & 59 \\
-5.91892744078452846\cdot 10^{-6} & 60 \\
-5.89836784911672593\cdot 10^{-6} & 61 \\
-5.87773865189914427\cdot 10^{-6} & 62 \\
-5.8570391373486671\cdot 10^{-6} & 63 \\
-5.83626858146773524\cdot 10^{-6} & 64 \\
-5.81542624774887119\cdot 10^{-6} & 65 \\
-5.79451138686994953\cdot 10^{-6} & 66 \\
-5.77352323637985666\cdot 10^{-6} & 67 \\
-5.75246102037416675\cdot 10^{-6} & 68 \\
{}^{-6} &
\end{array}\right.
$$

$-5.73132394916044359\cdot 10$	69
$-5.7101112189127599\cdot 10^{-6}$	70
$-5.68882201131500632\cdot 10^{-6}$	71
$-5.66745549319254255\cdot 10^{-6}$	72
$-5.64601081613172118\cdot 10^{-6}$	73
$-5.62448711608679293\cdot 10^{-6}$	74
$-5.60288351297367778\cdot 10^{-6}$	75
$-5.58119911025006172\cdot 10^{-6}$	76
$-5.5594329944812523\cdot 10^{-6}$	77
$-5.53758423489119807\cdot 10^{-6}$	78
$-5.5156518828980476\cdot 10^{-6}$	79
$-5.49363497163359228\cdot 10^{-6}$	80
$-5.47153251544590423\cdot 10^{-6}$	81
$-5.4493435093844452\cdot 10^{-6}$	82
$-5.42706692866688565\cdot 10^{-6}$	83
$-5.40470172812683353\cdot 10^{-6}$	84
$-5.38224684164163055\cdot 10^{-6}$	85
$-5.35970118153932973\cdot 10^{-6}$	86
$-5.33706363798392075\cdot 10^{-6}$	87
$-5.31433307833782\cdot 10^{-6}$	88

$-5.29150834650058907 \cdot 10^{-6}$	89
$-5.26858826222278938 \cdot 10^{-6}$	90
$-5.24557162039382057 \cdot 10^{-6}$	91
$-5.22245719030252679 \cdot 10^{-6}$	92
$-5.19924371486928728 \cdot 10^{-6}$	93
$-5.17592990984823543 \cdot 10^{-6}$	94
$-5.15251446299817366 \cdot 10^{-6}$	95
$-5.12899603322066973 \cdot 10^{-6}$	96
$-5.10537324966373247 \cdot 10^{-6}$	97
$-5.08164471078937181 \cdot 10^{-6}$	98
$-5.05780898340324844 \cdot 10^{-6}$	99
$-5.03386460164451216 \cdot 10^{-6}$	100
$-5.00981006593381398 \cdot 10^{-6}$	101
$-4.98564384187735581 \cdot 10^{-6}$	102
$-4.96136435912471108 \cdot 10^{-6}$	103
$-4.93697001017801042 \cdot 10^{-6}$	104
$-4.91245914914993706 \cdot 10^{-6}$	105
$-4.88783009046781641 \cdot 10^{-6}$	106
$-4.86308110752091237 \cdot 10^{-6}$	107

$-4.83821043124785839\cdot10^{-6}$	108
$-4.81321624866095286\cdot10^{-6}$	109
$-4.78809670130383533\cdot10^{-6}$	110
$-4.76284988363883027\cdot10^{-6}$	111
$-4.73747384135999849\cdot10^{-6}$	112
$-4.71196656962766948\cdot10^{-6}$	113
$-4.6863260112199414\cdot10^{-6}$	114
$-4.6605500545963251\cdot10^{-6}$	115
$-4.63463653186837414\cdot10^{-6}$	116
$-4.608583216671781\cdot10^{-6}$	117
$-4.58238782193402812\cdot10^{-6}$	118
$-4.55604799753125891\cdot10^{-6}$	119
$-4.52956132782757455\cdot10^{-6}$	120
$-4.50292532908946449\cdot10^{-6}$	121
$-4.47613744676753782\cdot10^{-6}$	122
$-4.44919505263713552\cdot10^{-6}$	123
$-4.42209544178876448\cdot10^{-6}$	124
$-4.3948358294585992\cdot10^{-6}$	125
$-4.36741334768853887\cdot10^{-6}$	126

-6

$-4.33982504180448169\cdot10$	127
$-4.31206786670057526\cdot10^{-6}$	128
$-4.2841386829162163\cdot10^{-6}$	129
$-4.25603425249149341\cdot10^{-6}$	130
$-4.22775123458558493\cdot10^{-6}$	131
$-4.19928618084132777\cdot10^{-6}$	132
$-4.17063553047775035\cdot10^{-6}$	133
$-4.1417956050907989\cdot10^{-6}$	134
$-4.11276260314076536\cdot10^{-6}$	135
$-4.08353259410302934\cdot10^{-6}$	136
$-4.05410151225663444\cdot10^{-6}$	137
$-4.0244651500829088\cdot10^{-6}$	138
$-3.99461915124378388\cdot10^{-6}$	139
$-3.96455900310663437\cdot10^{-6}$	140
$-3.93428002877932202\cdot10^{-6}$	141
$-3.90377737861563798\cdot10^{-6}$	142
$-3.87304602114745764\cdot10^{-6}$	143
$-3.84208073339559812\cdot10^{-6}$	144
$-3.81087609050654363\cdot10^{-6}$	145
$-3.77942645465681001\cdot10^{-6}$	146

$-3.7477259631606810 4\cdot 10^{-6}$	147
$-3.715768515710275 6\cdot 10^{-6}$	148
$-3.6835477606692939 8\cdot 10^{-6}$	149
$-3.6510570803332243 9\cdot 10^{-6}$	150
$-3.6182895750591282 1\cdot 10^{-6}$	151
$-3.5852380461572034 1\cdot 10^{-6}$	152
$-3.5518949774239613 5\cdot 10^{-6}$	153
$-3.5182525151828223 5\cdot 10^{-6}$	154
$-3.4843024466819806 4\cdot 10^{-6}$	155
$-3.4500361766812050 9\cdot 10^{-6}$	156
$-3.415444702038468 6\cdot 10^{-6}$	157
$-3.3805185840835095 6\cdot 10^{-6}$	158
$-3.3452479185381188 7\cdot 10^{-6}$	159
$-3.309622302711511 3\cdot 10^{-6}$	160
$-3.2736307996628614 1\cdot 10^{-6}$	161
$-3.2372618989810976 5\cdot 10^{-6}$	162
$-3.2005034737833133 8\cdot 10^{-6}$	163
$-3.1633427334764151 9\cdot 10^{-6}$	164
$-3.1257661717603628 2\cdot 10^{-6}$	165

$-3.08775950927370767 \cdot 10^{-6}$	166
$-3.04930763019083912 \cdot 10^{-6}$	167
$-3.01039451197261654 \cdot 10^{-6}$	168
$-2.97100314734446263 \cdot 10^{-6}$	169
$-2.93111545742426399 \cdot 10^{-6}$	170
$-2.8907121947412604 \cdot 10^{-6}$	171
$-2.84977283466986398 \cdot 10^{-6}$	172
$-2.80827545354066633 \cdot 10^{-6}$	173
$-2.76619659137417292 \cdot 10^{-6}$	174
$-2.7235110967975512 \cdot 10^{-6}$	175
$-2.68019195123358282 \cdot 10^{-6}$	176
$-2.63621006887172811 \cdot 10^{-6}$	177
$-2.59153406821469 \cdot 10^{-6}$	178
$-2.54613001010205135 \cdot 10^{-6}$	179
$-2.49996109599520475 \cdot 10^{-6}$	180
$-2.45298731889798679 \cdot 10^{-6}$	181
$-2.40516505749526593 \cdot 10^{-6}$	182
$-2.35644660179525844 \cdot 10^{-6}$	183
$-2.30677959559342467 \cdot 10^{-6}$	184

-6

$- 2.25610637720485962\cdot 10$	185
$- 2.20436319481351635\cdot 10^{-6}$	186
$- 2.15147926599954582\cdot 10^{-6}$	187
$- 2.09737564186732812\cdot 10^{-6}$	188
$- 2.04196382373792561\cdot 10^{-6}$	189
$- 1.98514406315360098\cdot 10^{-6}$	190
$- 1.92680325179881971\cdot 10^{-6}$	191
$- 1.86681227353252512\cdot 10^{-6}$	192
$- 1.80502264080305372\cdot 10^{-6}$	193
$- 1.74126216384148144\cdot 10^{-6}$	194
$- 1.67532928927938361\cdot 10^{-6}$	195
$- 1.60698557157642069\cdot 10^{-6}$	196
$- 1.53594546442867014\cdot 10^{-6}$	197
$- 1.46186216479203134\cdot 10^{-6}$	198
$- 1.38430746637844716\cdot 10^{-6}$	199
$- 1.30274219801502262\cdot 10^{-6}$	200
$- 1.21647123588487167\cdot 10^{-6}$	201
$- 1.12457193678871621\cdot 10^{-6}$	202
$- 1.02577383708729507\cdot 10^{-6}$	203
$- 9.18241637319896859\cdot 10^{-7}$	204

$- 7.99145102596310052 \cdot 10^{-7}$ 205

$- 6.63685694360980839 \cdot 10^{-7}$ 206

$- 5.0239252156964044 \cdot 10^{-7}$ 207

$- 2.90148139980607695 \cdot 10^{-7}$ 208

$1.94972337695746296 \cdot 10^{-7} + 1.25035959693061562 \cdot 10^{-7} \cdot \hat{\imath}$ 209

$1.94972337695746277 \cdot 10^{-7} + 5.16342774030646923 \cdot 10^{-7} \cdot \hat{\imath}$ 210

$1.94972337695746276 \cdot 10^{-7} + 7.19434312061193306 \cdot 10^{-7} \cdot \hat{\imath}$ 211

$1.94972337695746276 \cdot 10^{-7} + 8.76676450264441195 \cdot 10^{-7} \cdot \hat{\imath}$ 212

$1.94972337695746276 \cdot 10^{-7} + 1.00972148017438948 \cdot 10^{-6} \cdot \hat{\imath}$ 213

$1.94972337695746276 \cdot 10^{-7} + 1.12717050023625919 \cdot 10^{-6} \cdot \hat{\imath}$ 214

$1.94972337695746276 \cdot 10^{-7} + 1.23348660539146413 \cdot 10^{-6} \cdot \hat{\imath}$ 215

$1.94972337695746276 \cdot 10^{-7} + 1.3313395790546664 \cdot 10^{-6} \cdot \hat{\imath}$ 216

$1.94972337695746276 \cdot 10^{-7} + 1.42247704509941218 \cdot 10^{-6} \cdot \hat{\imath}$ 217

$1.94972337695746276 \cdot 10^{-7} + 1.50811697587158466 \cdot 10^{-6} \cdot \hat{\imath}$ 218

$1.94972337695746276 \cdot 10^{-7} + 1.58914841408515166 \cdot 10^{-6} \cdot \hat{\imath}$ 219

$1.94972337695746276 \cdot 10^{-7} + 1.66624384501988527 \cdot 10^{-6} \cdot \hat{\imath}$ 220

$1.94972337695746276 \cdot 10^{-7} + 1.73992655596262172 \cdot 10^{-6} \cdot \hat{\imath}$ 221

$1.94972337695746275 \cdot 10^{-7} + 1.81061323568045558 \cdot 10^{-6} \cdot \hat{\imath}$ 222

$1.94972337695746275 \cdot 10^{-7} + 1.87864210489878773 \cdot 10^{-6} \cdot \hat{\imath}$ 223

$$\left|\begin{array}{ll} 1.94972337695746275\cdot 10^{-7} + 1.94429216615606578\cdot 10^{-6}\cdot \hat{\imath} & 224 \\ 1.94972337695746275\cdot 10^{-7} + 2.00779677668163052\cdot 10^{-6}\cdot \hat{\imath} & 225 \end{array}\right]$$

This may indicate a zero for #120 in this range of values between n = 208 & 209 by the intermediate value theorem, with res11, b011, b111, and b211 because although the real part of the nth value does change sign between n = 208 & 209, there is a complex part appearing here of non-neglable size. And further calculation shows apparently a zero:

Set r = 10^-(209 - n/1000) in #167 so we can investigate the region betewwn 10^-208 and 10^-209 for zeros of r:

$$\#172{:}\ 5.69922927376079186\cdot 10^{-46}\cdot \hat{\imath}\cdot\sqrt{(- 8.72972658963434942\cdot 10^{75}\cdot \mathrm{LN}(10^{-(209 - n/1000)}) - 4.19999985115872094\cdot 10^{78} + 1.93359639726655723\cdot 10^{61}\cdot \hat{\imath}\cdot\sqrt{(- 1.45593367780608073\cdot 10^{28}\cdot \mathrm{LN}(10^{-(209 - n/1000)}) - 7.00445106126299473\cdot 10^{30}})}) + 2.02088116443766213\cdot 10^{-7} + 3.77266406289807648\cdot 10^{-22}\cdot \hat{\imath}\cdot\sqrt{(- 5.38695460788249 87\cdot 10^{29}\cdot \mathrm{LN}(10^{-(209 - n/1000)}) - 2.59164689266730805\cdot 10^{32}})$$

$$\#173{:}\ \mathrm{VECTOR}\left(\left[5.69922927376079186\cdot 10^{-46}\cdot \hat{\imath}\cdot\sqrt{(- 8.72972658963434942\cdot 10^{75}\cdot \mathrm{LN}(10^{-(209 - n/1000)}) - 4.19999985115872094\cdot 10^{78} + 1.93359639726655723\cdot 10^{61}\cdot \hat{\imath}\cdot\sqrt{(- 1.45593367780608073\cdot 10^{28}\cdot \mathrm{LN}(10^{-(209 - n/1000)}) - 7.00445106126299473\cdot 10^{30}})}) + 2.02088116443766213\cdot 10^{-7} + 3.77266406289807648\cdot 10^{-22}\cdot \hat{\imath}\cdot\sqrt{(- 5.38695460788249 87\cdot 10^{29}\cdot \mathrm{LN}(10^{-(209 - n/1000)}) - 2.59164689266730805\cdot 10^{32}}),\ n\right],\ n,\ 0,\ 1000,\ 10\right)$$

#174:

$$
\left[\begin{array}{ll}
1.94972337695746296\cdot10^{-7} + 1.25035959693061562\cdot10^{-7}\cdot\hat{\imath} & 0 \\
1.94972337695746299\cdot10^{-7} + 1.14561042792006429\cdot10^{-7}\cdot\hat{\imath} & 10 \\
1.94972337695746304\cdot10^{-7} + 1.03026568587034583\cdot10^{-7}\cdot\hat{\imath} & 20 \\
1.94972337695746311\cdot10^{-7} + 9.00261914336375297\cdot10^{-8}\cdot\hat{\imath} & 30 \\
1.94972337695746323\cdot10^{-7} + 7.47994415304884783\cdot10^{-8}\cdot\hat{\imath} & 40 \\
1.94972337695746347\cdot10^{-7} + 5.55445565514747407\cdot10^{-8}\cdot\hat{\imath} & 50 \\
1.94972337695746419\cdot10^{-7} + 2.39883111478691095\cdot10^{-8}\cdot\hat{\imath} & 60 \\
1.50991437079160424\cdot10^{-7} & 70 \\
1.28308417095327144\cdot10^{-7} & 80 \\
1.11582668068196039\cdot10^{-7} & 90 \\
9.76913236623545327\cdot10^{-8} & 100 \\
8.55495138328156193\cdot10^{-8} & 110 \\
7.46265314833529332\cdot10^{-8} & 120 \\
6.46156279962301483\cdot10^{-8} & 130 \\
5.53205190378537221\cdot10^{-8} & 140 \\
4.66066100318754203\cdot10^{-8} & 150 \\
3.83768465856798845\cdot10^{-8} & 160 \\
3.05585106410369547\cdot10^{-8} & 170 \\
2.30954479823561887\cdot10^{-8} & 180 \\
{}^{-8} &
\end{array}\right.
$$

$1.59432230011753347\cdot 10$	190
$9.06595641986100226\cdot 10^{-9}$	200
$2.43418228267545324\cdot 10^{-9}$	210
$-3.97665069233480248\cdot 10^{-9}$	220
$-1.01872554784794473\cdot 10^{-8}$	230
$-1.62152977429478982\cdot 10^{-8}$	240
$-2.20759888422848429\cdot 10^{-8}$	250
$-2.77825382188625453\cdot 10^{-8}$	260
$-3.3346503915071637\cdot 10^{-8}$	270
$-3.87780679194713049\cdot 10^{-8}$	280
$-4.40862551555706834\cdot 10^{-8}$	290
$-4.9279109601551679\cdot 10^{-8}$	300
$-5.43638373723687465\cdot 10^{-8}$	310
$-5.93469240371604048\cdot 10^{-8}$	320
$-6.42342316252176534\cdot 10^{-8}$	330
$-6.9031079460010754\cdot 10^{-8}$	340
$-7.37423119992222595\cdot 10^{-8}$	350
$-7.83723561460450634\cdot 10^{-8}$	360
$-8.29252699626062429\cdot 10^{-8}$	370
$-8.74047843113466\cdot 10^{-8}$	380

$-9.18143386401351316\cdot10^{-8}$	390
$-9.61571118873465554\cdot10^{-8}$	400
$-1.00436049296443874\cdot10^{-7}$	410
$-1.04653885782941525\cdot10^{-7}$	420
$-1.08813166380523883\cdot10^{-7}$	430
$-1.12916264200534607\cdot10^{-7}$	440
$-1.16965396264766308\cdot10^{-7}$	450
$-1.20962637511482896\cdot10^{-7}$	460
$-1.24909933225862472\cdot10^{-7}$	470
$-1.28809110106221655\cdot10^{-7}$	480
$-1.32661886144669202\cdot10^{-7}$	490
$-1.3646987947382984\cdot10^{-7}$	500
$-1.40234616308876737\cdot10^{-7}$	510
$-1.43957538095442203\cdot10^{-7}$	520
$-1.47640007958352195\cdot10^{-7}$	530
$-1.51283316532999039\cdot10^{-7}$	540
$-1.54888687250087634\cdot10^{-7}$	550
$-1.58457281135107229\cdot10^{-7}$	560
$-1.61990201175905337\cdot10^{-7}$	570

$-1.65488496304937325\cdot10^{-7}$	580
$-1.68953165036944007\cdot10^{-7}$	590
$-1.7238515879781155\cdot10^{-7}$	600
$-1.75785384976064482\cdot10^{-7}$	610
$-1.79154709724726017\cdot10^{-7}$	620
$-1.82493960538060699\cdot10^{-7}$	630
$-1.85803928624919116\cdot10^{-7}$	640
$-1.89085371097970409\cdot10^{-7}$	650
$-1.9233901299598374\cdot10^{-7}$	660
$-1.95565549154460947\cdot10^{-7}$	670
$-1.9876564593829207\cdot10^{-7}$	680
$-2.01939942848672296\cdot10^{-7}$	690
$-2.05089054015256275\cdot10^{-7}$	700
$-2.08213569583411003\cdot10^{-7}$	710
$-2.1131405700544255\cdot10^{-7}$	720
$-2.14391062243797882\cdot10^{-7}$	730
$-2.17445110893466746\cdot10^{-7}$	740
$-2.20476709230118215\cdot10^{-7}$	750
$-2.23486345189890766\cdot10^{-7}$	760

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$-2.26474489286205427\cdot 10$	770
$-2.29441595468479751\cdot 10^{-7}$	780
$-2.32388101927180338\cdot 10^{-7}$	790
$-2.35314431849256219\cdot 10^{-7}$	800
$-2.38220994127640726\cdot 10^{-7}$	810
$-2.41108184028189567\cdot 10^{-7}$	820
$-2.43976383817135084\cdot 10^{-7}$	830
$-2.4682596335187665\cdot 10^{-7}$	840
$-2.4965728063769206\cdot 10^{-7}$	850
$-2.52470682352742168\cdot 10^{-7}$	860
$-2.5526650434354849\cdot 10^{-7}$	870
$-2.58045072092948277\cdot 10^{-7}$	880
$-2.60806701162372992\cdot 10^{-7}$	890
$-2.63551697610151271\cdot 10^{-7}$	900
$-2.66280358387406137\cdot 10^{-7}$	910
$-2.68992971712996\cdot 10^{-7}$	920
$-2.71689817428839481\cdot 10^{-7}$	930
$-2.74371167336864066\cdot 10^{-7}$	940
$-2.77037285518726881\cdot 10^{-7}$	950
$-2.7968842863937216\cdot 10^{-7}$	960

$$\begin{bmatrix} \vdots & \vdots \\ -2.82324846235413001\cdot10^{-7} & 970 \\ -2.84946780989254516\cdot10^{-7} & 980 \\ -2.87554468989810691\cdot10^{-7} & 990 \\ -2.90148139980607695\cdot10^{-7} & 1000 \end{bmatrix}$$

#175: PrecisionDigits := 18

There is a zero between 210 & 220.

Using Newtons method starting at: 10^-(209 - 215/100):

#176: $\mathrm{NEWTON}(5.69922927376079186\cdot10^{-46}\cdot\hat{\imath}\cdot\sqrt{(-8.72972658963434942\cdot10^{75}\cdot\mathrm{LN}(r)}$
$4.19999985115872094\cdot10^{78} + 1.93359639726655723\cdot10^{61}\cdot\hat{\imath}\cdot\sqrt{(-}$
$1.45593367780608073\cdot10^{28}\cdot\mathrm{LN}(r) - 7.00445106126299473\cdot10^{30})) +$
$2.02088116443766213\cdot10^{-7} + 3.77266406289807648\cdot10^{-22}\cdot\hat{\imath}\cdot\sqrt{(-}$
$5.38695460788249 87\cdot10^{29}\cdot\mathrm{LN}(r) - 2.59164689266730805\cdot10^{32}), r, 10^{-(209 - 215/1000)}, 20)$

Executing:

#177: $[1.64058977319953927\cdot10^{-209}, 1.63588998790841438\cdot10^{-209},$
$1.63590625805351709\cdot10^{-209}, 1.63590625825042606\cdot10^{-209},$
$1.63590625825042611\cdot10^{-209}, 1.63590625825042602\cdot10^{-209},$
$1.63590625825042607\cdot10^{-209}, 1.63590625825042612\cdot10^{-209},$
$1.63590625825042603\cdot10^{-209}, 1.63590625825042615\cdot10^{-209},$
$1.63590625825042613\cdot10^{-209}, 1.63590625825042611\cdot10^{-209},$

$$1.63590625825042607\cdot 10^{-209}, 1.63590625825042603\cdot 10^{-209},$$

$$1.63590625825042608\cdot 10^{-209}, 1.63590625825042603\cdot 10^{-209},$$

$$1.63590625825042607\cdot 10^{-209}, 1.63590625825042607\cdot 10^{-209},$$

$$1.6359062582504262\cdot 10^{-209}, 1.6359062582504261\cdot 10^{-209},$$

$$1.63590625825042605\cdot 10^{-209}]$$

We have convergence, and r here equals:

$$\#178: 1.63590625825042605\cdot 10^{-209}$$

Recalling our completely normalized charge density formula from # 139:

$$\#179: \frac{2\cdot\pi^2\cdot R\cdot r^2\cdot(b0\cdot rhor + b1\cdot rhor^2 + b2\cdot rhor^3 + res)}{\alpha\cdot q\cdot rhor}$$

Substituting for res using res11 (from #155), b0 using b011 from (#152), b1 using b111 (from #149), and b2 using b211 (from #146), and then substituting for R from #80 for two steps as the firt step involves substituting expressions that contain R:

$$\#180: \frac{2\cdot\pi^2\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^2 + 4\cdot\pi^2\cdot hbar}{4\cdot\pi^2\cdot c\cdot me}\cdot r^2\cdot\left(\left(\frac{\sqrt{15}\cdot\sqrt{\left(\alpha\cdot\left(840\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN\left(8\cdot\frac{Mu0}{\ldots}\right.\right.\right.}{\ldots}\right.\right.}{\ldots}$$

$$\frac{\left.\frac{\alpha\cdot c\cdot q^2 + 4\cdot\pi^2\cdot hbar}{4\cdot\pi^2\cdot c\cdot me}\right) - 840\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(r) + 2\cdot\sqrt{30}\cdot\sqrt{Mu0}\cdot\sqrt{\alpha}\cdot q\cdot\sqrt{(-c)}\cdot\sqrt{}}{21\cdot\pi^2} \sim$$

$$\frac{\left(420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN\left(8\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^2 + 4\cdot\pi^2\cdot hbar}{4\cdot\pi^2\cdot c\cdot me}\right) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(r)\right.}{\cdot\sqrt{Mu0}\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^2 + 4\cdot\pi^2\cdot hbar}{4\cdot\pi^2\cdot c\cdot me}\cdot r^2\cdot\sqrt{(-c)}} \sim$$

$$- 599\cdot Mu0\cdot\alpha\cdot c\cdot q^2 - 1680\cdot\pi^2\cdot hbar\Big) - 1213\cdot Mu0\cdot\alpha\cdot c\cdot q^2 - 3360\cdot\pi^2\cdot hbar\Big)\Big) \sim$$

$$\overline{} \sim$$

$$\overline{} \sim$$

$$- \frac{11\cdot\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{\left(420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN\left(8\cdot\dfrac{Mu0\cdot\alpha\cdot c\cdot q^2 + 4\cdot\pi^2\cdot hbar}{4\cdot\pi^2\cdot c\cdot me}\right) - 420\cdot M \sim\right.}}{210\cdot\pi^2\cdot\sqrt{Mu0}\cdot\dfrac{Mu0\cdot\alpha\cdot c\cdot q^2 + 4\cdot\pi^2\cdot \sim}{4\cdot\pi^2\cdot c\cdot me}} \sim$$

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$$\frac{\cdots + 4\cdot\pi^{2}\cdot hbar}{\cdots\cdot c\cdot me}\Bigg) - 5880\cdot Mu0\cdot\alpha^{2}\cdot c\cdot q^{2}\cdot LN(r) + Mu0\cdot c\cdot\left(5\cdot\pi^{4}\cdot\left(\frac{Mu0\cdot\alpha\cdot c\cdot q^{2} + 4 \cdots}{4\cdot\pi^{2}\cdot c\cdot \cdots}\right.\right.\ \sim$$

$$\overline{}\ \sim$$

$$\overline{}\ \sim$$

$$\left.\frac{\cdots\cdot\pi^{2}\cdot hbar}{\cdots me}\right)^{2}\cdot\left(\frac{6\cdot\alpha\cdot q}{\pi^{2}\cdot\left(\dfrac{Mu0\cdot\alpha\cdot c\cdot q^{2} + 4\cdot\pi^{2}\cdot hbar}{4\cdot\pi^{2}\cdot c\cdot me}\right)^{2}\cdot r} - \frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{\left(420\cdot Mu0\cdot\alpha\cdot c \cdots\right.}}{\cdots}\right.\ \sim$$

$$\overline{}\ \sim$$

$$\overline{}\ \sim$$

$$\frac{\frac{\frac{\cdot q^2 \cdot LN\left(8\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^2 + 4\cdot\pi^2\cdot hbar}{4\cdot\pi^2\cdot c\cdot me}\right) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(r) - 599\cdot Mu0\cdot\alpha}{15\cdot\pi^2\cdot\sqrt{Mu0}\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^2 + 4\cdot\pi^2\cdot hbar}{4\cdot\pi^2\cdot c\cdot me}\cdot r^2\cdot\sqrt{(-c)}}}{56\cdot\pi^2\cdot\sqrt{Mu0}\cdot\frac{Mu0\cdot\alpha\cdot c}{}}}{} \sim$$

$$\frac{\frac{\cdot c\cdot q^2 - 1680\cdot\pi^2\cdot hbar\Big)}{}\Bigg)^2\cdot r^4 + 140\cdot\pi^2\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^2 + 4\cdot\pi^2\cdot hbar}{4\cdot\pi^2\cdot c\cdot me}\cdot\alpha\cdot\left(\frac{}{\pi^2\cdot}\right.}{\frac{\cdot q^2 + 4\cdot\pi^2\cdot hbar}{4\cdot\pi^2\cdot c\cdot me}\cdot r^2\cdot\sqrt{(-c)}} \sim$$

$$\frac{\dfrac{\dfrac{6\cdot\alpha\cdot q}{\dfrac{Mu0\cdot\alpha\cdot c\cdot q^{2}+4\cdot\pi^{2}\cdot hbar^{2}}{4\cdot\pi^{2}\cdot c\cdot me}\cdot r^{2}}-\dfrac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{\left(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN\left(8\cdot\dfrac{Mu0\cdot\alpha\cdot c}{\;}\right.\right.}}{15\cdot\pi}}{\;}}{\;}$$

$$\frac{\dfrac{\left.\dfrac{\cdot q^{2}+4\cdot\pi^{2}\cdot hbar}{4\cdot\pi^{2}\cdot c\cdot me}\right)-420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r)-599\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}-1680\cdot\pi^{2}\cdot h}{{}^{2}\cdot\sqrt{Mu0}\cdot\dfrac{Mu0\cdot\alpha\cdot c\cdot q^{2}+4\cdot\pi^{2}\cdot hbar^{2}}{4\cdot\pi^{2}\cdot c\cdot me}\cdot r^{2}\cdot\sqrt{(-c)}}}{\;}$$

$$\alpha\cdot q\cdot rhor$$

$$\frac{\left.\mathrm{bar}\right)}{}\left(\cdot q\cdot r^{2} - 9506\cdot\alpha^{2}\cdot q^{2}\right) - 23520\cdot\pi^{2}\cdot\alpha\cdot \mathrm{hbar}\Bigg) - 3\cdot\left(4\cdot\pi^{2}\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^{2}}{4\cdot\pi^{2}} \right.$$

$$\frac{+\ 4\cdot\pi^{2}\cdot \mathrm{hbar}}{\cdot c\cdot me}\cdot\left(\frac{6\cdot\alpha\cdot q}{\pi^{2}\cdot\dfrac{Mu0\cdot\alpha\cdot c\cdot q^{2} + 4\cdot\pi^{2}\cdot \mathrm{hbar}}{4\cdot\pi^{2}\cdot c\cdot me}\cdot r^{2}} - \frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{\left(420\cdot Mu0\cdot\alpha\cdot\right.}}{7\cdot\pi^{2}\cdot\dfrac{Mu}{}}\right.$$

$$\frac{\dfrac{c \cdot q^{2} \cdot LN\left(8 \cdot \dfrac{Mu0 \cdot \alpha \cdot c \cdot q^{2} + 4 \cdot \pi^{2} \cdot hbar}{4 \cdot \pi^{2} \cdot c \cdot me}\right) - 420 \cdot Mu0 \cdot \alpha \cdot c \cdot q^{2} \cdot LN(r) - 599 \cdot Mu0 \cdot}{15 \cdot \pi^{2} \cdot \sqrt{Mu0} \cdot \dfrac{Mu0 \cdot \alpha \cdot c \cdot q^{2} + 4 \cdot \pi^{2} \cdot hbar}{4 \cdot \pi^{2} \cdot c \cdot me} \cdot r^{2} \cdot \sqrt{(-c)}}}{\dfrac{0 \cdot \alpha \cdot c \cdot q^{2} + 4 \cdot \pi^{2} \cdot hbar}{4 \cdot \pi^{2} \cdot c \cdot me} \cdot r^{2}} \sim$$

$$\frac{\dfrac{\alpha \cdot c \cdot q^{2} - 1680 \cdot \pi^{2} \cdot hbar\Big)}{} \Bigg) \cdot r^{2} + 7 \cdot \alpha \cdot q \Bigg)}{} \Bigg) \cdot rhor^{2} + \left(\frac{6 \cdot \alpha \cdot q}{\pi^{2} \cdot \dfrac{Mu0 \cdot \alpha \cdot c \cdot q^{2} + 4 \cdot \pi}{4 \cdot \pi^{2} \cdot c \cdot me}}\right. \sim$$

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                                                                        ⎟ ⎟      ⎜~
                                                                        ⎠ ⎟    3 ⎜~
────────────────────────────────────────────────────────────────────────── ⎟·rhor  + ⎜−~
2       2                                                                 ⎟      ⎜~
  + 4·π ·hbar   2                                                         ⎟      ⎜~
─────────────·r ·√(−c)                                                    ⎟      ⎜~
 2                                                                        ⎟      ⎜~
π ·c·me                                                                   ⎠      ⎝~
──────────────────────────────────────────────────────────────────────────────────~
                                                                                  ~
```

$$\frac{\frac{\sqrt{15}\cdot\sqrt{\left(\alpha\cdot\left(840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN\left(8\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^{2}+4\cdot\pi^{2}\cdot hbar}{4\cdot\pi^{2}\cdot c\cdot me}\right)-840\cdot Mu0\cdot\alpha\cdot\right.\right.}}{}}{}$$

$$\frac{c\cdot q^{2}\cdot LN(r)+2\cdot\sqrt{30}\cdot\sqrt{Mu0}\cdot\sqrt{\alpha}\cdot q\cdot\sqrt{(-c)}\cdot\sqrt{\left(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN\left(8\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^{2}}{4\cdot\pi^{2}}\right.\right.}}{84\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^{2}+4\cdot\pi^{2}\cdot hbar}{4\cdot\pi^{2}\cdot c\cdot me}\cdot r^{2}}$$

$$\frac{\frac{+\ 4\cdot\pi^{2}\cdot hbar}{\cdot c\cdot me}\Bigg) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar\Bigg)}{\cdot\sqrt{(-c)}}$$ ~

$$\frac{- 1213\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} - 3360\cdot\pi^{2}\cdot hbar\Bigg)\Bigg)}{} + \frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{\Bigg(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN\Bigg(8\cdot}}{}$$ ~

$$\frac{\left.\frac{Mu0\cdot\alpha\cdot c\cdot q^2 + 4\cdot\pi^2\cdot hbar}{4\cdot\pi^2\cdot c\cdot me}\right) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c\cdot q^2 - 1}{210\cdot\pi^2\cdot\sqrt{Mu0}\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^2 + 4\cdot\pi^2\cdot hbar}{4\cdot\pi^2\cdot c\cdot me}\cdot r^2\cdot\sqrt{(-c)}} \sim$$

$$\frac{\left.680\cdot\pi^2\cdot hbar\right)}{} - \left.\left.\frac{13\cdot\alpha\cdot q}{14\cdot\pi^2\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^2 + 4\cdot\pi^2\cdot hbar}{4\cdot\pi^2\cdot c\cdot me}\cdot r^2}\right)\right)$$

Simplifying:

$$\#181:\ \frac{\sqrt{15}\cdot\left(\sqrt{2}\cdot(14\cdot rhor^3 - 24\cdot rhor^2 + 11\cdot rhor - 1)\cdot\sqrt{(-c)}\cdot\sqrt{\left(420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN\right.}\right.}{} \sim$$

$$\frac{\left.\frac{Mu0\cdot\alpha\cdot c\cdot q^2 + 4\cdot\pi^2\cdot hbar}{c\cdot me}\right) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN\left(\frac{\pi^2\cdot r}{2}\right) - 599\cdot Mu0\cdot\alpha\cdot c\cdot}{105\cdot\sqrt{Mu0}\cdot\sqrt{\alpha}\cdot c\cdot q\cdot rhor} \sim$$

$$\overline{2 - 1680\cdot\pi^{2}\cdot hbar) + \sqrt{15}\cdot\sqrt{Mu0}\cdot\sqrt{\alpha}\cdot c\cdot q\cdot(84\cdot rhor^{3} - 186\cdot rhor^{2} + 115\cdot rhor}$$

$$\overline{- 13))} \; -$$

$$\frac{\sqrt{15}\cdot(3\cdot rhor^{2} - 4\cdot rhor + 1)\cdot\sqrt{(}\alpha\cdot((840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(\frac{2\cdot(Mu0\cdot\alpha\cdot c\cdot q^{2} + 4}{\pi^{2}\cdot c\cdot me}}{}$$

$$\frac{\frac{\cdot\pi^{2}\cdot hbar)}{}) - 840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) + 2\cdot\sqrt{30}\cdot\sqrt{Mu0}\cdot\sqrt{\alpha}\cdot q\cdot\sqrt{(-c)}\cdot\sqrt{(}420\cdot Mu0\cdot}{42\cdot\sqrt{Mu0}\cdot\alpha\cdot q\cdot rh}$$

$$\frac{\alpha\cdot c\cdot q^{2}\cdot LN\left(\frac{2\cdot(Mu0\cdot\alpha\cdot c\cdot q^{2} + 4\cdot\pi^{2}\cdot hbar)}{\pi^{2}\cdot c\cdot me}\right) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot}{or\cdot\sqrt{(-c)}}$$

$$\overline{Mu0\cdot\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar) - 1213\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} - 3360\cdot\pi^{2}\cdot hbar))}$$

Substituting for our constants, but not for r and α:

$$\#182: \frac{\sqrt{15}\cdot(\sqrt{2}\cdot(14\cdot rhor^{3} - 24\cdot rhor^{2} + 11\cdot rhor - 1)\cdot\sqrt{(-299792458)}\cdot\sqrt{(}420\cdot(4\cdot\pi\cdot}{}$$

$$\frac{0^{-7})\cdot\alpha\cdot299792458\cdot(+\ 1.6021764874\cdot10^{-19})^{2}\cdot LN\left(\frac{(4\cdot\pi\cdot10^{-7})\cdot\alpha\cdot299792458\cdot(}{29}\right.}{} \sim$$

$$\frac{\left.\frac{+\ 1.6021764874\cdot10^{-19})^{2}\ +\ 4\cdot\pi^{2}\cdot(1.05457162853\cdot10^{-34})}{9792458\cdot(+\ 9.1093821545\cdot10^{-31})}\right)\ -\ 420\cdot(4\cdot\pi\cdot10^{-7}}{105\cdot\sqrt{(4\cdot\pi\cdot10^{-7})}\cdot\sqrt{\alpha}} \sim$$

$$\frac{)\cdot\alpha\cdot299792458\cdot(+\ 1.6021764874\cdot10^{-19})^{2}\cdot LN\left(\frac{\pi^{2}\cdot r}{2}\right)\ -\ 599\cdot(4\cdot\pi\cdot10^{-7})\cdot\alpha\cdot2}{\cdot299792458\cdot(+\ 1.6021764874\cdot10^{-19})\cdot rhor} \sim$$

$$\frac{\left.99792458\cdot(+\ 1.6021764874\cdot10^{-19})^{2}\ -\ 1680\cdot\pi^{2}\cdot(1.05457162853\cdot10^{-34})\right)\ +\ \sqrt{}}{} \sim$$

$$\frac{15\cdot\sqrt{(4\cdot\pi\cdot10^{-7})}\cdot\sqrt{\alpha}\cdot299792458\cdot(+\ 1.6021764874\cdot10^{-19})\cdot(84\cdot rhor^{3}\ -\ 186\cdot rh}{} \sim$$

$$\frac{\left.or^{2}\ +\ 115\cdot rhor\ -\ 13)\right)}{}\ -$$

```
                                                                                ~
                                                                                ~
                          2                                   -7                ~
 √15·(3·rhor  - 4·rhor + 1)·√⎜α·⎜840·(4·π·10  )·α·299792458·(+ 1.6021 ~
                                                                                ~
                                                                                ~
─────────────────────────────────────────────────────────────────────────────── ~
                                                                                ~
                                                                                ~

                                    -7                                  -19 2   ~
          -19 2      ⎛ 2·((4·π·10  )·α·299792458·(+ 1.6021764874·10    )     ~
764874·10    ) ·LN⎜───────────────────────────────────────────────────────── ~
                     ⎜                                  2                       ~
                     ⎝                                  π ·299792458·(+ 9.1093821545 ~
─────────────────────────────────────────────────────────────────────────────── ~
                                                                                ~
                                                                                ~

        2                         -34   ⎞                                       ~
+ 4·π ·(1.05457162853·10    ))  ⎟                         -7                ~
──────────────────────────────────────⎟ - 840·(4·π·10  )·α·299792458·(+ 1.602 ~
    -31                                 ⎟                                       ~
·10    )                                ⎠                                       ~
─────────────────────────────────────────────────────────────────────────────── ~
                                                                                ~
                                                                                ~

                                                                                ~
           -19 2                           -7                          -19      ~
1764874·10    ) ·LN(r) + 2·√30·√(4·π·10  )·√α·(+ 1.6021764874·10    )·√ ~
                                                                                ~
                                                                                ~
─────────────────────────────────────────────────────────────────────────────── ~
                                                                                ~
                                                                                ~

                     ⎛                                                        ⎛ ~
                     ⎜                -7                              -19 2   ⎜ ~
(-299792458)·√⎜420·(4·π·10  )·α·299792458·(+ 1.6021764874·10    ) ·LN⎜ ~
                     ⎜                                                        ⎜ ~
                     ⎝                                                        ⎝ ~
─────────────────────────────────────────────────────────────────────────────── ~
                                                -7                      -19     ~
                                42·√(4·π·10  )·α·(+ 1.6021764874·10    )·rho ~

            -7                              -19 2        2                      ~
 2·((4·π·10  )·α·299792458·(+ 1.6021764874·10    )  + 4·π ·(1.05457162 ~
─────────────────────────────────────────────────────────────────────────────── ~
                                2                    -31                        ~
                                π ·299792458·(+ 9.1093821545·10    )           ~
─────────────────────────────────────────────────────────────────────────────── ~
                                                                                ~
r·√(-299792458)                                                                 ~
```

```
         -34 ⎞
853·10     ))⎟                      -7                                   -19 2      ~
─────────────⎟ - 420·(4·π·10  )·α·299792458·(+ 1.6021764874·10   ) ·LN~
             ⎠
─────────────────────────────────────────────────────────────────────────~

                    -7                                   -19 2       2
(r) - 599·(4·π·10  )·α·299792458·(+ 1.6021764874·10   )  - 1680·π ·(1~
─────────────────────────────────────────────────────────────────────────~

                      -34 ⎞                    -7
.05457162853·10     )⎟ - 1213·(4·π·10  )·α·299792458·(+ 1.6021764874·10~
                          ⎠
─────────────────────────────────────────────────────────────────────────~

-19 2            2                         -34 ⎞⎞
    )  - 3360·π ·(1.05457162853·10     )⎟⎟
                                               ⎠⎠
──────────────────────────────────────────────────
```

Setting α = 0.95 and r = #178

```
       ⎛                   3           2                                        ⎛
 √15·⎜√2·(14·rhor  - 24·rhor  + 11·rhor - 1)·√(-299792458)·√~⎜420·(4·π·
#183:  ⎝                                                                        ⎝
──────────────────────────────────────────────────────────────────────────────────

  -7                                 -19 2      ⎛       -7
0   )·0.95·299792458·(+ 1.6021764874·10   ) ·LN⎜ (4·π·10  )~·0.95·29979
                                                 ⎜──────────────────────
                                                 ⎝
──────────────────────────────────────────────────────────────────────────
```

```
                                  -19 2         2                        -34  ⎞        ~
2458·(+ 1.6021764874·10     )  + 4·π ·(1.05457162853·10    )  ⎟        ~
──────────────────────────────────────────────────────────────⎟ - 420·(4·~
                                          -31                  ⎟        ~
  299792458·(+ 9.1093821545·10    )                            ⎠        ~
─────────────────────────────────────────────────────────────────────────~
                                                                          ~
                                                                          ~

                                                            ⎛  2                    ~
   -7                                             -19 2     ⎜ π ·(1.635906258250~
π·10  )·0.95·299792458·(+ 1.6021764874·10    ) ·LN⎜────────────────────~
                                                            ⎝                  2  ~
                                                                                  ~
─────────────────────────────────────────────────────────────────────────~
            -7                                          -19                     ~
  105·√(4·π·10  )·√0.95·299792458·(+ 1.6021764874·10    )·rhor

        -209 ⎞                                                                    ~
42605·10     )⎟                 -7                                          -19~
──────────────⎟ - 599·(4·π·10  )·0.95·299792458·(+ 1.6021764874·10    ~
              ⎠                                                                   ~
                                                                                  ~
─────────────────────────────────────────────────────────────────────────~
                                                                                  ~
                                                                                  ~

                                                   ⎞                                ~
 2          2                          -34         ⎟                -7              ~
)  - 1680·π ·(1.05457162853·10    )⎟ + √15·√(4·π·10  )·√0.95·299792458~
                                                   ⎠                                ~
─────────────────────────────────────────────────────────────────────────~
                                                                                  ~
                                                                                  ~

                                                                            ⎞
                       -19             3              2                    ⎟
·(+ 1.6021764874·10    )·(84·rhor  - 186·rhor  + 115·rhor - 13)⎟
                                                                            ⎠
──────────────────────────────────────────────────────────────────── -

                                           ⎛     ⎛                                       ~
                  2                        ⎜     ⎜                  -7                   ~
 √15·(3·rhor  - 4·rhor + 1)·√⎜0.95·⎜840·(4·π·10  )·0.95·299792458·(+ ~
                                           ⎝     ⎝                                       ~
─────────────────────────────────────────────────────────────────────────~
                                                                                  ~
                                                                                  ~
```

```
                                                             -7                           ~
                    -19 2     ⎛  2·((4·π·10  )·0.95·299792458·(+ 1.6021764874 ~
1.6021764874·10     ) ·LN⎜──────────────────────────────────────────────── ~
                              ⎜                                2                          ~
                              ⎝                               π ·299792458·(+ 9.10 ~
────────────────────────────────────────────────────────────────────────── ~
                                                                                          ~
                                                                                          ~

  -19 2       2                     -34  ⎞                                                 ~
·10    )  + 4·π ·(1.05457162853·10    )) ⎟                     -7                          ~
───────────────────────────────────────⎟ - 840·(4·π·10  )·0.95·299792 ~
                 -31                      ⎟                                                ~
93821545·10    )                          ⎠                                                ~
────────────────────────────────────────────────────────────────────────── ~
                                                                                          ~
                                                                                          ~

                                                                                          ~
                          -19 2                                 -209                      ~
458·(+ 1.6021764874·10    ) ·LN(1.63590625825042605·10     ) + 2·√30·√( ~
                                                                                          ~
                                                                                          ~
────────────────────────────────────────────────────────────────────────── ~
                                                                                          ~
                                                                                          ~

                                                            ⎛                             ~
     -7                                -19                  ⎜                -7           ~
4·π·10  )·√0.95·(+ 1.6021764874·10    )·√(-299792458)·√⎜420·(4·π·10  ) ~
                                                            ⎜                             ~
                                                            ⎝                             ~
────────────────────────────────────────────────────────────────────────── ~
                                                                                          ~
                                                                              42·√( ~

                                                                    ⎛            -7       ~
                                                 -19 2              ⎜ 2·((4·π·10  )·0.95·299792 ~
·0.95·299792458·(+ 1.6021764874·10    ) ·LN⎜─────────────────── ~
                                                                    ⎜                     ~
                                                                    ⎝                   π ~
────────────────────────────────────────────────────────────────────────── ~
     -7                               -19                                                 ~
4·π·10  )·0.95·(+ 1.6021764874·10    )·rhor·√(-299792458)                              ~

                          -19 2       2                       -34  ⎞                       ~
458·(+ 1.6021764874·10    )  + 4·π ·(1.05457162853·10    ))  ⎟                       ~
────────────────────────────────────────────────────────⎟ - 420·(4· ~
2                                    -31                              ⎟                    ~
 ·299792458·(+ 9.1093821545·10    )                                   ⎠                    ~
────────────────────────────────────────────────────────────────────────── ~
                                                                                          ~
                                                                                          ~
```

$$\pi\cdot10^{-7})\cdot0.95\cdot299792458\cdot(+\ 1.6021764874\cdot10^{-19})^{2}\cdot LN(1.63590625825042605 \sim$$

$$\overline{} \sim$$

$$\cdot10^{-209}) - 599\cdot(4\cdot\pi\cdot10^{-7})\cdot0.95\cdot299792458\cdot(+\ 1.6021764874\cdot10^{-19})^{2} - 16 \sim$$

$$\overline{} \sim$$

$$\left.80\cdot\pi^{2}\cdot(1.05457162853\cdot10^{-34})\right) - 1213\cdot(4\cdot\pi\cdot10^{-7})\cdot0.95\cdot299792458\cdot(+\ 1.60 \sim$$

$$\overline{} \sim$$

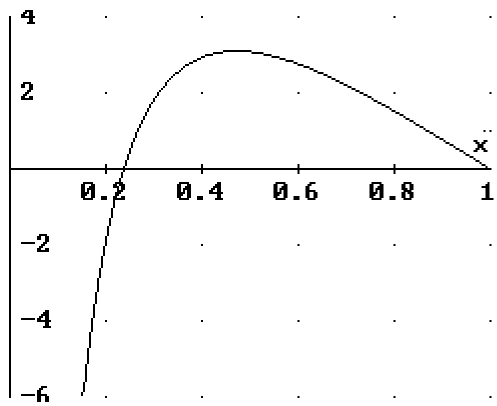
$$\left.\left.21764874\cdot10^{-19})^{2} - 3360\cdot\pi^{2}\cdot(1.05457162853\cdot10^{-34})\right)\right)$$

$$\overline{}$$

Simplifying:

$$\#184{:}3.16129032258064516\cdot rhor^{2} - 17.2258064516129032\cdot rhor - \frac{3.16129032258064516}{rhor} + 17.2258064516129032$$

Plotting:



We have both positive and negative values of normalized charge density and so must reject this solution involving res11, b011, b111, b211, r = #178, and α = 0.95.

Next, we consider b221 instead (from b22):

$$\#185: \frac{3\cdot\sqrt{(5880\cdot Mu0\cdot\alpha^2\cdot c\cdot q^2\cdot LN(8\cdot R) - 5880\cdot Mu0\cdot\alpha^2\cdot c\cdot q^2\cdot LN(r) + Mu0\cdot c\cdot(5\cdot\pi^4\cdot R}}{56\cdot\pi^2\cdot\sqrt{Mu0}\cdot R\cdot r}$$

$$\frac{\cdot b2^2\cdot r^4 + 140\cdot\pi^2\cdot R\cdot\alpha\cdot b2\cdot q\cdot r^2 - 9506\cdot\alpha^2\cdot q^2) - 23520\cdot\pi^2\cdot\alpha\cdot hbar)}{\cdot\sqrt{(-c)}} -$$

$$\frac{3\cdot(4\cdot\pi^2\cdot R\cdot b2\cdot r^2 + 7\cdot\alpha\cdot q)}{7\cdot\pi^2\cdot R\cdot r^2}$$

This just above is "b12" from #51, the second solution for "b1".

We first calculate b01 for b0 using b12 for b1,

and so we substitute into b0 from #24 using b12 (#51) for b1:

#186:

$$-\frac{\pi^{2}\cdot R\cdot r^{2}\cdot\left(8\cdot\left(\frac{3\cdot\sqrt{(5880\cdot Mu0\cdot\alpha^{2}\cdot c\cdot q^{2}\cdot LN(8\cdot R)-5880\cdot Mu0\cdot\alpha^{2}\cdot c\cdot q^{2}\cdot LN(r)+Mu0\cdot c\cdot(5\cdot\pi^{4}\cdot R^{2}\cdot b2^{2}\cdot r^{4}+140\cdot\pi^{2}\cdot R\cdot\alpha\cdot b2\cdot q\cdot r^{2}-9506\cdot\alpha^{2}\cdot q^{2})-23520\cdot\pi^{2}\cdot\alpha\cdot hbar)}}{56\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}}-\frac{3\cdot(4\cdot\pi^{2}\cdot R\cdot b2\cdot r^{2}+7\cdot\alpha\cdot q)}{7\cdot\pi^{2}\cdot R\cdot r^{2}}\right)+9\cdot b2\right)+3\cdot\alpha\cdot q}{6\cdot\pi^{2}\cdot R\cdot r^{2}}$$

Simplifying:

#187:

$$\frac{11\cdot\pi^{2}\cdot R\cdot b2\cdot r^{2}+49\cdot\alpha\cdot q}{14\cdot\pi^{2}\cdot R\cdot r^{2}}-\frac{\sqrt{(5880\cdot Mu0\cdot\alpha^{2}\cdot c\cdot q^{2}\cdot LN(8\cdot R)-5880\cdot Mu0\cdot\alpha^{2}\cdot c\cdot q^{2}\cdot LN(r)+Mu0\cdot c\cdot(5\cdot\pi^{4}\cdot R^{2}\cdot b2^{2}\cdot r^{4}+140\cdot\pi^{2}\cdot R\cdot\alpha\cdot b2\cdot q\cdot r^{2}-9506\cdot\alpha^{2}\cdot q^{2})-23520\cdot\pi^{2}\cdot\alpha\cdot hbar)}}{14\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}}$$

This just above is b02.

Recalling #90 for b2:

#188:

$$b2 = \frac{\left(-\frac{\pi^2\cdot R\cdot r^2\cdot(8\cdot b1 + 9\cdot b2) + 3\cdot\alpha\cdot q}{6\cdot\pi^2\cdot R\cdot r^2} - b1 - b2\right) - b1}{2}$$

Substituting for b1 using b12 (#51):

#189:

b2 =

$$\left(-\frac{\pi^2\cdot R\cdot r^2\cdot\left(8\cdot\left(\frac{3\cdot\sqrt{(5880\cdot Mu0\cdot\alpha^2\cdot c\cdot q^2\cdot LN(8\cdot R) - 5880\cdot Mu0\cdot\alpha^2\cdot c\cdot q^2\cdot LN}{}\right.\right.}{}\right.$$

$$\frac{\frac{(r) + Mu0\cdot c\cdot(5\cdot\pi^4\cdot R^2\cdot b2^2\cdot r^4 + 140\cdot\pi^2\cdot R\cdot\alpha\cdot b2\cdot q\cdot r^2 - 9506\cdot\alpha^2\cdot q^2) - 2352}{56\cdot\pi^2\cdot\sqrt{Mu0}\cdot R\cdot r^2\cdot\sqrt{(-c)}}}{6\cdot\pi^2\cdot R\cdot r^2}$$

$$\frac{\frac{0\cdot\pi^2\cdot\alpha\cdot hbar)}{} - \left.\frac{3\cdot(4\cdot\pi^2\cdot R\cdot b2\cdot r^2 + 7\cdot\alpha\cdot q)}{7\cdot\pi^2\cdot R\cdot r^2}\right) + 9\cdot b2\right) + 3\cdot\alpha\cdot q}{} - \left(\frac{3\cdot\sqrt{}}{}\right.$$

```
                                                                      ~
                                                                      ~
                                                                      ~
         2    2                       2    2                  4  2    ~
5880·Mu0·α ·c·q ·LN(8·R) - 5880·Mu0·α ·c·q ·LN(r) + Mu0·c·(5·π ·R ·b2 ~
───────────────────────────────────────────────────────────────────── ~
                                                   2        2         ~
                                              56·π ·√Mu0·R·r ·√(      ~
───────────────────────────────────────────────────────────────────── ~
                                                          2           ~

                                                                      ~
                                                                      ~
                                                                      ~
2  4         2          2        2  2         2                       ~
 ·r  + 140·π ·R·α·b2·q·r  - 9506·α ·q ) - 23520·π ·α·hbar)     3·(4·π ~
────────────────────────────────────────────────────────────── - ──── ~
                                                                      ~
-c)                                                                   ~
───────────────────────────────────────────────────────────────────── ~
                                                                      ~

                                  ⎞                                   ~
                                  ⎟                                   ~
                                  ⎟                                   ~
2      2               ⎞          ⎟   ⎛              2    2           ~
 ·R·b2·r  + 7·α·q)     ⎟ - b2     ⎟ - ⎜ 3·√(5880·Mu0·α ·c·q ·LN(8·R) - 5880·Mu ~
───────────────────────⎟          ⎟   ⎜─────────────────────────────── ~
    2    2             ⎟          ⎟   ⎜                                ~
  7·π ·R·r             ⎠          ⎠   ⎝                                ~
───────────────────────────────────────────────────────────────────── ~
                                                                      ~

                                                                      ~
                                                                      ~
                                                                      ~
  2    2                    4  2   2  4        2         2            ~
0·α ·c·q ·LN(r) + Mu0·c·(5·π ·R ·b2 ·r  + 140·π ·R·α·b2·q·r  - 9506·α ~
───────────────────────────────────────────────────────────────────── ~
                         2        2                                   ~
                    56·π ·√Mu0·R·r ·√(-c)                             ~
───────────────────────────────────────────────────────────────────── ~
                                                                      ~


2  2          2                       2       2       ⎞
 ·q ) - 23520·π ·α·hbar)     3·(4·π ·R·b2·r  + 7·α·q) ⎟
────────────────────────── - ──────────────────────── ⎟
                                      2    2          ⎟
                                   7·π ·R·r           ⎠
───────────────────────────────────────────────────────
```

#190:

```
b2 =

 ⎛                                                                          ~
 ⎜       2     2  ⎛   ⎛                 2    2                          2    2  ~
 ⎜      π ·R·r ·  ⎜8· ⎜ 3·√(5880·Mu0·α ·c·q ·LN(8·R) - 5880·Mu0·α ·c·q ·LN~
 ⎜                ⎜   ⎜ ──────────────────────────────────────────────────────~
 ⎜                ⎝   ⎝                                                       ~
 ⎜                                                                            ~
 ⎜── ─────────────────────────────────────────────────────────────────────────~
 ⎜                                                                            ~
 ⎝                                                                            ~
──────────────────────────────────────────────────────────────────────────────~
                                                                              ~

                            4  2    2  4          2            2          2  2      ~
(r) + Mu0·c·(5·π ·R ·b2 ·r  + 140·π ·R·α·b2·q·r  - 9506·α ·q ) - 2352~
──────────────────────────────────────────────────────────────────────────────~
           2          2                                                       ~
     56·π ·√Mu0·R·r ·√(-c)                                                    ~
──────────────────────────────────────────────────────────────────────────────~
                                          2    2                              ~
                                     6·π ·R·r                                 ~
──────────────────────────────────────────────────────────────────────────────~
                                                                              ~

    2                       2          2         ⎞        ⎞                      ~
0·π ·α·hbar)      3·(4·π ·R·b2·r  + 7·α·q)       ⎟        ⎟                      ~
───────────── - ───────────────────────────────  ⎟ + 9·b2 ⎟ + 3·α·q              ~
                              2    2             ⎟        ⎟                 ⎛     ~
                          7·π ·R·r               ⎠        ⎠                 ⎜ 3·√(~
─────────────────────────────────────────────────────────────────────── -   ⎜ ────~
                                                                            ⎜     ~
                                                                            ⎝     ~
──────────────────────────────────────────────────────────────────────────────~
                                                                              ~

                                                                              ~
                                                                              ~
                                                                              ~
         2    2                          2    2                         4  2  ~
5880·Mu0·α ·c·q ·LN(8·R) - 5880·Mu0·α ·c·q ·LN(r) + Mu0·c·(5·π ·R ·b2~
──────────────────────────────────────────────────────────────────────────────~
                                                         2          2         ~
                                                   56·π ·√Mu0·R·r ·√(~
──────────────────────────────────────────────────────────────────────────────~
                                                                 2            ~
```

$$\frac{\dfrac{{}^{2}\cdot r^{4} + 140\cdot\pi^{2}\cdot R\cdot\alpha\cdot b2\cdot q\cdot r^{2} - 9506\cdot\alpha^{2}\cdot q^{2}) - 23520\cdot\pi^{2}\cdot\alpha\cdot hbar)}{\quad} - \dfrac{3\cdot(4\cdot\pi}{\quad}}{-c)}$$

$$\frac{\dfrac{{}^{2}\cdot R\cdot b2\cdot r^{2} + 7\cdot\alpha\cdot q)}{7\cdot\pi^{2}\cdot R\cdot r^{2}}\Bigg) - b2\Bigg) - \Bigg(\dfrac{3\cdot\sqrt{(}5880\cdot Mu0\cdot\alpha^{2}\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 5880\cdot Mu}{\quad}}{\quad}$$

$$\frac{0\cdot\alpha^{2}\cdot c\cdot q^{2}\cdot LN(r) + Mu0\cdot c\cdot(5\cdot\pi^{4}\cdot R^{2}\cdot b2^{2}\cdot r^{4} + 140\cdot\pi^{2}\cdot R\cdot\alpha\cdot b2\cdot q\cdot r^{2} - 9506\cdot\alpha}{56\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}}$$

$$\frac{\dfrac{{}^{2}\cdot q^{2}) - 23520\cdot\pi^{2}\cdot\alpha\cdot hbar)}{\quad} - \dfrac{3\cdot(4\cdot\pi^{2}\cdot R\cdot b2\cdot r^{2} + 7\cdot\alpha\cdot q)}{7\cdot\pi^{2}\cdot R\cdot r^{2}}\Bigg)}{\quad}$$

Simplifying:

$$\#191{:}b2 = \frac{23\cdot\pi^{2}\cdot R\cdot b2\cdot r^{2} + 35\cdot\alpha\cdot q}{28\cdot\pi^{2}\cdot R\cdot r^{2}} -$$

$$\frac{\sqrt{(}5880\cdot Mu0\cdot\alpha^{2}\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 5880\cdot Mu0\cdot\alpha^{2}\cdot c\cdot q^{2}\cdot LN(r) + Mu0\cdot c\cdot(5\cdot\pi^{4}\cdot R}{56\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot}$$

$$\frac{\cdot b2^{2}\cdot r^{4} + 140\cdot \pi^{2}\cdot R\cdot \alpha\cdot b2\cdot q\cdot r^{2} - 9506\cdot \alpha^{2}\cdot q^{2}) - 23520\cdot \pi^{2}\cdot \alpha\cdot hbar)}{{}^{2}\cdot\sqrt{(-c)}}$$

This just above is b22.

$$\#192:SOLVE\left(b2 = \frac{23\cdot \pi^{2}\cdot R\cdot b2\cdot r^{2} + 35\cdot \alpha\cdot q}{28\cdot \pi^{2}\cdot R\cdot r^{2}} - \right.$$

$$\frac{\sqrt{(5880\cdot Mu0\cdot \alpha^{2}\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 5880\cdot Mu0\cdot \alpha^{2}\cdot c\cdot q^{2}\cdot LN(r) + Mu0\cdot c\cdot (5\cdot \pi^{4}\cdot R}}{56\cdot \pi^{2}\cdot \sqrt{Mu0}\cdot R\cdot}$$

$$\left.\frac{\cdot b2^{2}\cdot r^{4} + 140\cdot \pi^{2}\cdot R\cdot \alpha\cdot b2\cdot q\cdot r^{2} - 9506\cdot \alpha^{2}\cdot q^{2}) - 23520\cdot \pi^{2}\cdot \alpha\cdot hbar)}{{}^{2}\cdot\sqrt{(-c)}}, b2\right)$$

Solving, there are two solutions:

$$\#193:b2 = \frac{6\cdot \alpha\cdot q}{\pi^{2}\cdot R\cdot r^{2}} -$$

$$\frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot \alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot \alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot \alpha\cdot}}{15\cdot \pi^{2}\cdot \sqrt{Mu0}\cdot R\cdot r^{2}\cdot \sqrt{(-c)}}$$

$$\frac{\cdot q^{2} - 1680\cdot \pi^{2}\cdot hbar)}{} \vee b2 =$$

$$\frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot \alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot \alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot \alpha\cdot}}{15\cdot \pi^{2}\cdot \sqrt{Mu0}\cdot R\cdot r^{2}\cdot \sqrt{(-c)}}$$

$$\frac{\cdot q^{2} - 1680\cdot \pi^{2}\cdot hbar)}{} + \frac{6\cdot \alpha\cdot q}{\pi^{2}\cdot R\cdot r^{2}}$$

The first solution (b221) is:

$$\#194: \frac{6\cdot\alpha\cdot q}{\pi^2\cdot R\cdot r^2} -$$

$$\frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{}(420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c\cdot}{15\cdot\pi^2\cdot\sqrt{Mu0}\cdot R\cdot r^2\cdot\sqrt{(-c)}}$$

$$\frac{\cdot q^2 - 1680\cdot\pi^2\cdot hbar)}{}$$

The second solution (b222) is:

$$\#195: \frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{}(420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c\cdot}{15\cdot\pi^2\cdot\sqrt{Mu0}\cdot R\cdot r^2\cdot\sqrt{(-c)}}$$

$$\frac{{}^2 - 1680\cdot\pi^2\cdot hbar)}{} + \frac{6\cdot\alpha\cdot q}{\pi^2\cdot R\cdot r^2}$$

We first investigate #163 that we denote by b221:

Now we can calculate our coefficients: res21 for res, b021 for b0, b121 for b1, and b221 for b2 ... in terms of only our known constants,
so: recall b12 (#51):

$$\#196: \frac{3\cdot\sqrt{}(5880\cdot Mu0\cdot\alpha^2\cdot c\cdot q^2\cdot LN(8\cdot R) - 5880\cdot Mu0\cdot\alpha^2\cdot c\cdot q^2\cdot LN(r) + Mu0\cdot c\cdot(5\cdot\pi^4\cdot R}{56\cdot\pi^2\cdot\sqrt{Mu0}\cdot R\cdot r}$$

$$\frac{\cdot b2^{2}\cdot r^{4} + 140\cdot \pi^{2}\cdot R\cdot \alpha\cdot b2\cdot q\cdot r^{2} - 9506\cdot \alpha^{2}\cdot q^{2}) - 23520\cdot \pi^{2}\cdot \alpha\cdot hbar)}{\cdot\sqrt{(-c)}} -$$

$$\frac{3\cdot(4\cdot \pi^{2}\cdot R\cdot b2\cdot r^{2} + 7\cdot \alpha\cdot q)}{7\cdot \pi^{2}\cdot R\cdot r^{2}}$$

Substituting in b12 just above, the b221 (#163) for b2:

#197:

$$\frac{3\cdot\sqrt{\left(5880\cdot Mu0\cdot \alpha^{2}\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 5880\cdot Mu0\cdot \alpha^{2}\cdot c\cdot q^{2}\cdot LN(r) + Mu0\cdot c\cdot \left(5\cdot \pi^{4}\cdot R\right.\right.}}{}$$

$$\frac{\cdot\left(\frac{6\cdot \alpha\cdot q}{\pi^{2}\cdot R\cdot r^{2}} - \frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot \alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot \alpha\cdot c\cdot q^{2}\cdot LN(r)}}{15\cdot \pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}}\right.}{}$$

$$\frac{\left.\frac{- 599\cdot Mu0\cdot \alpha\cdot c\cdot q^{2} - 1680\cdot \pi^{2}\cdot hbar)}{}\right)^{2}\cdot r^{4} + 140\cdot \pi^{2}\cdot R\cdot \alpha\cdot\left(\frac{6\cdot \alpha\cdot q}{\pi^{2}\cdot R\cdot r^{2}} - \frac{\sqrt{3}}{}\right.}{56\cdot \pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}}$$

$$\frac{0\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot \alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot \alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot \alpha\cdot c\cdot q^{2}}}{15\cdot \pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}}$$

$$\frac{\left.\left.\left.\dfrac{-\ 1680\cdot\pi^{2}\cdot hbar)}{}\right)\cdot q\cdot r^{2}\ -\ 9506\cdot\alpha^{2}\cdot q^{2}\right)\ -\ 23520\cdot\pi^{2}\cdot\alpha\cdot hbar\right)}{}\ -$$

$$\frac{3\cdot\left(4\cdot\pi^{2}\cdot R\cdot\left(\dfrac{6\cdot\alpha\cdot q}{\pi^{2}\cdot R\cdot r^{2}}\ -\ \dfrac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R)\ -\ 420\cdot Mu0\cdot\alpha\cdot}}{15\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot}\right.\right.}{7\cdot\pi^{2}\cdot R\cdot r^{2}}\sim$$

$$\frac{\left.\left.\dfrac{c\cdot q^{2}\cdot LN(r)\ -\ 599\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\ -\ 1680\cdot\pi^{2}\cdot hbar)}{R\cdot r^{2}\cdot\sqrt{(-c)}}\right)\cdot r^{2}\ +\ 7\cdot\alpha\cdot q\right)}{}$$

Simplifying:

$$\#198:\frac{\sqrt{15}\cdot\sqrt{(\alpha\cdot(840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R)\ -\ 840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r)\ +\ 2\sim\sqrt{30}\cdot\sqrt{Mu0}\cdot\sqrt{}}}{}$$

$$\frac{\cdot q\cdot\sqrt{(-c)}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R)\ -\ 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r)\ -\sim\ 599\cdot Mu0\cdot\alpha}}{28\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}}$$

$$\frac{c\cdot q^{2}\ -\ 1680\cdot\pi^{2}\cdot hbar)\ -\ 1213\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\ -\ 3360\cdot\pi^{2}\cdot hbar))}{}\ +$$

$$\frac{4\cdot\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R)\ -\ 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r)\ \sim-\ 599\cdot Mu0\cdot}}{35\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}}$$

$$\frac{\cdot c\cdot q^2 - 1680\cdot\pi^2\cdot hbar)}{} - \frac{93\cdot\alpha\cdot q}{7\cdot\pi^2\cdot R\cdot r^2}$$

This just above is "b121" for b1 using b221 for b2, and it is not a function of res, b0, b1, or b2.

We recall #24 for b0:

$$\#199{:}\ -\frac{\pi^2\cdot R\cdot r^2\cdot(8\cdot b1 + 9\cdot b2) + 3\cdot\alpha\cdot q}{6\cdot\pi^2\cdot R\cdot r^2}$$

Substituting b121 for b1 and b221 for b2:

#200: −

$$\frac{\pi^2\cdot R\cdot r^2\cdot\left(8\cdot\left(\frac{\sqrt{15}\cdot\sqrt{(\alpha\cdot(840\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(8\cdot R) - 840\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(r)}{}\right.\right.}{}$$

$$\frac{+ 2\cdot\sqrt{30}\cdot\sqrt{Mu0}\cdot\sqrt{\alpha}\cdot q\cdot\sqrt{(-c)}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN}{28\cdot\pi^2\cdot\sqrt{Mu0}\cdot R\cdot r^2\cdot\sqrt{(-c)}}$$

$$\frac{r) - 599\cdot Mu0\cdot\alpha\cdot c\cdot q^2 - 1680\cdot\pi^2\cdot hbar) - 1213\cdot Mu0\cdot\alpha\cdot c\cdot q^2 - 3360\cdot\pi^2\cdot hbar)}{}$$

$$\frac{\left.\right) + \dfrac{4\cdot\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot}}{35\cdot\pi^{2}\cdot\sqrt{Mu0\cdot R\cdot r^{2}}\cdot\sqrt{(-c)}}}{6\cdot\pi^{2}\cdot R\cdot r^{2}} \sim$$

$$\frac{\dfrac{Mu0\cdot\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar)}{} - \left.\dfrac{93\cdot\alpha\cdot q}{7\cdot\pi^{2}\cdot R\cdot r^{2}}\right) + 9\cdot\left(\dfrac{6\cdot\alpha\cdot q}{\pi^{2}\cdot R\cdot r^{2}} - \dfrac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{}}{}\right.}{} \sim$$

$$\frac{\dfrac{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} - 168}{15\cdot\pi^{2}\cdot\sqrt{Mu0\cdot R\cdot r^{2}}\cdot\sqrt{(-c)}}}{} \sim$$

$$\frac{\left.\left.\dfrac{0\cdot\pi^{2}\cdot hbar)}{}\right)\right) + 3\cdot\alpha\cdot q}{}$$

Simplifying:

#201:-

$$\frac{\sqrt{15}\cdot\sqrt{(\alpha\cdot(840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) + \sim 2\cdot\sqrt{30}\cdot\sqrt{Mu0}}}{} \sim$$

$$\frac{\sqrt{\alpha}\cdot q\cdot\sqrt{(-c)}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r)\sim - 599\cdot Mu0}}{21\cdot\pi^{2}\cdot\sqrt{Mu0\cdot R\cdot r^{2}}\cdot\sqrt{(-c)}} \sim$$

$$\frac{\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar) - 1213\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} - 3360\cdot\pi^{2}\cdot hbar))}{} -$$

$$\frac{11\cdot\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(}420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot}{210\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}} \sim$$

$$\frac{\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar)}{} + \frac{115\cdot\alpha\cdot q}{14\cdot\pi^{2}\cdot R\cdot r^{2}}$$

This just above is b021,

and it does not depend upon res21, b121, or b221.

Recalling res from #103

#202:-b0 - b1 - b2

Substituting into the just above for b021 (#170), b121 (#167) for b1, and (#163) b221 for b2:

$$\#203:- \left(- \right.$$

$$\frac{\sqrt{15}\cdot\sqrt{(}\alpha\cdot(840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) + \sim 2\cdot\sqrt{30}\cdot\sqrt{Mu0}}{}$$

$$\frac{\sqrt{\alpha}\cdot q\cdot\sqrt{(-c)}\cdot\sqrt{(}420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) \sim - 599\cdot Mu0}{21\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}}$$

$$\frac{\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar) - 1213\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} - 3360\cdot\pi^{2}\cdot hbar))}{} -$$

```
                                   2                                   2                  ~
 11·√30·√α·√(420·Mu0·α·c·q ·LN(8·R) - 420·Mu0·α·c·q ·LN(r) - 599·Mu0· ~
─────────────────────────────────────────────────────────────────────── ~
                                          2              2              ~
                                   210·π ·√Mu0·R·r ·√(-c)             ~

       2             2
α·c·q  - 1680·π ·hbar)        115·α·q    ⎞
────────────────────── + ─────────── ⎟ -
                               2    2     ⎟
                           14·π ·R·r  ⎠

⎛                                2                                   2                   ~
⎜ √15·√(α·(840·Mu0·α·c·q ·LN(8·R) - 840·Mu0·α·c·q ·LN(r) + 2·√30·√Mu0 ~
⎜─────────────────────────────────────────────────────────────────────── ~
⎜                                                                        ~
⎝                                                                        ~

                                   2                                   2                   ~
·√α·q·√(-c)·√(420·Mu0·α·c·q ·LN(8·R) - 420·Mu0·α·c·q ·LN(r) - 599·Mu0 ~
─────────────────────────────────────────────────────────────────────── ~
                               2             2                           ~
                          28·π ·√Mu0·R·r ·√(-c)                        ~

        2             2                                  2              2
·α·c·q  - 1680·π ·hbar) - 1213·Mu0·α·c·q  - 3360·π ·hbar))
──────────────────────────────────────────────────────────── +


                                 2                                   2                   ~
 4·√30·√α·√(420·Mu0·α·c·q ·LN(8·R) - 420·Mu0·α·c·q ·LN(r) - 599·Mu0·α ~
─────────────────────────────────────────────────────────────────────── ~
                                          2             2                ~
                                   35·π ·√Mu0·R·r ·√(-c)              ~

     2             2
·c·q  - 1680·π ·hbar)        93·α·q    ⎞     ⎛   6·α·q
────────────────────── - ────────── ⎟ - ⎜ ──────── -
                              2    2     ⎟     ⎜   2    2
                          7·π ·R·r   ⎠     ⎝ π ·R·r

                               2                                   2                   ~
 √30·√α·√(420·Mu0·α·c·q ·LN(8·R) - 420·Mu0·α·c·q ·LN(r) - 599·Mu0·α·c ~
─────────────────────────────────────────────────────────────────────── ~
                                         2             2                 ~
                                  15·π ·√Mu0·R·r ·√(-c)               ~

   2             2       ⎞
·q  - 1680·π ·hbar)   ⎟
─────────────────────── ⎟
                          ⎟
                          ⎠
```

Simplifying:

$$\#204: \frac{\sqrt{15}\cdot\sqrt{(\alpha\cdot(840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) + 2\cdot\sqrt{30}\cdot\sqrt{Mu0}\cdot\sqrt{\alpha} \sim}{\sim}$$

$$\frac{\cdot q\cdot\sqrt{(-c)}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot \sim}}{84\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)} \sim}$$

$$\frac{c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar) - 1213\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} - 3360\cdot\pi^{2}\cdot hbar))}{} +$$

$$\frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c \sim}}{210\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)} \sim}$$

$$\frac{\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar)}{} - \frac{13\cdot\alpha\cdot q}{14\cdot\pi^{2}\cdot R\cdot r^{2}}$$

This just above is res21.

We have (in view of #111) for b2 and res:

#205:b2 + res = 0

Substituting res21 for res and b221 for b2 into the left side of #175, we obtain our desired relation for ”r” after substituting for our known constants (including ”R” from #80 in terms of our given fundamental constants) since this sum of b2 and res vanishes.

$$\#206: \left(\frac{6\cdot\alpha\cdot q}{\pi^{2}\cdot R\cdot r^{2}} -\right.$$

$$\frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - \sim 599\cdot Mu0\cdot\alpha\cdot c}}{15\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)} \sim}$$

$$\frac{\cdot q^{2} - 1680\cdot \pi^{2}\cdot hbar)}{} \Bigg) +$$

$$\Bigg(\frac{\sqrt{15}\cdot\sqrt{}(\alpha\cdot(840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) + 2\cdot\sqrt{30}\cdot\sqrt{Mu0}}{} \sim$$

$$\frac{\cdot\sqrt{\alpha}\cdot q\cdot\sqrt{(-c)}\cdot\sqrt{}(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0}{84\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}} \sim$$

$$\frac{\cdot\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar) - 1213\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} - 3360\cdot\pi^{2}\cdot hbar))}{} +$$

$$\frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{}(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c}{210\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}} \sim$$

$$\frac{\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar)}{} - \frac{13\cdot\alpha\cdot q}{14\cdot\pi^{2}\cdot R\cdot r^{2}} \Bigg) = 0$$

Simplifying:

$$\#207: \frac{\sqrt{15}\cdot\sqrt{}(\alpha\cdot(840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) + 2\cdot\sqrt{30}\cdot\sqrt{Mu0}\cdot\sqrt{}}{} \sim$$

$$\frac{\cdot q\cdot\sqrt{(-c)}\cdot\sqrt{}(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot\alpha}{84\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}} \sim$$

$$\frac{c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar) - 1213\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} - 3360\cdot\pi^{2}\cdot hbar))}{} -$$

$$\frac{13\cdot\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot \sim}{210\cdot\pi^{2}\cdot\sqrt{Mu0\cdot R\cdot r^{2}}\cdot\sqrt{(-c)}}$$

$$\frac{\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar)}{} + \frac{71\cdot\alpha\cdot q}{14\cdot\pi^{2}\cdot R\cdot r^{2}} = 0$$

Multiplying the just above through by r^2 to simplify the algebra:

$$\#208: \left(\frac{\sqrt{15}\cdot\sqrt{(\alpha\cdot(840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) + 2\cdot\sqrt{30}\cdot\sqrt{Mu0}\cdot \sim}{}\right.$$

$$\frac{\alpha\cdot q\cdot\sqrt{(-c)}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot \sim}{84\cdot\pi^{2}\cdot\sqrt{Mu0\cdot R\cdot r^{2}}\cdot\sqrt{(-c)}}$$

$$\frac{\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar) - 1213\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} - 3360\cdot\pi^{2}\cdot hbar))}{} -$$

$$\frac{13\cdot\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0 \sim}{210\cdot\pi^{2}\cdot\sqrt{Mu0\cdot R\cdot r^{2}}\cdot\sqrt{(-c)}}$$

$$\left.\frac{\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar)}{} + \frac{71\cdot\alpha\cdot q}{14\cdot\pi^{2}\cdot R\cdot r^{2}} = 0\right)\cdot r^{2}$$

Simplifying:

$$\#209: \frac{\sqrt{15}\cdot\sqrt{(\alpha\cdot(840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) + 2\cdot\sqrt{30}\cdot\sqrt{Mu0}\cdot\sqrt{\sim}}{}$$

$$\frac{\cdot q\cdot\sqrt{(-c)}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot}}{84\cdot\pi^2\cdot\sqrt{Mu0}\cdot R\cdot\sqrt{(-c)}} \sim$$

$$\frac{c\cdot q^2 - 1680\cdot\pi^2\cdot hbar) - 1213\cdot Mu0\cdot\alpha\cdot c\cdot q^2 - 3360\cdot\pi^2\cdot hbar))}{} -$$

$$\frac{13\cdot\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(r) - 599\cdot Mu0\cdot}}{210\cdot\pi^2\cdot\sqrt{Mu0}\cdot R\cdot\sqrt{(-c)}} \sim$$

$$\frac{\alpha\cdot c\cdot q^2 - 1680\cdot\pi^2\cdot hbar)}{} + \frac{71\cdot\alpha\cdot q}{14\cdot\pi^2\cdot R} = 0$$

Substituting for R from #80:

$$\#210: \frac{\sqrt{15}\cdot\sqrt{\left(\alpha\cdot\left(840\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN\left(8\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^2 + 4\cdot\pi^2\cdot hbar}{4\cdot\pi^2\cdot c\cdot me}\right) - 840\cdot Mu0\cdot\alpha\cdot c\cdot\right.\right.}}{} \sim$$

$$\frac{{}^2\cdot LN(r) + 2\cdot\sqrt{30}\cdot\sqrt{Mu0}\cdot\sqrt{\alpha}\cdot q\cdot\sqrt{(-c)}\cdot\sqrt{\left(420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN\left(8\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^2 + 4}{4\cdot\pi^2\cdot c}\right.\right.}}{84\cdot\pi^2\cdot\sqrt{Mu0}\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^2 + 4\cdot\pi^2\cdot hbar}{4\cdot\pi^2\cdot c\cdot me}\cdot\sqrt{(-}} \sim$$

$$\frac{\cdot\pi^2\cdot hbar}{me}\Bigg) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c\cdot q^2 - 1680\cdot\pi^2\cdot hbar\Bigg) - \sim$$

$$\overline{c)} \sim$$

$$\frac{1213\cdot Mu0\cdot\alpha\cdot c\cdot q^2 - 3360\cdot\pi^2\cdot hbar\Bigg)\Bigg)}{} -$$

$$\frac{13\cdot\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{\Bigg(420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN\left(8\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^2 + 4\cdot\pi^2\cdot hbar}{4\cdot\pi^2\cdot c\cdot me}\right) - 420\cdot Mu0\cdot \sim}}{210\cdot\pi^2\cdot\sqrt{Mu0}\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^2 + 4\cdot\pi^2\cdot h}{4\cdot\pi^2\cdot c\cdot me} \sim}$$

$$\frac{\alpha\cdot c\cdot q^2\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c\cdot q^2 - 1680\cdot\pi^2\cdot hbar\Bigg)}{\frac{bar}{}\cdot\sqrt{(-c)}} +$$

$$\frac{71\cdot\alpha\cdot q}{14\cdot\pi^{2}\cdot\dfrac{Mu0\cdot\alpha\cdot c\cdot q^{2}+4\cdot\pi^{2}\cdot hbar}{4\cdot\pi^{2}\cdot c\cdot me}}$$

Substituting for our constants listed above, but not for r or α:

#211: $\sqrt{15}\cdot\sqrt{\left(\alpha\cdot\left(840\cdot(4\cdot\pi\cdot10^{-7})\cdot\alpha\cdot299792458\cdot(+\ 1.6021764874\cdot10^{-19})^{2}\right.\right.}$ ~ $\cdot LN\left(8\cdot\dfrac{(4\cdot\right.$

$$\frac{\cdot10^{-7})\cdot\alpha\cdot299792458\cdot(+\ 1.6021764874\cdot10^{-19})^{2}+4\cdot\pi^{2}\cdot(1.05457162853\cdot10^{-3}}{4\cdot\pi^{2}\cdot299792458\cdot(+\ 9.1093821545\cdot10^{-31})}$$

$$\left.\frac{{}^{4})}{}\right)-840\cdot(4\cdot\pi\cdot10^{-7})\cdot\alpha\cdot299792458\cdot(+\ 1.6021764874\cdot10^{-19})^{2}\cdot LN(r)+2\cdot$$

$$\frac{30\cdot\sqrt{(4\cdot\pi\cdot10^{-7})}\cdot\sqrt{\alpha}\cdot(+\ 1.6021764874\cdot10^{-19})\cdot\sqrt{(-299792458)}\cdot\sqrt{\left(420\cdot(4\cdot\pi\cdot10^{-}\right.}}{84\cdot\pi^{2}\cdot\sqrt{(4\cdot\pi\cdot10^{-}}}$$

$$\frac{{}^{7})\cdot\alpha\cdot299792458\cdot(+\ 1.6021764874\cdot10^{-19})^{2}\cdot LN\left(8\cdot\frac{(4\cdot\pi\cdot10^{-7})\cdot\alpha\cdot299792458\cdot(}{4\cdot\pi^{2}\cdot}\right.}{{}^{7})\cdot\frac{(4\cdot\pi\cdot10^{-7})\cdot\alpha\cdot299792458\cdot(+\ 1.6021764874\cdot10^{-19})^{2}+4\cdot\pi^{2}\cdot(1.05457162}{4\cdot\pi^{2}\cdot299792458\cdot(+\ 9.1093821545\cdot10^{-31})}}$$

$$\frac{\left.\frac{+\ 1.6021764874\cdot10^{-19})^{2}+4\cdot\pi^{2}\cdot(1.05457162853\cdot10^{-34})}{299792458\cdot(+\ 9.1093821545\cdot10^{-31})}\right)-420\cdot(4\cdot\pi\cdot10^{-7}}{\frac{853\cdot10^{-34})}{}\cdot\sqrt{(-299792458)}}$$

$$\frac{)\cdot\alpha\cdot299792458\cdot(+\ 1.6021764874\cdot10^{-19})^{2}\cdot LN(r)-599\cdot(4\cdot\pi\cdot10^{-7})\cdot\alpha\cdot299792}{}$$

$$458\cdot(+\ 1.6021764874\cdot10^{-19})^{2} - 1680\cdot\pi^{2}\cdot(1.05457162853\cdot10^{-34})\Big) - 1213\cdot(\sim$$

$$\overline{} \sim$$

$$4\cdot\pi\cdot10^{-7})\cdot\alpha\cdot299792458\cdot(+\ 1.6021764874\cdot10^{-19})^{2} - 3360\cdot\pi^{2}\cdot(1.0545716285 \sim$$

$$\overline{} \sim$$

$$3\cdot10^{-34})\Big)\Big)$$

$$\overline{} -$$

$$13\cdot\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{\Big(420\cdot(4\cdot\pi\cdot10^{-7})\cdot\alpha\cdot299792458\cdot(+\ 1.6021764874\cdot10^{-19})^{2}\cdot \mathrm{LN}\Big(8\cdot \sim}$$

$$\overline{} \sim$$

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                                2                         -31            ~
                            4·π ·299792458·(+ 9.1093821545·10    )       ~
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 9792458·(+ 9.1093821545·10    )                                        ~

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 - 599·(4·π·10   )·α·299792458·(+ 1.6021764874·10    )  - 1680·π ·(1.054~
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$$\frac{71\cdot\alpha\cdot(+\ 1.6021764874\cdot10^{-19})}{14\cdot\pi^{2}\cdot\frac{(4\cdot\pi\cdot10^{-7})\cdot\alpha\cdot299792458\cdot(+\ 1.6021764874\cdot10^{-19})^{2}+4\cdot\pi^{2}\cdot(1.0545\sim}{4\cdot\pi^{2}\cdot299792458\cdot(+\ 9.1093821545\cdot10^{-31})}}\sim$$

$$\frac{\quad}{7162853\cdot10^{-34})}$$

Setting α = 0.95.

$$\#212:\frac{\sqrt{15}\cdot\sqrt{\left(0.95\cdot\left(840\cdot(4\cdot\pi\cdot10^{-7})\cdot0.95\cdot299792458\cdot(+\ 1.6021764874\cdot10^{-19})^{2}\cdot\mathrm{LN}\left(\sim\right.\right.\right.}}{\sim}$$

$$\cdot\frac{\frac{(4\cdot\pi\cdot10^{-7})\cdot0.95\cdot299792458\cdot(+\ 1.6021764874\cdot10^{-19})^{2}+4\cdot\pi^{2}\cdot(1.054571\sim}{4\cdot\pi^{2}\cdot299792458\cdot(+\ 9.1093821545\cdot10^{-31})}}{\sim}$$

$$\frac{\left.\frac{2853\cdot10^{-34})}{}\right) - 840\cdot(4\cdot\pi\cdot10^{-7})\cdot0.95\cdot299792458\cdot(+ 1.6021764874\cdot10^{-19})^{2}}{}$$

$$\frac{\cdot LN(r) + 2\cdot\sqrt{30}\cdot\sqrt{(4\cdot\pi\cdot10^{-7})}\cdot\sqrt{0.95}\cdot(+ 1.6021764874\cdot10^{-19})\cdot\sqrt{(-299792458)}}{}$$

84

$$\frac{\cdot\sqrt{\left(420\cdot(4\cdot\pi\cdot10^{-7})\cdot0.95\cdot299792458\cdot(+ 1.6021764874\cdot10^{-19})^{2}\cdot LN\left(8\cdot\frac{(4\cdot\pi\cdot1}{}\right.\right.}}{\cdot\pi^{2}\cdot\sqrt{(4\cdot\pi\cdot10^{-7})}\cdot\frac{(4\cdot\pi\cdot10^{-7})\cdot0.95\cdot299792458\cdot(+ 1.6021764874\cdot10^{-19})^{2} +}{4\cdot\pi^{2}\cdot299792458\cdot(+ 9.1093821545\cdot}}$$

$$\frac{\frac{0^{-7})\cdot0.95\cdot299792458\cdot(+ 1.6021764874\cdot10^{-19})^{2} + 4\cdot\pi^{2}\cdot(1.05457162853\cdot10^{-}}{4\cdot\pi^{2}\cdot299792458\cdot(+ 9.1093821545\cdot10^{-31})}}{}$$

$$\frac{4\cdot\pi^{2}\cdot(1.05457162853\cdot10^{-34})}{10^{-31})}\cdot\sqrt{(-299792458)}$$

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0    )  - 3360·π  ·(1.05457162853·10    )⎟⎟
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                              4·π ·299792458·(+ 9.1093821545·10     )               ~
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 457162853·10    )                         -7                                      ~
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 92458·(+ 1.6021764874·10     )  + 4·π ·(1.05457162853·10     )                     ~
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     2                              -31                                             ~
  4·π ·299792458·(+ 9.1093821545·10     )                                           ~

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    ) ·LN(r) - 599·(4·π·10   )·0.95·299792458·(+ 1.6021764874·10     )  - ~
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$$\frac{1680\cdot\pi^{2}\cdot(1.05457162853\cdot10^{-34})\Big)}{\qquad} +$$

$$\frac{71\cdot0.95\cdot(+\ 1.6021764874\cdot10^{-19})}{14\cdot\pi^{2}\cdot\dfrac{(4\cdot\pi\cdot10^{-7})\cdot0.95\cdot299792458\cdot(+\ 1.6021764874\cdot10^{-19})^{2} + 4\cdot\pi^{2}\cdot(1.0}{4\cdot\pi^{2}\cdot299792458\cdot(+\ 9.1093821545\cdot10^{-31})}} \sim$$

$$\frac{\qquad}{5457162853\cdot10^{-34})}$$

Simplifying:

$$\#213{:}-\ 1.63399491122471267\cdot10^{-46}\cdot\hat{\imath}\cdot\sqrt{(}-\ 1.06201707598351766\cdot10^{77}\cdot LN(r)\ -$$

$$5.1095203443772735\cdot10^{79} + 3.86719279453311447\cdot10^{61}\cdot\hat{\imath}\cdot\sqrt{(}-$$

$$5.3869546078824987\cdot10^{29}\cdot LN(r) - 2.59164689266730805\cdot10^{32})) +$$

$$2.02088116443766213\cdot10^{-7} + 3.77266406289807648\cdot10^{-22}\cdot\hat{\imath}\cdot\sqrt{(}-$$

$$5.3869546078824987\cdot10^{29}\cdot LN(r) - 2.59164689266730805\cdot10^{32})$$

Set r = 10^-j:

$$\#214{:}-\ 1.63399491122471267\cdot10^{-46}\cdot\hat{\imath}\cdot\sqrt{(}-\ 1.06201707598351766\cdot10^{77}\cdot LN(10^{-j})\ -$$

$5.1095203443772735\cdot 10^{79} + 3.8671927945331 1447\cdot 10^{61}\cdot \hat{\imath}\cdot\sqrt{(-5.3869546078824987\cdot 10^{29}\cdot \mathrm{LN}(10^{-j}) - 2.5916468926673 0805\cdot 10^{32})}) + 2.02088116443766213\cdot 10^{-7} + 3.77266406289807648\cdot 10^{-22}\cdot \hat{\imath}\cdot\sqrt{(-5.3869546078824987\cdot 10^{29}\cdot \mathrm{LN}(10^{-j}) - 2.59164689266730805\cdot 10^{32})}$

The just above determines the value of "r", and so we look for zeros by first setting r = 10^-j.

#215:PrecisionDigits := 18

#216:FUN(j) := $- 1.63399491122471267\cdot 10^{-46}\cdot \hat{\imath}\cdot\sqrt{(-1.06201707598351766\cdot 10^{77}\cdot \mathrm{LN}(10^{-j}) - 5.1095203443772735\cdot 10^{79} + 3.86719279453311447\cdot 10^{61}\cdot \hat{\imath}\cdot\sqrt{(-5.3869546078824987\cdot 10^{29}\cdot \mathrm{LN}(10^{-j}) - 2.59164689266730805\cdot 10^{32})}) + 2.02088116443766213\cdot 10^{-7} + 3.77266406289807648\cdot 10^{-22}\cdot \hat{\imath}\cdot\sqrt{(-5.3869546078824987\cdot 10^{29}\cdot \mathrm{LN}(10^{-j}) - 2.59164689266730805\cdot 10^{32})}$

We look for zeros by generating zeros to FUN(n) with j = 50 up to 225 using increments of one:

#217:VECTOR([FUN(j), j], j, 50, 225)

#218:

$$\begin{bmatrix} -4.06925196785193713\cdot10^{-6} & 50 \\ -4.05577119301927929\cdot10^{-6} & 51 \\ -4.04224767269755768\cdot10^{-6} & 52 \\ -4.02868099767122486\cdot10^{-6} & 53 \\ -4.01507075215351978\cdot10^{-6} & 54 \\ -4.00141651363778243\cdot10^{-6} & 55 \\ -3.98771785274441497\cdot10^{-6} & 56 \\ -3.97397433306333233\cdot10^{-6} & 57 \\ -3.96018551099173877\cdot10^{-6} & 58 \\ -3.94635093556705982\cdot10^{-6} & 59 \\ -3.93247014829485157\cdot10^{-6} & 60 \\ -3.91854268297150147\cdot10^{-6} & 61 \\ -3.9045680655015268\cdot10^{-6} & 62 \\ -3.89054581370926807\cdot10^{-6} & 63 \\ -3.87647543714476584\cdot10^{-6} & 64 \\ -3.86235643688359987\cdot10^{-6} & 65 \\ -3.84818830532045939\cdot10^{-6} & 66 \\ -3.83397052595620293\cdot10^{-6} & 67 \\ -3.81970257317815492\cdot10^{-6} & 68 \\ {}^{-6} & \end{bmatrix}$$

$- 3.80538391203337472 \cdot 10$	69
$- 3.79101399799462125 \cdot 10^{-6}$	70
$- 3.77659227671872367 \cdot 10^{-6}$	71
$- 3.76211818379705466 \cdot 10^{-6}$	72
$- 3.74759114449778857 \cdot 10^{-6}$	73
$- 3.73301057349961137 \cdot 10^{-6}$	74
$- 3.71837587461653336 \cdot 10^{-6}$	75
$- 3.70368644051343861 \cdot 10^{-6}$	76
$- 3.68894165241198707 \cdot 10^{-6}$	77
$- 3.67414087978646646 \cdot 10^{-6}$	78
$- 3.65928348004917098 \cdot 10^{-6}$	79
$- 3.64436879822486255 \cdot 10^{-6}$	80
$- 3.62939616661384806 \cdot 10^{-6}$	81
$- 3.61436490444318226 \cdot 10^{-6}$	82
$- 3.59927431750548063 \cdot 10^{-6}$	83
$- 3.58412369778480017 \cdot 10^{-6}$	84
$- 3.5689123230690175 \cdot 10^{-6}$	85
$- 3.55363945654810404 \cdot 10^{-6}$	86
$- 3.5383043463976657 \cdot 10^{-6}$	87
$- 3.52290622534708132 \cdot 10^{-6}$	88

$-3.50744431023153779 \cdot 10^{-6}$	89
$-3.49191780152722187 \cdot 10^{-6}$	90
$-3.47632588286888816 \cdot 10^{-6}$	91
$-3.46066772054897947 \cdot 10^{-6}$	92
$-3.44494246299743013 \cdot 10^{-6}$	93
$-3.42914924024123371 \cdot 10^{-6}$	94
$-3.41328716334280477 \cdot 10^{-6}$	95
$-3.39735532381610856 \cdot 10^{-6}$	96
$-3.38135279301947364 \cdot 10^{-6}$	97
$-3.365278621523939 \cdot 10^{-6}$	98
$-3.34913183845591994 \cdot 10^{-6}$	99
$-3.33291145081290504 \cdot 10^{-6}$	100
$-3.31661644275081918 \cdot 10^{-6}$	101
$-3.30024577484160558 \cdot 10^{-6}$	102
$-3.28379838329949141 \cdot 10^{-6}$	103
$-3.26727317917430709 \cdot 10^{-6}$	104
$-3.25066904751012836 \cdot 10^{-6}$	105
$-3.23398484646740147 \cdot 10^{-6}$	106
$-3.21721940640659551 \cdot 10^{-6}$	107

$-3.20037152893130087\cdot10^{-6}$	108
$-3.18343998588855842\cdot10^{-6}$	109
$-3.16642351832405945\cdot10^{-6}$	110
$-3.14932083538970118\cdot10^{-6}$	111
$-3.13213061320081514\cdot10^{-6}$	112
$-3.11485149364020516\cdot10^{-6}$	113
$-3.09748208310593776\cdot10^{-6}$	114
$-3.08002095119961703\cdot10^{-6}$	115
$-3.06246662935165025\cdot10^{-6}$	116
$-3.04481760937976458\cdot10^{-6}$	117
$-3.02707234197677069\cdot10^{-6}$	118
$-3.00922923512328187\cdot10^{-6}$	119
$-2.99128665242078602\cdot10^{-6}$	120
$-2.97324291134013081\cdot10^{-6}$	121
$-2.95509628138011597\cdot10^{-6}$	122
$-2.93684498213048861\cdot10^{-6}$	123
$-2.918487181233205\cdot10^{-6}$	124
$-2.9000209922353511\cdot10^{-6}$	125
$-2.88144447232660056\cdot10^{-6}$	126

$^{-6}$

$- 2.86275561995352956 \cdot 10$	127
$- 2.84395237230249617 \cdot 10^{-6}$	128
$- 2.82503260264212397 \cdot 10^{-6}$	129
$- 2.80599411751569879 \cdot 10^{-6}$	130
$- 2.78683465377298659 \cdot 10^{-6}$	131
$- 2.76755187543010271 \cdot 10^{-6}$	132
$- 2.74814337034509865 \cdot 10^{-6}$	133
$- 2.72860664669587348 \cdot 10^{-6}$	134
$- 2.70893912924585075 \cdot 10^{-6}$	135
$- 2.68913815538157797 \cdot 10^{-6}$	136
$- 2.66920097090498788 \cdot 10^{-6}$	137
$- 2.64912472556149632 \cdot 10^{-6}$	138
$- 2.62890646828337943 \cdot 10^{-6}$	139
$- 2.60854314212595557 \cdot 10^{-6}$	140
$- 2.58803157887196978 \cdot 10^{-6}$	141
$- 2.56736849327721608 \cdot 10^{-6}$	142
$- 2.54655047692780359 \cdot 10^{-6}$	143
$- 2.52557399167654392 \cdot 10^{-6}$	144
$- 2.5044353626226683 \cdot 10^{-6}$	145
$- 2.48313077059542939 \cdot 10^{-6}$	146

$-2.4616562440980517\cdot10^{-6}$	147
$-2.44000765066390608\cdot10^{-6}$	148
$-2.41818068757162823\cdot10^{-6}$	149
$-2.39617087186009719\cdot10^{-6}$	150
$-2.37397352957764494\cdot10^{-6}$	151
$-2.35158378419247008\cdot10^{-6}$	152
$-2.32899654408285449\cdot10^{-6}$	153
$-2.30620648901627646\cdot10^{-6}$	154
$-2.28320805551570627\cdot10^{-6}$	155
$-2.25999542099905187\cdot10^{-6}$	156
$-2.23656248656364973\cdot10^{-6}$	157
$-2.2129028582715807\cdot10^{-6}$	158
$-2.18900982677309023\cdot10^{-6}$	159
$-2.164876345084098\cdot10^{-6}$	160
$-2.14049500430920614\cdot10^{-6}$	161
$-2.11585800707317263\cdot10^{-6}$	162
$-2.09095713839080264\cdot10^{-6}$	163
$-2.06578373366677483\cdot10^{-6}$	164
$-2.04032864347202968\cdot10^{-6}$	165

$-2.01458219469074716\cdot10^{-6}$	166
$-1.98853414757009427\cdot10^{-6}$	167
$-1.96217364813194349\cdot10^{-6}$	168
$-1.9354891753193231\cdot10^{-6}$	169
$-1.90846848214757563\cdot10^{-6}$	170
$-1.88109853000747643\cdot10^{-6}$	171
$-1.85336541512040143\cdot10^{-6}$	172
$-1.82525428596836431\cdot10^{-6}$	173
$-1.79674925030719136\cdot10^{-6}$	174
$-1.76783327011012504\cdot10^{-6}$	175
$-1.73848804247001742\cdot10^{-6}$	176
$-1.70869386409585778\cdot10^{-6}$	177
$-1.67842947655399326\cdot10^{-6}$	178
$-1.64767188880027029\cdot10^{-6}$	179
$-1.61639617279240647\cdot10^{-6}$	180
$-1.58457522701687172\cdot10^{-6}$	181
$-1.55217950155051243\cdot10^{-6}$	182
$-1.5191766767214751\cdot10^{-6}$	183
$-1.48553128542345867\cdot10^{-6}$	184

-6

$- 1.45120426651507589\cdot 10$	185
$- 1.41615243328223046\cdot 10^{-6}$	186
$- 1.38032783634373429\cdot 10^{-6}$	187
$- 1.34367699418965133\cdot 10^{-6}$	188
$- 1.30613995610199156\cdot 10^{-6}$	189
$- 1.26764915054486843\cdot 10^{-6}$	190
$- 1.22812795575614564\cdot 10^{-6}$	191
$- 1.1874889059628493\cdot 10^{-6}$	192
$- 1.14563141282352996\cdot 10^{-6}$	193
$- 1.10243883165601326\cdot 10^{-6}$	194
$- 1.05777462630749537\cdot 10^{-6}$	195
$- 1.01147726915387533\cdot 10^{-6}$	196
$- 9.63353325602173344\cdot 10^{-7}$	197
$- 9.13167864557998677\cdot 10^{-7}$	198
$- 8.6063081079395778\cdot 10^{-7}$	199
$- 8.0537691932196051\cdot 10^{-7}$	200
$- 7.46935299814438894\cdot 10^{-7}$	201
$- 6.84680935910591651\cdot 10^{-7}$	202
$- 6.1775319095156442\cdot 10^{-7}$	203
$- 5.44908797560746276\cdot 10^{-7}$	204

$- 4.64230499844768114 \cdot 10^{-7}$ 205

$- 3.72467674911157998 \cdot 10^{-7}$ 206

$- 2.63204557858959658 \cdot 10^{-7}$ 207

$- 1.19426105814776173 \cdot 10^{-7}$ 208

$2.09203895191786223 \cdot 10^{-7} + 8.47017791469128373 \cdot 10^{-8} \cdot \hat{\imath}$ 209

$2.09203895191786154 \cdot 10^{-7} + 3.49780588859470541 \cdot 10^{-7} \cdot \hat{\imath}$ 210

$2.09203895191786152 \cdot 10^{-7} + 4.8735872752532453 \cdot 10^{-7} \cdot \hat{\imath}$ 211

$2.09203895191786151 \cdot 10^{-7} + 5.93877595340427933 \cdot 10^{-7} \cdot \hat{\imath}$ 212

$2.09203895191786151 \cdot 10^{-7} + 6.8400487366652193 \cdot 10^{-7} \cdot \hat{\imath}$ 213

$2.09203895191786151 \cdot 10^{-7} + 7.6356711306327238 \cdot 10^{-7} \cdot \hat{\imath}$ 214

$2.0920389519178615 \cdot 10^{-7} + 8.35587700426475725 \cdot 10^{-7} \cdot \hat{\imath}$ 215

$2.0920389519178615 \cdot 10^{-7} + 9.01875198714451451 \cdot 10^{-7} \cdot \hat{\imath}$ 216

$2.0920389519178615 \cdot 10^{-7} + 9.63613482164117947 \cdot 10^{-7} \cdot \hat{\imath}$ 217

$2.0920389519178615 \cdot 10^{-7} + 1.02162762881623479 \cdot 10^{-6} \cdot \hat{\imath}$ 218

$2.0920389519178615 \cdot 10^{-7} + 1.0765198934125221 \cdot 10^{-6} \cdot \hat{\imath}$ 219

$2.0920389519178615 \cdot 10^{-7} + 1.12874583049734164 \cdot 10^{-6} \cdot \hat{\imath}$ 220

$2.0920389519178615 \cdot 10^{-7} + 1.1786599250069373 \cdot 10^{-6} \cdot \hat{\imath}$ 221

$2.0920389519178615 \cdot 10^{-7} + 1.22654444997708282 \cdot 10^{-6} \cdot \hat{\imath}$ 222

$2.0920389519178615 \cdot 10^{-7} + 1.27262852267337234 \cdot 10^{-6} \cdot \hat{\imath}$ 223

$$\begin{bmatrix} 2.0920389519178615\cdot 10^{-7} + 1.31710114481539941\cdot 10^{-6}\cdot \hat{\imath} & 224 \\ 2.0920389519178615\cdot 10^{-7} + 1.36012039710691101\cdot 10^{-6}\cdot \hat{\imath} & 225 \end{bmatrix}$$

There appears to possibly be a zero here as there is a sign change between 208 & 209.

#219:PrecisionDigits := 18

We investigate the region between 208 & 209 by setting r = 10^-(209 - j/1000) in #213 for a zeros by 10^-(209 - j/1000):

$$\#220{:}- 1.63399491122471267\cdot 10^{-46}\cdot \hat{\imath}\cdot \sqrt{(}- 1.06201707598351766\cdot 10^{77}\cdot \mathrm{LN}(10^{- (209 - j/1000)}) - 5.1095203443772735\cdot 10^{79} + 3.86719279453311447\cdot 10^{61}\cdot \hat{\imath}\cdot \sqrt{(}- 5.3869546078824987\cdot 10^{29}\cdot \mathrm{LN}(10^{- (209 - j/1000)}) - 2.59164689266730805\cdot 10^{32})) + 2.02088116443766213\cdot 10^{-7} + 3.77266406289807648\cdot 10^{-22}\cdot \hat{\imath}\cdot \sqrt{(}- 5.3869546078824987\cdot 10^{29}\cdot \mathrm{LN}(10^{- (209 - j/1000)}) - 2.59164689266730805\cdot 10^{32})$$

$$\#221{:}\mathrm{VECTOR}(\Big[- 1.63399491122471267\cdot 10^{-46}\cdot \hat{\imath}\cdot \sqrt{(}- 1.06201707598351766\cdot 10^{77}\cdot \mathrm{LN}(10^{- (209 - j/1000)}) - 5.1095203443772735\cdot 10^{79} + 3.86719279453311447\cdot 10^{61}\cdot \hat{\imath}\cdot \sqrt{(}- 5.3869546078824987\cdot 10^{29}\cdot \mathrm{LN}(10^{- (209 - j/1000)}) - 2.59164689266730805\cdot 10^{32})) + 2.02088116443766213\cdot 10^{-7} + 3.77266406289807648\cdot 10^{-22}\cdot \hat{\imath}\cdot \sqrt{(}- 5.3869546078824987\cdot 10^{29}\cdot \mathrm{LN}(10^{- (209 - j/1000)}) - 2.59164689266730805\cdot 10^{32}), j\Big], j, 0, 1000, 10)$$

Generating values:

#222:

$$\left[\begin{array}{cc}
2.09203895191786223\cdot 10^{-7} + 8.47017791469128373\cdot 10^{-8}\cdot \hat{\imath} & 0 \\
2.09203895191786235\cdot 10^{-7} + 7.76058676978109841\cdot 10^{-8}\cdot \hat{\imath} & 10 \\
2.09203895191786252\cdot 10^{-7} + 6.97921916234752314\cdot 10^{-8}\cdot \hat{\imath} & 20 \\
2.09203895191786278\cdot 10^{-7} + 6.09854845195611155\cdot 10^{-8}\cdot \hat{\imath} & 30 \\
2.09203895191786321\cdot 10^{-7} + 5.06705894238795221\cdot 10^{-8}\cdot \hat{\imath} & 40 \\
2.09203895191786406\cdot 10^{-7} + 3.76269576639024989\cdot 10^{-8}\cdot \hat{\imath} & 50 \\
2.09203895191786662\cdot 10^{-7} + 1.62501462614599298\cdot 10^{-8}\cdot \hat{\imath} & 60 \\
1.79410381870873414\cdot 10^{-7} & 70 \\
1.64044465107631462\cdot 10^{-7} & 80 \\
1.52714118992478106\cdot 10^{-7} & 90 \\
1.43303853427230617\cdot 10^{-7} & 100 \\
1.3507875644593005\cdot 10^{-7} & 110 \\
1.27679316789842414\cdot 10^{-7} & 120 \\
1.208977370082431\cdot 10^{-7} & 130 \\
1.14601050294504224\cdot 10^{-7} & 140 \\
1.08698079677551175\cdot 10^{-7} & 150 \\
1.03123078633354194\cdot 10^{-7} & 160 \\
9.78267865418218828\cdot 10^{-8} & 170 \\
9.2771163450457489\cdot 10^{-8} & 180 \\
{}^{-8} &
\end{array}\right.$$

8.7926107818044649·10	190
$8.32673143274768723 \cdot 10^{-8}$	200
$7.87748221700285943 \cdot 10^{-8}$	210
$7.44319998321184185 \cdot 10^{-8}$	220
$7.02248159447301083 \cdot 10^{-8}$	230
$6.61413034429934136 \cdot 10^{-8}$	240
$6.21711578595716103 \cdot 10^{-8}$	250
$5.83054308625351003 \cdot 10^{-8}$	260
$5.45362928102644235 \cdot 10^{-8}$	270
$5.08568462266388404 \cdot 10^{-8}$	280
$4.72609774537973244 \cdot 10^{-8}$	290
$4.37432373452295517 \cdot 10^{-8}$	300
$4.0298744339192182 \cdot 10^{-8}$	310
$3.69231049856236379 \cdot 10^{-8}$	320
$3.3612348232423565 \cdot 10^{-8}$	330
$3.03628706669185602 \cdot 10^{-8}$	340
$2.7171390559710765 \cdot 10^{-8}$	350
$2.40349090408953161 \cdot 10^{-8}$	360
$2.09506771006441935 \cdot 10^{-8}$	370
$1.79161673805297571 \cdot 10^{-8}$	380

$1.49290499319955895\cdot 10^{-8}$	390
$1.19871712806588177\cdot 10^{-8}$	400
$9.08853626159289126\cdot 10^{-9}$	410
$6.23129219009448146\cdot 10^{-9}$	420
$3.41371501108707695\cdot 10^{-9}$	430
$6.34197133015295018\cdot 10^{-10}$	440
$-2.10876329759327703\cdot 10^{-9}$	450
$-4.81657188407870874\cdot 10^{-9}$	460
$-7.49054640027132536\cdot 10^{-9}$	470
$-1.01319242869662565\cdot 10^{-8}$	480
$-1.27418693452694336\cdot 10^{-8}$	490
$-1.53214777295395442\cdot 10^{-8}$	500
$-1.78717833274745394\cdot 10^{-8}$	510
$-2.03937626022446946\cdot 10^{-8}$	520
$-2.28883389609901736\cdot 10^{-8}$	530
$-2.53563867051057783\cdot 10^{-8}$	540
$-2.77987346102303109\cdot 10^{-8}$	550
$-3.02161691775016495\cdot 10^{-8}$	560
$-3.26094375922358523\cdot 10^{-8}$	570

$-3.497925042158010 26\cdot10^{-8}$	580
$-3.732628407874592\cdot10^{-8}$	590
$-3.96511830780432888\cdot10^{-8}$	600
$-4.19545621020210817\cdot10^{-8}$	610
$-4.42370078995014769\cdot10^{-8}$	620
$-4.64990810311152938\cdot10^{-8}$	630
$-4.87413174770516413\cdot10^{-8}$	640
$-5.09642301200863884\cdot10^{-8}$	650
$-5.31683101155147745\cdot10^{-8}$	660
$-5.53540281583541733\cdot10^{-8}$	670
$-5.75218356570784828\cdot10^{-8}$	680
$-5.96721658221747653\cdot10^{-8}$	690
$-6.18054346769574613\cdot10^{-8}$	700
$-6.39220419973203417\cdot10^{-8}$	710
$-6.60223721864384869\cdot10^{-8}$	720
$-6.81067950898404866\cdot10^{-8}$	730
$-7.01756667557452011\cdot10^{-8}$	740
$-7.22293301450897451\cdot10^{-8}$	750
$-7.42681157952582477\cdot10^{-8}$	760
-8	

$-7.62923424411488249\cdot 10$	770
$-7.83023175968830446\cdot 10^{-8}$	780
$-8.02983381011640876\cdot 10^{-8}$	790
$-8.22806906290219427\cdot 10^{-8}$	800
$-8.42496521724437055\cdot 10^{-8}$	810
$-8.62054904921703404\cdot 10^{-8}$	820
$-8.8148464542746336\cdot 10^{-8}$	830
$-9.00788248727325587\cdot 10^{-8}$	840
$-9.19968140018333204\cdot 10^{-8}$	850
$-9.39026667765446839\cdot 10^{-8}$	860
$-9.57966107058005797\cdot 10^{-8}$	870
$-9.76788662779746296\cdot 10^{-8}$	880
$-9.95496472604881465\cdot 10^{-8}$	890
$-1.01409160983176657\cdot 10^{-7}$	900
$-1.03257608606478342\cdot 10^{-7}$	910
$-1.05095185375426314\cdot 10^{-7}$	920
$-1.06922080860352542\cdot 10^{-7}$	930
$-1.0873847918514339\cdot 10^{-7}$	940
$-1.10544559243824653\cdot 10^{-7}$	950
$-1.1234049490619726\cdot 10^{-7}$	960

$$
\begin{bmatrix}
-\ 1.1412645521319267 \cdot 10^{-7} & 970 \\
-\ 1.15902604562569181 \cdot 10^{-7} & 980 \\
-\ 1.1766910288552659 \cdot 10^{-7} & 990 \\
-\ 1.19426105814776173 \cdot 10^{-7} & 1000
\end{bmatrix}
$$

There is a sign change between 440 and 450 indicating a zero.,
and so we use 445 in the trial value for r: 10^-(190 - 445/1000)

$$
\#223{:}\mathrm{NEWTON}(-\ 1.63399491122471267 \cdot 10^{-46} \cdot î \cdot \sqrt{(}-\ 1.06201707598351766 \cdot 10^{77} \cdot \mathrm{LN}(r
$$

$$
-\ 5.1095203443772735 \cdot 10^{79} + 3.86719279453311447 \cdot 10^{61} \cdot î \cdot \sqrt{(}-
$$

$$
5.3869546078824987 \cdot 10^{29} \cdot \mathrm{LN}(r) - 2.59164689266730805 \cdot 10^{32})) +
$$

$$
2.02088116443766213 \cdot 10^{-7} + 3.77266406289807648 \cdot 10^{-22} \cdot î \cdot \sqrt{(}-
$$

$$
5.3869546078824987 \cdot 10^{29} \cdot \mathrm{LN}(r) - 2.59164689266730805 \cdot 10^{32}), r, 10^{-(209 - 445/1000)}, 20)
$$

Executing:

$$
\#224{:}[2.78612116862977036 \cdot 10^{-209}, 2.76877232873308158 \cdot 10^{-209},
$$

$$
2.76885668700776039 \cdot 10^{-209}, 2.76885668902726995 \cdot 10^{-209},
$$

$$
2.76885668902726996 \cdot 10^{-209}, 2.7688566890272699 \cdot 10^{-209},
$$

$$
2.76885668902726994 \cdot 10^{-209}, 2.76885668902726992 \cdot 10^{-209},
$$

$$
2.7688566890272699 \cdot 10^{-209}, 2.76885668902726994 \cdot 10^{-209},
$$

$$
2.76885668902726993 \cdot 10^{-209}, 2.76885668902726993 \cdot 10^{-209},
$$

$$
2.76885668902726993 \cdot 10^{-209}, 2.76885668902726993 \cdot 10^{-209},
$$

$$2.76885668902726993\cdot 10^{-209},\ 2.76885668902726993\cdot 10^{-209},$$

$$2.76885668902726993\cdot 10^{-209},\ 2.76885668902726993\cdot 10^{-209},$$

$$2.76885668902726993\cdot 10^{-209},\ 2.76885668902726993\cdot 10^{-209},$$

$$2.76885668902726993\cdot 10^{-209}]$$

We have convergence and our value for r here is:

$$\#225{:}\ 2.76885668902726993\cdot 10^{-209}$$

We recall the completely normalized charge density formula:

$$\#226{:}\ \frac{2\cdot\pi^2\cdot R\cdot r^2\cdot(b0\cdot rhor + b1\cdot rhor^2 + b2\cdot rhor^3 + res)}{\alpha\cdot q\cdot rhor}$$

Substituting for res using res21 (from #204), b0 using b021 from (#201), b1 using b121 (from #197), and b2 using b221 (from #194), and then substituting for R from #80 for two steps as the first step involves substituting expressions that contain R:

$$\#227{:}\ \frac{2\cdot\pi^2\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^2 + 4\cdot\pi^2\cdot hbar}{4\cdot\pi^2\cdot c\cdot me}\cdot r^2\cdot\left(\left(-\frac{\sqrt{15}\cdot\sqrt{\left(\alpha\cdot\left(840\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN\left(8\cdot\frac{M}{\ }\right.\right.\right.}}{\ }\right.\right.}{\ }$$

$$\frac{\dfrac{0\cdot\alpha\cdot c\cdot q^{2} + 4\cdot\pi^{2}\cdot hbar}{4\cdot\pi^{2}\cdot c\cdot me}\Bigg) - 840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) + 2\cdot\sqrt{30}\cdot\sqrt{Mu0}\cdot\sqrt{\alpha}\cdot q\cdot\sqrt{(-c)}}{21\cdot}$$

$$\frac{\cdot\sqrt{\left(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN\left(8\cdot\dfrac{Mu0\cdot\alpha\cdot c\cdot q^{2} + 4\cdot\pi^{2}\cdot hbar}{4\cdot\pi^{2}\cdot c\cdot me}\right) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(\right.}}{\pi^{2}\cdot\sqrt{Mu0}\cdot\dfrac{Mu0\cdot\alpha\cdot c\cdot q^{2} + 4\cdot\pi^{2}\cdot hbar}{4\cdot\pi^{2}\cdot c\cdot me}\cdot r^{2}\cdot\sqrt{(-c)}}$$

$$\left.r) - 599\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar\right) - 1213\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} - 3360\cdot\pi^{2}\cdot hbar\Big)$$

$$\Big) - \frac{11\cdot\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{\left(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN\left(8\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^{2} + 4\cdot\pi^{2}\cdot hbar}{4\cdot\pi^{2}\cdot c\cdot me}\right) - 420\right.}}{210\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^{2} + 4\cdot\pi}{4\cdot\pi^{2}\cdot c\cdot me}}$$

$$\frac{\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar\Big)}{\frac{{}^{2}\ \cdot hbar}{\quad}\cdot r^{2}\cdot\sqrt{(-c)}} + \frac{1}{14\cdot\pi^{2}\cdot\frac{Mu0\cdot\alpha\cdot c}{\quad}}$$

$$\frac{15\cdot\alpha\cdot q}{\frac{\cdot q^{2} + 4\cdot\pi^{2}\cdot hbar}{4\cdot\pi^{2}\cdot c\cdot me}\cdot r^{2}}\Bigg)\cdot rhor + \left(\frac{3\cdot\sqrt{\left(5880\cdot Mu0\cdot\alpha^{2}\cdot c\cdot q^{2}\cdot LN\left(8\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^{2}}{4\cdot\pi^{2}}\right.\right.}}{\quad}\right.$$

$$\frac{\left.\frac{+ 4\cdot\pi^{2}\cdot hbar}{\cdot c\cdot me}\right) - 5880\cdot Mu0\cdot\alpha^{2}\cdot c\cdot q^{2}\cdot LN(r) + Mu0\cdot c\cdot\left(5\cdot\pi^{4}\cdot\left(\frac{Mu0\cdot\alpha\cdot c\cdot q^{2} + 4}{4\cdot\pi^{2}\cdot c\cdot}\right.\right.}{}$$

$$\frac{\left.\frac{\cdot\pi^{2}\cdot hbar}{me}\right)^{2}\cdot\left(\frac{6\cdot\alpha\cdot q}{\pi^{2}\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^{2} + 4\cdot\pi^{2}\cdot hbar}{4\cdot\pi^{2}\cdot c\cdot me}\cdot r^{2}} - \frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{\left(420\cdot Mu0\cdot\alpha\cdot c\right.}}{}\right.}{}$$

$$\cdot q^{2}\cdot LN\left(8\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^{2}+4\cdot\pi^{2}\cdot hbar}{4\cdot\pi^{2}\cdot c\cdot me}\right)-420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r)-599\cdot Mu0\cdot\alpha$$

―――――――――――――――――――――――――――――――――――――

$$15\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^{2}+4\cdot\pi^{2}\cdot hbar}{4\cdot\pi^{2}\cdot c\cdot me}\cdot r^{2}\cdot\sqrt{(-c)}$$

―――――――――――――――――――――――――――――――――――――

$$56\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot\frac{Mu0\cdot\alpha\cdot c}{}$$

―――――――――――――――――――――――――――――――――――――

$$\left.\left.\frac{\cdot c\cdot q^{2}-1680\cdot\pi^{2}\cdot hbar\Big)}{}\right)^{2}\cdot r^{4}+140\cdot\pi^{2}\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^{2}+4\cdot\pi^{2}\cdot hbar}{4\cdot\pi^{2}\cdot c\cdot me}\cdot\alpha\cdot\left(\frac{}{\pi^{2}\cdot}\right.\right.$$

―――――――――――――――――――――――――――――――――――――

$$\frac{\cdot q^{2}+4\cdot\pi^{2}\cdot hbar}{4\cdot\pi^{2}\cdot c\cdot me}\cdot r^{2}\cdot\sqrt{(-c)}$$

―――――――――――――――――――――――――――――――――――――

$$\frac{\dfrac{6\cdot\alpha\cdot q}{\dfrac{Mu0\cdot\alpha\cdot c\cdot q^2 + 4\cdot\pi^2\cdot hbar}{4\cdot\pi^2\cdot c\cdot me}\cdot r^2} - \dfrac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{\left(420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN\left(8\cdot\dfrac{Mu0\cdot\alpha\cdot c}{}\right.\right.}}{15\cdot\pi}}{} \sim$$

$$\frac{\dfrac{\cdot q^2 + 4\cdot\pi^2\cdot hbar}{4\cdot\pi^2\cdot c\cdot me}\Bigg) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c\cdot q^2 - 1680\cdot\pi^2\cdot h}{\dfrac{{}^2\cdot\sqrt{Mu0}\cdot\dfrac{Mu0\cdot\alpha\cdot c\cdot q^2 + 4\cdot\pi^2\cdot hbar}{4\cdot\pi^2\cdot c\cdot me}\cdot r^2\cdot\sqrt{(-c)}}{}} \sim$$

$$\alpha\cdot q\cdot rhor$$

$$\frac{\left.\text{bar}\right)}{}\left.\cdot q\cdot r^{2} - 9506\cdot\alpha^{2}\cdot q^{2}\right) - 23520\cdot\pi^{2}\cdot\alpha\cdot hbar\Bigg) - 3\cdot\left(4\cdot\pi^{2}\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^{2}}{4\cdot\pi^{2}}\right. \sim$$

$$\frac{+ 4\cdot\pi^{2}\cdot hbar}{\cdot c\cdot me}\cdot\left(\frac{6\cdot\alpha\cdot q}{\pi^{2}\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^{2} + 4\cdot\pi^{2}\cdot hbar}{4\cdot\pi^{2}\cdot c\cdot me}\cdot r^{2}} - \frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{\left(420\cdot Mu0\cdot\alpha\cdot\right.}}{}\right. \sim$$

$$7\cdot\pi^{2}\cdot\frac{Mu}{} \sim$$

$$c\cdot q^{2}\cdot LN\left(8\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^{2}+4\cdot\pi^{2}\cdot hbar}{4\cdot\pi^{2}\cdot c\cdot me}\right)-420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r)-599\cdot Mu0\cdot \sim$$

$$\overline{\qquad 15\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^{2}+4\cdot\pi^{2}\cdot hbar}{4\cdot\pi^{2}\cdot c\cdot me}\cdot r^{2}\cdot\sqrt{(-c)} \qquad} \sim$$

$$\overline{\frac{0\cdot\alpha\cdot c\cdot q^{2}+4\cdot\pi^{2}\cdot hbar}{4\cdot\pi^{2}\cdot c\cdot me}\cdot r^{2}} \sim$$

$$\frac{\left.\left.\frac{\left.\alpha\cdot c\cdot q^{2}-1680\cdot\pi^{2}\cdot hbar\right)}{\qquad}\right)\cdot r^{2}+7\cdot\alpha\cdot q\right)}{\qquad}\right)\cdot rhor^{2}+\left(\frac{6\cdot\alpha\cdot q}{\pi^{2}\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^{2}+4\cdot\pi}{4\cdot\pi^{2}\cdot c\cdot me}}\right. \sim$$

$$\frac{\qquad}{\dfrac{{}^{2}\cdot hbar}{\qquad}\cdot r^{2}} - \frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{\left(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN\left(8\cdot\dfrac{Mu0\cdot\alpha\cdot c\cdot q^{2} + 4\cdot\pi^{2}\cdot hbar}{4\cdot\pi^{2}\cdot c\cdot me}\right)\right.} \sim}{15\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot\dfrac{Mu0\cdot\alpha\cdot c\cdot q \sim}{4\cdot \sim}} \sim$$

$$\left.\frac{- 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar\Big)}{\dfrac{{}^{2} + 4\cdot\pi^{2}\cdot hbar}{\pi^{2}\cdot c\cdot me}\cdot r^{2}\cdot\sqrt{(-c)}}\right)\cdot rhor^{3} + \Big(- \sim$$

$$\frac{\sqrt{15}\cdot\sqrt{\left(\alpha\cdot\left(840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN\left(8\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^{2}+4\cdot\pi^{2}\cdot hbar}{4\cdot\pi^{2}\cdot c\cdot me}\right)-840\cdot Mu0\cdot\alpha\cdot c\cdot\right.\right.}\sim}{\sim}$$

$$\frac{q^{2}\cdot LN(r)+2\cdot\sqrt{30}\cdot\sqrt{Mu0}\cdot\sqrt{\alpha}\cdot q\cdot\sqrt{(-c)}\cdot\sqrt{\left(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN\left(8\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^{2}+}{4\cdot\pi^{2}\cdot c}\right.\right.}\sim}{84\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^{2}+4\cdot\pi^{2}\cdot hbar}{4\cdot\pi^{2}\cdot c\cdot me}\cdot r^{2}\cdot\sqrt{}\sim}$$

$$\frac{\frac{\frac{4\cdot\pi^{2}\cdot hbar}{\cdot me}\Big) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar\Big) -}{(-c)}}{}$$ ~

$$\frac{\frac{1213\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} - 3360\cdot\pi^{2}\cdot hbar\Big)\Big)}{} + \frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{\Big(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN\Big(8\cdot\frac{M}{}}}{}}{}$$ ~

$$\frac{\frac{u0\cdot\alpha\cdot c\cdot q^{2} + 4\cdot\pi^{2}\cdot hbar}{4\cdot\pi^{2}\cdot c\cdot me}\Bigg) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} - 168}{210\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^{2} + 4\cdot\pi^{2}\cdot hbar}{4\cdot\pi^{2}\cdot c\cdot me}\cdot r^{2}\cdot\sqrt{(-c)}}$$

$$\frac{\frac{0\cdot\pi^{2}\cdot hbar\Big)}{} - \frac{13\cdot\alpha\cdot q}{14\cdot\pi^{2}\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^{2} + 4\cdot\pi^{2}\cdot hbar}{4\cdot\pi^{2}\cdot c\cdot me}\cdot r^{2}}\Bigg)\Bigg)}{}$$

Simplifying:

$$\#228: \frac{\sqrt{15}\cdot(3\cdot rhor^{2} - 4\cdot rhor + 1)\cdot\sqrt{\Bigg(\alpha\cdot\Bigg(840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN\Bigg(\frac{2\cdot(Mu0\cdot\alpha\cdot c\cdot q^{2} + 4\cdot}{\pi^{2}\cdot c\cdot me}}}{}$$

$$\frac{\frac{{}^{2}\cdot hbar)}{}\Bigg) - 840\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) + 2\cdot\sqrt{30}\cdot\sqrt{Mu0}\cdot\sqrt{\alpha}\cdot q\cdot\sqrt{(-c)}\cdot\sqrt{\Bigg(420\cdot Mu0\cdot\alpha}}{42\cdot\sqrt{Mu0}\cdot\alpha\cdot q\cdot rho}$$

$$\frac{c \cdot q^2 \cdot \mathrm{LN}\left(\frac{2 \cdot (Mu0 \cdot \alpha \cdot c \cdot q^2 + 4 \cdot \pi^2 \cdot hbar)}{\pi^2 \cdot c \cdot me}\right) - 420 \cdot Mu0 \cdot \alpha \cdot c \cdot q^2 \cdot \mathrm{LN}(r) - 599 \cdot Mu \sim}{\cdot \sqrt{(-c)} \sim}$$

$$\frac{0 \cdot \alpha \cdot c \cdot q^2 - 1680 \cdot \pi^2 \cdot hbar\Big) - 1213 \cdot Mu0 \cdot \alpha \cdot c \cdot q^2 - 3360 \cdot \pi^2 \cdot hbar\Big)\Big)}{} +$$

$$\frac{\sqrt{15} \cdot \Big(\sqrt{2} \cdot (14 \cdot rhor^3 - 24 \cdot rhor^2 + 11 \cdot rhor - 1) \cdot \sqrt{(-c)} \cdot \sqrt{\Big(420 \cdot Mu0 \cdot \alpha \cdot c \cdot q^2 \cdot L \sim}}{\sim}$$

$$\frac{N\left(\frac{Mu0 \cdot \alpha \cdot c \cdot q^2 + 4 \cdot \pi^2 \cdot hbar}{c \cdot me}\right) - 420 \cdot Mu0 \cdot \alpha \cdot c \cdot q^2 \cdot \mathrm{LN}\left(\frac{\pi^2 \cdot r}{2}\right) - 599 \cdot Mu0 \cdot \alpha \cdot c \sim}{105 \cdot \sqrt{Mu0} \cdot \sqrt{\alpha} \cdot c \cdot q \cdot rhor \sim}$$

$$\frac{\cdot q^2 - 1680 \cdot \pi^2 \cdot hbar\Big) + \sqrt{15} \cdot \sqrt{Mu0} \cdot \sqrt{\alpha} \cdot c \cdot q \cdot (84 \cdot rhor^3 - 186 \cdot rhor^2 + 115 \cdot rho \sim}{\sim}$$

$$\frac{r - 13)\Big)}{}$$

Substituting for our constants but not r and α:

$$\#229: \frac{\sqrt{15} \cdot (3 \cdot rhor^2 - 4 \cdot rhor + 1) \cdot \sqrt{\Big(\alpha \cdot \Big(840 \cdot (4 \cdot \pi \cdot 10^{-7}) \cdot \alpha \cdot 299792458 \cdot \sim (+ 1.60217}{\sim}$$

$$\frac{4874\cdot 10^{-19})^2\cdot LN\left(\frac{2\cdot((4\cdot\pi\cdot 10^{-7})\cdot\alpha\cdot 299792458\cdot(+\ 1.6021764874\cdot 10^{-19})^2\ +}{\pi^2\cdot 299792458\cdot(+\ 9.1093821545\cdot 1}\right.}{}\sim$$

$$\frac{\left.\frac{4\cdot\pi^2\cdot(1.05457162853\cdot 10^{-34}))}{0^{-31})}\right)\ -\ 840\cdot(4\cdot\pi\cdot 10^{-7})\cdot\alpha\cdot 299792458\cdot(+\ 1.60217}{}\sim$$

$$\frac{64874\cdot 10^{-19})^2\cdot LN(r)\ +\ 2\cdot\sqrt{30}\cdot\sqrt{(4\cdot\pi\cdot 10^{-7})}\cdot\sqrt{\alpha}\cdot(+\ 1.6021764874\cdot 10^{-19})\cdot\sqrt{(-}}{}\sim$$

$$\frac{299792458)\cdot\sqrt{\left(420\cdot(4\cdot\pi\cdot 10^{-7})\cdot\alpha\cdot 299792458\cdot(+\ 1.6021764874\cdot 10^{-19})^2\cdot LN\left(\frac{2}{}\right.\right.}}{42\cdot\sqrt{(4\cdot\pi\cdot 10^{-7})}\cdot\alpha\cdot(+\ 1.6021764874\cdot 10^{-19})\cdot rhor\cdot}\sim$$

$$\frac{\frac{\cdot((4\cdot\pi\cdot 10^{-7})\cdot\alpha\cdot 299792458\cdot(+\ 1.6021764874\cdot 10^{-19})^2\ +\ 4\cdot\pi^2\cdot(1.0545716285}{\pi^2\cdot 299792458\cdot(+\ 9.1093821545\cdot 10^{-31})}}{\sqrt{(-299792458)}}\sim$$

$$\frac{\left.\frac{3\cdot 10^{-34}))}{}\right)\ -\ 420\cdot(4\cdot\pi\cdot 10^{-7})\cdot\alpha\cdot 299792458\cdot(+\ 1.6021764874\cdot 10^{-19})^2\cdot LN(r}{}\sim$$

$) - 599\cdot(4\cdot\pi\cdot10^{-7})\cdot\alpha\cdot299792458\cdot(+\ 1.6021764874\cdot10^{-19})^{2} - 1680\cdot\pi^{2}\cdot(1.0$ ~

$5457162853\cdot10^{-34})) - 1213\cdot(4\cdot\pi\cdot10^{-7})\cdot\alpha\cdot299792458\cdot(+\ 1.6021764874\cdot10^{-1}$ ~

$9)^{2} - 3360\cdot\pi^{2}\cdot(1.05457162853\cdot10^{-34}))) +$

$\sqrt{15}\cdot(\sqrt{2}\cdot(14\cdot rhor^{3} - 24\cdot rhor^{2} + 11\cdot rhor - 1)\cdot\sqrt{(-299792458)}\cdot\sqrt{(}420\cdot(4\cdot\pi$ ~

$\cdot10^{-7})\cdot\alpha\cdot299792458\cdot(+\ 1.6021764874\cdot10^{-19})^{2}\cdot LN\left(\frac{(4\cdot\pi\cdot10^{-7})\cdot\alpha\cdot299792458}{}\right.$ ~

$\left.\frac{\cdot(+\ 1.6021764874\cdot10^{-19})^{2} + 4\cdot\pi^{2}\cdot(1.05457162853\cdot10^{-34})}{299792458\cdot(+\ 9.1093821545\cdot10^{-31})}\right) - 420\cdot(4\cdot\pi\cdot10$ ~

$105\cdot\sqrt{(4\cdot\pi\cdot10^{-7})}\cdot$ ~

$$\frac{{}^{-7})\cdot\alpha\cdot 299792458\cdot(+\ 1.6021764874\cdot 10^{-19})^{2}\cdot \mathrm{LN}\left(\frac{\pi^{2}\cdot r}{2}\right) - 599\cdot(4\cdot\pi\cdot 10^{-7})\cdot\alpha \sim}{\sqrt{\alpha}\cdot 299792458\cdot(+\ 1.6021764874\cdot 10^{-19})\cdot \mathrm{rhor}}$$

$$\frac{\left.\cdot 299792458\cdot(+\ 1.6021764874\cdot 10^{-19})^{2} - 1680\cdot\pi^{2}\cdot(1.05457162853\cdot 10^{-34})\right) + \sim}{}$$

$$\frac{}{\sqrt{15}\cdot\sqrt{(4\cdot\pi\cdot 10^{-7})}\cdot\sqrt{\alpha}\cdot 299792458\cdot(+\ 1.6021764874\cdot 10^{-19})\cdot(84\cdot \mathrm{rhor}^{3} - 186\cdot \sim}$$

$$\frac{}{\left.\mathrm{rhor}^{2} + 115\cdot \mathrm{rhor} - 13)\right)}$$

Setting α = 0.95 and r = #225:

$$\#230:\ \frac{\sqrt{15}\cdot(3\cdot \mathrm{rhor}^{2} - 4\cdot \mathrm{rhor} + 1)\cdot\sqrt{\left(0.95\cdot\left(840\cdot(4\cdot\pi\cdot 10^{-7})\cdot 0.95\cdot 299792458\cdot(+\ 1 \sim\right.\right.}}{}$$

$$\frac{6021764874\cdot 10^{-19})^{2}\cdot \mathrm{LN}\left(\frac{2\cdot((4\cdot\pi\cdot 10^{-7})\cdot 0.95\cdot 299792458\cdot(+\ 1.6021764874\cdot 1 \sim}{\pi^{2}\cdot 299792458\cdot(+\ 9.109 \sim}\right.}{}$$

```
 -19 2       2                              -34 ⎞                                 ~
0    )  + 4·π  ·(1.05457162853·10    ))⎟                       -7               ~
─────────────────────────────────────────────────⎟ - 840·(4·π·10  )·0.95·29979245~
             -31                                 ⎟                                 ~
821545·10    )                                   ⎠                                 ~
────────────────────────────────────────────────────────────────────────────────────~
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                              -19 2                              -209              ~
8·(+ 1.6021764874·10    ) ·LN(2.76885668902726993·10     ) + 2·√30·√(4·~
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────────────────────────────────────────────────────────────────────────────────────~
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                                                                  ⎛                ~
   -7                                    -19                      ⎜            -7  ~
π·10   )·√0.95·(+ 1.6021764874·10    )·√(-299792458)·√⎜420·(4·π·10  )·0~
                                                                  ⎜                ~
                                                                  ⎝                ~
────────────────────────────────────────────────────────────────────────────────────~
                                                                                   ~
                                                                        42·√(4·~
                                                   ⎛                               ~
                                                   ⎜                  -7           ~
                                          -19 2    ⎜ 2·((4·π·10  )·0.95·29979245~
.95·299792458·(+ 1.6021764874·10    ) ·LN⎜────────────────────────────────────~
                                                   ⎜                            2  ~
                                                   ⎝                            π ·~
────────────────────────────────────────────────────────────────────────────────────~
   -7                                    -19                                       ~
π·10   )·0.95·(+ 1.6021764874·10    )·rhor·√(-299792458)                         ~

                              -19 2       2                              -34 ⎞                 ~
8·(+ 1.6021764874·10    )  + 4·π  ·(1.05457162853·10    ))⎟                 ~
──────────────────────────────────────────────────────────────────⎟ - 420·(4·π·~
                                          -31                                 ⎟                 ~
299792458·(+ 9.1093821545·10    )                                            ⎠                 ~
────────────────────────────────────────────────────────────────────────────────────~
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  -7                                                    -19 2                      ~
10   )·0.95·299792458·(+ 1.6021764874·10    ) ·LN(2.76885668902726993·1~
                                                                                   ~
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────────────────────────────────────────────────────────────────────────────────────~
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$$0^{-209}) - 599\cdot(4\cdot\pi\cdot 10^{-7})\cdot 0.95\cdot 299792458\cdot(+\ 1.6021764874\cdot 10^{-19})^{2} - 1680 \sim$$

$$\cdot\pi^{2}\cdot(1.05457162853\cdot 10^{-34})\Big) - 1213\cdot(4\cdot\pi\cdot 10^{-7})\cdot 0.95\cdot 299792458\cdot(+\ 1.6021 \sim$$

$$764874\cdot 10^{-19})^{2} - 3360\cdot\pi^{2}\cdot(1.05457162853\cdot 10^{-34})\Big)\Big)\Big) +$$

$$\sqrt{15}\cdot\Big(\sqrt{2}\cdot(14\cdot rhor^{3} - 24\cdot rhor^{2} + 11\cdot rhor - 1)\cdot\sqrt{(-299792458)}\cdot\sqrt{\Big(420\cdot(4\cdot\pi} \sim$$

$$\cdot 10^{-7})\cdot 0.95\cdot 299792458\cdot(+\ 1.6021764874\cdot 10^{-19})^{2}\cdot LN\Big(\frac{(4\cdot\pi\cdot 10^{-7})\cdot 0.95\cdot 299}{} \sim$$

$$\frac{792458\cdot(+\ 1.6021764874\cdot 10^{-19})^{2} + 4\cdot\pi^{2}\cdot(1.05457162853\cdot 10^{-34})}{299792458\cdot(+\ 9.1093821545\cdot 10^{-31})}\Big) - 420\cdot(\sim$$

```
            -7                                          -19 2    ⎛  2                     ~
4·π·10   )·0.95·299792458·(+ 1.6021764874·10     ) ·LN⎜ π  ·(2.7688566890 ~
                                                                        ⎜ ──────────────── ~
                                                                        ⎝                 2 ~
──────────────────────────────────────────────────────────────────────────── ~
                     -7                                              -19                  ~
   105·√(4·π·10   )·√0.95·299792458·(+ 1.6021764874·10    )·rhor               ~

          -209  ⎞                                                                  ~
2726993·10     )⎟                    -7                                           - ~
────────────────⎟  - 599·(4·π·10   )·0.95·299792458·(+ 1.6021764874·10 ~
                ⎠                                                                  ~
──────────────────────────────────────────────────────────────────────────── ~

19 2            2                          -34 ⎞                    -7                 ~
  )  - 1680·π  ·(1.05457162853·10     )⎟  + √15·√(4·π·10   )·√0.95·2997924 ~
                                               ⎠                                       ~
──────────────────────────────────────────────────────────────────────────── ~

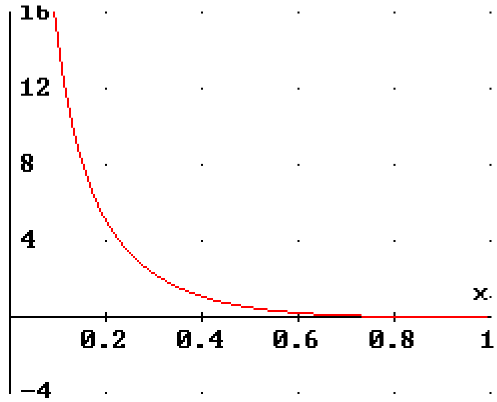
                             -19              3              2                  ⎞
58·(+ 1.6021764874·10    )·(84·rhor  - 186·rhor  + 115·rhor - 13)⎟
                                                                                 ⎠
─────────────────────────────────────────────────────────────────────────
```

Simplifying:

#231: $$- 2\cdot rhor^2 + 6\cdot rhor + \frac{2}{rhor} - 6$$

The coeficiants turn out to be one digit integers!

We plot this completely normalized charge density function:



We accept this plot and the completely normalized charge density function plotted above from α = 0.95, res21, b021, b121, b221, r from #225, and R from #80.

We next try for a solution using b222 with b12:

#232:PrecisionDigits := 18

Now we can calculate our coefficients: res22 for res, b022 for b0, b122 for b1, and b222 for b2 ... in terms of only our known constants,

so we recall b12 (#51):

$$\#233:\ \frac{3\cdot\sqrt{\left(-5880\cdot Mu0\cdot c\cdot q^{2}\cdot LN(8\cdot R)+5880\cdot Mu0\cdot c\cdot q^{2}\cdot LN(r)-Mu0\cdot c\cdot\left(5\cdot\pi^{4}\cdot R^{2}\cdot b2\cdot r^{4}+140\cdot\pi^{2}\cdot R\cdot b2\cdot q\cdot r^{2}-9506\cdot q^{2}\right)+23520\cdot\pi^{2}\cdot hbar\right)}}{56\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot\sqrt{c}\cdot r^{2}}-\frac{3\cdot\left(4\cdot\pi^{2}\cdot R\cdot b2\cdot r^{2}+7\cdot q\right)}{7\cdot\pi^{2}\cdot R\cdot r^{2}}$$

Substituting for b12 just above, b222 (#195) for b2:

#234:

$$\frac{3\cdot\sqrt{\left(-5880\cdot Mu0\cdot c\cdot q^{2}\cdot LN(8\cdot R)+5880\cdot Mu0\cdot c\cdot q^{2}\cdot LN(r)-Mu0\cdot c\cdot\left(5\cdot\pi^{4}\cdot R^{2}\cdot\left(\frac{\sqrt{}}{}\right.\right.\right.}}{} \sim$$

$$\frac{\dfrac{30\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R)-420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r)-599\cdot Mu0\cdot\alpha\cdot c\cdot q}}{15\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}}}{} \sim$$

$$\frac{\left.\dfrac{^{2}-1680\cdot\pi^{2}\cdot hbar)}{}+\dfrac{6\cdot\alpha\cdot q}{\pi^{2}\cdot R\cdot r^{2}}\right)^{2}\cdot r^{4}+140\cdot\pi^{2}\cdot R\cdot\left(\dfrac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c}}{}\right.}{56\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot\sqrt{c}\cdot r^{2}} \sim$$

$$\frac{\dfrac{^{2}\cdot q^{2}\cdot LN(8\cdot R)-420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r)-599\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}-1680\cdot\pi^{2}\cdot hbar)}{15\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}}}{} \sim$$

$$\frac{\left.\left.\left.+\dfrac{6\cdot\alpha\cdot q}{\pi^{2}\cdot R\cdot r^{2}}\right)\cdot q\cdot r^{2}-9506\cdot q^{2}\right)+23520\cdot\pi^{2}\cdot hbar\right)}{}-$$

$$\frac{3\cdot\left(4\cdot\pi^{2}\cdot R\cdot\left(\dfrac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R)-420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r)-}}{15\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}}\right.\right.}{7\cdot\pi^{2}\cdot R\cdot r^{2}} \sim$$

$$\frac{\left.\left.\dfrac{599\cdot Mu0\cdot\alpha\cdot c\cdot q^2 - 1680\cdot\pi^2\cdot hbar)}{} + \dfrac{6\cdot\alpha\cdot q}{\pi^2\cdot R\cdot r^2}\right)\cdot r^2 + 7\cdot q\right)}{}$$

Simplifying:

$$\#235: \frac{\sqrt{6}\cdot\sqrt{(420\cdot Mu0\cdot c\cdot q^2\cdot(\alpha^2 - 21)\cdot LN(8\cdot R) + 420\cdot Mu0\cdot c\cdot q^2\cdot(21 - \alpha^2)\cdot LN(r) +}}{}$$

$$\frac{\cdot\sqrt{30}\cdot\sqrt{Mu0}\cdot\sqrt{\alpha}\cdot q\cdot(3\cdot\alpha + 7)\cdot\sqrt{(-c)}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c}}{56\cdot\pi^2\cdot\sqrt{Mu0}\cdot R\cdot\sqrt{c}\cdot r^2}$$

$$\frac{\cdot q^2\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c\cdot q^2 - 1680\cdot\pi^2\cdot hbar) - Mu0\cdot c\cdot q^2\cdot(869\cdot\alpha^2 + 1260}{}$$

$$\frac{\alpha - 14259) - 1680\cdot\pi^2\cdot hbar\cdot(\alpha - 21))}{} -$$

$$\frac{4\cdot\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(r) - 599\cdot Mu0\cdot\alpha}}{35\cdot\pi^2\cdot\sqrt{Mu0}\cdot R\cdot r^2\cdot\sqrt{(-c)}}$$

$$\frac{\cdot c\cdot q^2 - 1680\cdot\pi^2\cdot hbar)}{} - \frac{3\cdot q\cdot(24\cdot\alpha + 7)}{7\cdot\pi^2\cdot R\cdot r^2}$$

This just above is b122 and does not depend upon res, b0, b1, or b2.

We recall b0 from #24:

$$\#236: -\frac{\pi^2\cdot R\cdot r^2\cdot(8\cdot b1 + 9\cdot b2) + 3\cdot\alpha\cdot q}{6\cdot\pi^2\cdot R\cdot r^2}$$

Substituting b122 (#235) for b1 and b222 (#195) for b2 thus yielding b022:

#237: _

$$\frac{\pi^2 \cdot R \cdot r^2 \cdot \left(8 \cdot \left(\frac{\sqrt{6} \cdot \sqrt{(420 \cdot Mu0 \cdot c \cdot q^2 \cdot (\alpha^2 - 21) \cdot LN(8 \cdot R) + 420 \cdot Mu0 \cdot c \cdot q^2 \cdot (21}{}\right.\right.}{}$$

$$- \alpha^2) \cdot LN(r) + 2 \cdot \sqrt{30} \cdot \sqrt{Mu0} \cdot \sqrt{\alpha} \cdot q \cdot (3 \cdot \alpha + 7) \cdot \sqrt{(-c)} \cdot \sqrt{(420 \cdot Mu0 \cdot \alpha \cdot c \cdot q^2 \cdot LN(8 \cdot}$$

$$56 \cdot \pi^2 \cdot \sqrt{Mu0}$$

$$\frac{) - 420 \cdot Mu0 \cdot \alpha \cdot c \cdot q^2 \cdot LN(r) - 599 \cdot Mu0 \cdot \alpha \cdot c \cdot q^2 - 1680 \cdot \pi^2 \cdot hbar) - Mu0 \cdot c \cdot q^2}{R \cdot \sqrt{c} \cdot r^2}$$

$$\frac{\dfrac{(869 \cdot \alpha^2 + 1260 \cdot \alpha - 14259) - 1680 \cdot \pi^2 \cdot hbar \cdot (\alpha - 21))}{} - \dfrac{4 \cdot \sqrt{30} \cdot \sqrt{\alpha} \cdot \sqrt{(420}}{}}{6 \cdot \pi^2 \cdot R \cdot r^2}$$

$$\frac{\cdot Mu0 \cdot \alpha \cdot c \cdot q^2 \cdot LN(8 \cdot R) - 420 \cdot Mu0 \cdot \alpha \cdot c \cdot q^2 \cdot LN(r) - 599 \cdot Mu0 \cdot \alpha \cdot c \cdot q^2 - 1680 \cdot \pi^2}{35 \cdot \pi^2 \cdot \sqrt{Mu0} \cdot R \cdot r^2 \cdot \sqrt{(-c)}}$$

$$\frac{\frac{\cdot hbar)}{} - \frac{3\cdot q\cdot (24\cdot \alpha + 7)}{7\cdot \pi^2\cdot R\cdot r^2}\Bigg) + 9\cdot \Bigg(\frac{\sqrt{30}\cdot \sqrt{\alpha}\cdot \sqrt{(}420\cdot Mu0\cdot \alpha\cdot c\cdot q^2\cdot LN(8\cdot R) - 4}{15}}{}$$

$$\frac{\frac{20\cdot Mu0\cdot \alpha\cdot c\cdot q^2\cdot LN(r) - 599\cdot Mu0\cdot \alpha\cdot c\cdot q^2 - 1680\cdot \pi^2\cdot hbar)}{\cdot \pi^2\cdot \sqrt{Mu0}\cdot R\cdot r^2\cdot \sqrt{(-c)}} + \frac{6\cdot \alpha\cdot q}{\pi^2\cdot R\cdot r^2}\Bigg)\Bigg) +}{}$$

$$\frac{3\cdot \alpha\cdot q}{}$$

This just above is b022 unsimplified

Simplifying:

#238:-

$$\frac{\sqrt{6}\cdot \sqrt{(}420\cdot Mu0\cdot c\cdot q^2\cdot (\alpha^2 - 21)\cdot LN(8\cdot R) + 420\cdot Mu0\cdot c\cdot q^2\cdot (21 - \alpha^2)\cdot LN(r) -}{}$$

$$\frac{2\cdot \sqrt{30}\cdot \sqrt{Mu0}\cdot \sqrt{\alpha}\cdot q\cdot (3\cdot \alpha + 7)\cdot \sqrt{(-c)}\cdot \sqrt{(}420\cdot Mu0\cdot \alpha\cdot c\cdot q^2\cdot LN(8\cdot R) - 420\cdot Mu0\cdot c}{42\cdot \pi^2\cdot \sqrt{Mu0}\cdot R\cdot \sqrt{c}\cdot r^2}$$

$$\frac{\cdot c\cdot q^2\cdot LN(r) - 599\cdot Mu0\cdot \alpha\cdot c\cdot q^2 - 1680\cdot \pi^2\cdot hbar) - Mu0\cdot c\cdot q^2\cdot (869\cdot \alpha^2 + 12}{}$$

$$\frac{0\cdot\alpha - 14259) - 1680\cdot\pi^2\cdot\alpha\cdot hbar + 35280\cdot\pi^2\cdot hbar)}{} +$$

$$\frac{11\cdot\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(r) - 599\cdot Mu0\cdot}}{210\cdot\pi^2\cdot\sqrt{Mu0}\cdot R\cdot r^2\cdot\sqrt{(-c)}}$$

$$\frac{\alpha\cdot c\cdot q^2 - 1680\cdot\pi^2\cdot hbar)}{} + \frac{q\cdot(59\cdot\alpha + 56)}{14\cdot\pi^2\cdot R\cdot r^2}$$

This just above is b022 simplified, and does not depend upon b0, b1 or b2.

We recall res from #19:

#239:$-b0 - b1 - b2$

Substituting b022 (#238) for b0, b122 (#235) for b1, and b222 (#195) for b2:

#240:$-\left(-\right.$

$$\frac{\sqrt{6}\cdot\sqrt{(420\cdot Mu0\cdot c\cdot q^2\cdot(\alpha^2 - 21)\cdot LN(8\cdot R) + 420\cdot Mu0\cdot c\cdot q^2\cdot(21 - \alpha^2)\cdot LN(r) -}}{}$$

$$\frac{2\cdot\sqrt{30}\cdot\sqrt{Mu0}\cdot\sqrt{\alpha}\cdot q\cdot(3\cdot\alpha + 7)\cdot\sqrt{(-c)}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(8\cdot R) - 420\cdot Mu0\cdot}}{42\cdot\pi^2\cdot\sqrt{Mu0}\cdot R\cdot\sqrt{c}\cdot r^2}$$

$$\frac{\cdot c\cdot q^2\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c\cdot q^2 - 1680\cdot\pi^2\cdot hbar) - Mu0\cdot c\cdot q^2\cdot(869\cdot\alpha^2 + 12}{}$$

$$\frac{0\cdot\alpha - 14259) - 1680\cdot\pi^{2}\cdot\alpha\cdot hbar + 35280\cdot\pi^{2}\cdot hbar)}{} +$$

$$\frac{11\cdot\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(}420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot}{210\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}} \sim$$

$$\left.\frac{\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar)}{} + \frac{q\cdot(59\cdot\alpha + 56)}{14\cdot\pi^{2}\cdot R\cdot r^{2}}\right) -$$

$$\left(\frac{\sqrt{6}\cdot\sqrt{(}420\cdot Mu0\cdot c\cdot q^{2}\cdot(\alpha^{2} - 21)\cdot LN(8\cdot R) + 420\cdot Mu0\cdot c\cdot q^{2}\cdot(21 - \alpha^{2})\cdot LN(r)}{}\right. \sim$$

$$\frac{+ 2\cdot\sqrt{30}\cdot\sqrt{Mu0}\cdot\sqrt{\alpha}\cdot q\cdot(3\cdot\alpha + 7)\cdot\sqrt{(-c)}\cdot\sqrt{(}420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot}{56\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot\sqrt{c}\cdot r^{2}} \sim$$

$$\frac{\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar) - Mu0\cdot c\cdot q^{2}\cdot(869\cdot\alpha^{2} + 12}{} \sim$$

$$\frac{60\cdot\alpha - 14259) - 1680\cdot\pi^{2}\cdot hbar\cdot(\alpha - 21))}{} -$$

$$\frac{4\cdot\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(}420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot\alpha}{35\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}} \sim$$

$$\left.\frac{\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar)}{} - \frac{3\cdot q\cdot(24\cdot\alpha + 7)}{7\cdot\pi^{2}\cdot R\cdot r^{2}}\right) -$$

$$\left(\frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot \sim}}{15\cdot\pi^2\cdot\sqrt{Mu0}\cdot R\cdot r^2\cdot\sqrt{(-c)}} \sim\right.$$

$$\left.\frac{c\cdot q^2 - 1680\cdot\pi^2\cdot hbar)}{} + \frac{6\cdot\alpha\cdot q}{\pi^2\cdot R\cdot r^2}\right)$$

Simplifying:

#241:-

$$\frac{\sqrt{6}\cdot\sqrt{(420\cdot Mu0\cdot c\cdot q^2\cdot(\alpha^2 - 21)\cdot LN(8\cdot R) + 420\cdot Mu0\cdot c\cdot q^2\cdot(21 - \sim\alpha^2)\cdot LN(r) -}}{}$$

$$\frac{2\cdot\sqrt{30}\cdot\sqrt{Mu0}\cdot\sqrt{\alpha}\cdot q\cdot(3\cdot\alpha + 7)\cdot\sqrt{(-c)}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(8\cdot R) \sim - 420\cdot Mu0\cdot}}{56\cdot\pi^2\cdot\sqrt{Mu\sim0}\cdot R\cdot\sqrt{c}\cdot r^2}$$

$$\frac{\cdot c\cdot q^2\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c\cdot q^2 - 1680\cdot\pi^2\cdot hbar) - Mu0\cdot c\cdot q^2\cdot(8\sim69\cdot\alpha^2 + 12}{}$$

$$\frac{0\cdot\alpha - 14259) - 1680\cdot\pi^2\cdot\alpha\cdot hbar + 35280\cdot\pi^2\cdot hbar)}{} +$$

$$\frac{\sqrt{6}\cdot\sqrt{(420\cdot Mu0\cdot c\cdot q^2\cdot(\alpha^2 - 21)\cdot LN(8\cdot R) + 420\cdot Mu0\cdot c\cdot q^2\cdot(21 - \sim\alpha^2)\cdot LN(r) -}}{}$$

$$\frac{2\cdot\sqrt{30}\cdot\sqrt{Mu0}\cdot\sqrt{\alpha}\cdot q\cdot(3\cdot\alpha + 7)\cdot\sqrt{(-c)}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^2\cdot LN(8\cdot R) \sim - 420\cdot Mu0\cdot}}{42\cdot\pi^2\cdot\sqrt{Mu\sim0}\cdot R\cdot\sqrt{c}\cdot r^2}$$

$$\frac{\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot \alpha\cdot c\cdot q^{2} - 1680\cdot \pi^{2}\cdot hbar) - Mu0\cdot c\cdot q^{2}\cdot (869\cdot \alpha^{2} + 126}{}\sim$$

$$\frac{0\cdot \alpha - 14259) - 1680\cdot \pi^{2}\cdot \alpha\cdot hbar + 35280\cdot \pi^{2}\cdot hbar)}{} -$$

$$\frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot \alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot \alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot \alpha\cdot c}}{210\cdot \pi^{2}\cdot\sqrt{Mu0\cdot R\cdot r^{2}}\cdot\sqrt{(-c)}}\sim$$

$$\frac{\cdot q^{2} - 1680\cdot \pi^{2}\cdot hbar)}{} + \frac{q\cdot (\alpha - 14)}{14\cdot \pi^{2}\cdot R\cdot r^{2}}$$

This just above is res22.

We recall:

#242:b2 + res = 0

Substituting for res, res22 (#240); and b222 (#195) for b2:

$$\#243: \left(\frac{\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot \alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot \alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot \alpha\cdot c}}{15\cdot \pi^{2}\cdot\sqrt{Mu0\cdot R\cdot r^{2}}\cdot\sqrt{(-c)}}\sim\right.$$

$$\left.\frac{q^{2} - 1680\cdot \pi^{2}\cdot hbar)}{} + \frac{6\cdot \alpha\cdot q}{\pi^{2}\cdot R\cdot r^{2}}\right) + \left(-\right.$$

$$\frac{\sqrt{6}\cdot\sqrt{(420\cdot Mu0\cdot c\cdot q^{2}\cdot (\alpha^{2} - 21)\cdot LN(8\cdot R) + 420\cdot Mu0\cdot c\cdot q^{2}\cdot (21 - \alpha^{2})\cdot LN(r) -}}{}\sim$$

$$\frac{2\cdot\sqrt{30}\cdot\sqrt{Mu0}\cdot\sqrt{\alpha}\cdot q\cdot (3\cdot \alpha + 7)\cdot\sqrt{(-c)}\cdot\sqrt{(420\cdot Mu0\cdot \alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R)} - 420\cdot Mu0\cdot}{56\cdot \pi^{2}\cdot\sqrt{Mu0\cdot R\cdot\sqrt{c}\cdot r^{2}}}\sim$$

$$\frac{\cdot c\cdot q^{2}\cdot \mathrm{LN}(r) - 599\cdot Mu0\cdot \alpha\cdot c\cdot q^{2} - 1680\cdot \pi^{2}\cdot hbar) - Mu0\cdot c\cdot q^{2}\cdot (869\cdot \alpha^{2} + 126}{}$$

$$\frac{0\cdot \alpha - 14259) - 1680\cdot \pi^{2}\cdot \alpha\cdot hbar + 35280\cdot \pi^{2}\cdot hbar)}{} +$$

$$\frac{\sqrt{6}\cdot \sqrt{(}420\cdot Mu0\cdot c\cdot q^{2}\cdot (\alpha^{2} - 21)\cdot \mathrm{LN}(8\cdot R) + 420\cdot Mu0\cdot c\cdot q^{2}\cdot (21 - \alpha^{2})\cdot \mathrm{LN}(r) +}{}$$

$$\frac{2\cdot \sqrt{30}\cdot \sqrt{Mu0}\cdot \sqrt{\alpha}\cdot q\cdot (3\cdot \alpha + 7)\cdot \sqrt{(-c)}\cdot \sqrt{(}420\cdot Mu0\cdot \alpha\cdot c\cdot q^{2}\cdot \mathrm{LN}(8\cdot R) - 420\cdot Mu0\cdot \alpha}{42\cdot \pi^{2}\cdot \sqrt{Mu0}\cdot R\cdot \sqrt{c}\cdot r^{2}}$$

$$\frac{\cdot c\cdot q^{2}\cdot \mathrm{LN}(r) - 599\cdot Mu0\cdot \alpha\cdot c\cdot q^{2} - 1680\cdot \pi^{2}\cdot hbar) - Mu0\cdot c\cdot q^{2}\cdot (869\cdot \alpha^{2} + 126}{}$$

$$\frac{0\cdot \alpha - 14259) - 1680\cdot \pi^{2}\cdot \alpha\cdot hbar + 35280\cdot \pi^{2}\cdot hbar)}{} -$$

$$\frac{\sqrt{30}\cdot \sqrt{\alpha}\cdot \sqrt{(}420\cdot Mu0\cdot \alpha\cdot c\cdot q^{2}\cdot \mathrm{LN}(8\cdot R) - 420\cdot Mu0\cdot \alpha\cdot c\cdot q^{2}\cdot \mathrm{LN}(r) - 599\cdot Mu0\cdot \alpha\cdot c}{210\cdot \pi^{2}\cdot \sqrt{Mu0}\cdot R\cdot r^{2}\cdot \sqrt{(-c)}}$$

$$\left.\frac{\cdot q^{2} - 1680\cdot \pi^{2}\cdot hbar)}{} + \frac{q\cdot (\alpha - 14)}{14\cdot \pi^{2}\cdot R\cdot r^{2}}\right) = 0$$

Simplifing:

$$\#244: \frac{\sqrt{6}\cdot \sqrt{(}420\cdot Mu0\cdot c\cdot q^{2}\cdot (\alpha^{2} - 21)\cdot \mathrm{LN}(8\cdot R) + 420\cdot Mu0\cdot c\cdot q^{2}\cdot (21 - \alpha^{2})\cdot \mathrm{LN}(r) +}{}$$

$$\frac{\cdot\sqrt{30}\cdot\sqrt{Mu0}\cdot\sqrt{\alpha}\cdot q\cdot(3\cdot\alpha + 7)\cdot\sqrt{(-c)}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c}}{168\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot\sqrt{c}\cdot r^{2}} \sim$$

$$\frac{\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar) - Mu0\cdot c\cdot q^{2}\cdot(869\cdot\alpha^{2} + 1260\cdot}{} \sim$$

$$\frac{\alpha - 14259) - 1680\cdot\pi^{2}\cdot\alpha\cdot hbar + 35280\cdot\pi^{2}\cdot hbar)}{} +$$

$$\frac{13\cdot\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(8\cdot R) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN(r) - 599\cdot Mu0\cdot}}{210\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot R\cdot r^{2}\cdot\sqrt{(-c)}} \sim$$

$$\frac{\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar)}{} + \frac{q\cdot(85\cdot\alpha - 14)}{14\cdot\pi^{2}\cdot R\cdot r^{2}} = 0$$

We substitute for R from #80

$$\#245: \frac{\sqrt{6}\cdot\sqrt{\left(420\cdot Mu0\cdot c\cdot q^{2}\cdot(\alpha^{2} - 21)\cdot LN\left(8\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^{2} + 4\cdot\pi^{2}\cdot hbar}{4\cdot\pi^{2}\cdot c\cdot me}\right)\right.} \sim + 420\cdot Mu0\cdot}{}$$

$$\frac{\cdot q^{2}\cdot(21 - \alpha^{2})\cdot LN(r) + 2\cdot\sqrt{30}\cdot\sqrt{Mu0}\cdot\sqrt{\alpha}\cdot q\cdot(3\cdot\alpha + 7)\cdot\sqrt{(-c)}\cdot\sqrt{\left(420\cdot Mu0\cdot\alpha\cdot c\cdot\right.}}{\sim 168\cdot\pi^{2}\cdot\sqrt{Mu0}}$$

$$\frac{{}^{2}\cdot \mathrm{LN}\left(8\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^{2} + 4\cdot\pi^{2}\cdot hbar}{4\cdot\pi^{2}\cdot c\cdot me}\right) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot \mathrm{LN}(r) - 599\cdot Mu0\cdot\alpha\cdot c \sim}{\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^{2} + 4\cdot\pi^{2}\cdot hbar}{4\cdot\pi^{2}\cdot c\cdot me}\cdot\sqrt{c}\cdot r^{2} \sim}$$

$$\frac{\left.\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar\right) - Mu0\cdot c\cdot q^{2}\cdot(869\cdot\alpha^{2} + 1260\cdot\alpha - 14259) - 1680\cdot\pi^{2}\cdot\alpha\cdot \sim}{\sim}$$

$$\frac{\left.hbar + 35280\cdot\pi^{2}\cdot hbar\right)}{} +$$

$$\frac{13\cdot\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{\left(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot \mathrm{LN}\left(8\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^{2} + 4\cdot\pi^{2}\cdot hbar}{4\cdot\pi^{2}\cdot c\cdot me}\right) - 420\cdot Mu0\cdot \sim\right.}}{210\cdot\pi^{2}\cdot\sqrt{Mu0}\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^{2} + 4\cdot\pi^{2}\cdot hba \sim}{4\cdot\pi^{2}\cdot c\cdot me}}$$

$$\frac{\alpha\cdot c\cdot q^{2}\cdot \mathrm{LN}(r) - 599\cdot \mathrm{Mu0}\cdot\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot \mathrm{hbar}\Big)}{\frac{r}{\;}\cdot r^{2}\cdot\sqrt{(-c)}} +$$

$$\frac{q\cdot(85\cdot\alpha - 14)}{14\cdot\pi^{2}\cdot\dfrac{\mathrm{Mu0}\cdot\alpha\cdot c\cdot q^{2} + 4\cdot\pi^{2}\cdot \mathrm{hbar}}{4\cdot\pi^{2}\cdot c\cdot \mathrm{me}}\cdot r^{2}} = 0$$

Simplifying:

#246:

$$\frac{\sqrt{6}\cdot\sqrt{c}\cdot \mathrm{me}\cdot\sqrt{\Big(2\cdot\sqrt{30}\cdot\sqrt{\mathrm{Mu0}}\cdot\sqrt{\alpha}\cdot q\cdot(3\cdot\alpha + 7)\cdot\sqrt{(-c)}\cdot\sqrt{\Big(420\cdot \mathrm{Mu0}\cdot\alpha\cdot c\cdot q^{2}\cdot \mathrm{LN}\Big(\frac{\mathrm{Mu0}\cdot\alpha}{}}}}{}$$

$$\frac{\dfrac{c\cdot q^{2} + 4\cdot\pi^{2}\cdot \mathrm{hbar}}{c\cdot \mathrm{me}}\Big) - 420\cdot \mathrm{Mu0}\cdot\alpha\cdot c\cdot q^{2}\cdot \mathrm{LN}\Big(\dfrac{\pi^{2}\cdot r}{2}\Big) - 599\cdot \mathrm{Mu0}\cdot\alpha\cdot c\cdot q^{2} - 168}{}$$

$$42\cdot\sqrt{\mathrm{Mu}}$$

$$\frac{0\cdot\pi^{2}\cdot \mathrm{hbar}\Big) + 420\cdot \mathrm{Mu0}\cdot c\cdot q^{2}\cdot(\alpha^{2} - 21)\cdot \mathrm{LN}\Big(\dfrac{\mathrm{Mu0}\cdot\alpha\cdot c\cdot q^{2} + 4\cdot\pi^{2}\cdot \mathrm{hbar}}{c\cdot \mathrm{me}}\Big) + 4}{0\cdot r^{2}\cdot(\mathrm{Mu0}\cdot\alpha\cdot c\cdot q^{2} + 4\cdot\pi^{2}\cdot \mathrm{hbar})}$$

$$\frac{0\cdot \mathrm{Mu0}\cdot c\cdot q^{2}\cdot(21 - \alpha^{2})\cdot \mathrm{LN}\Big(\dfrac{\pi^{2}\cdot r}{2}\Big) - \mathrm{Mu0}\cdot c\cdot q^{2}\cdot(869\cdot\alpha^{2} + 1260\cdot\alpha - 14259)}{}$$

$$\frac{- 1680\cdot\pi^{2}\cdot hbar\cdot(\alpha - 21)\Big)}{} -$$

$$\frac{26\cdot\sqrt{30}\cdot\sqrt{\alpha}\cdot me\cdot\sqrt{(-c)}\cdot\sqrt{\left(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN\left(\frac{Mu0\cdot\alpha\cdot c\cdot q^{2} + 4\cdot\pi^{2}\cdot hbar}{c\cdot me}\right) - 4 \sim\right.}}{105\cdot\sqrt{Mu0}\cdot r^{2}\cdot(Mu0\cdot\alpha\cdot c\cdot q^{2} \sim}$$

$$\frac{20\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN\left(\frac{\pi^{2}\cdot r}{2}\right) - 599\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar\Big)}{+ 4\cdot\pi^{2}\cdot hbar)} +$$

$$\frac{2\cdot c\cdot me\cdot q\cdot(85\cdot\alpha - 14)}{7\cdot r^{2}\cdot(Mu0\cdot\alpha\cdot c\cdot q^{2} + 4\cdot\pi^{2}\cdot hbar)} = 0$$

Multiplying by r^2 to facilitate numerical analysis as r is very small:

#247:
$$\left(\frac{\sqrt{6}\cdot\sqrt{c}\cdot me\cdot\sqrt{\left(2\cdot\sqrt{30}\cdot\sqrt{Mu0}\cdot\sqrt{\alpha}\cdot q\cdot(3\cdot\alpha + 7)\cdot\sqrt{(-c)}\cdot\sqrt{\left(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN\left(\frac{Mu0\cdot}{}\right.\right.}\right.}}{\sim}\right.$$

$$\frac{\frac{\cdot c\cdot q^{2} + 4\cdot\pi^{2}\cdot hbar}{c\cdot me}\Big) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN\left(\frac{\pi^{2}\cdot r}{2}\right) - 599\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} - 1\sim}{42\cdot\sqrt{M}\sim}$$

$$\frac{80\cdot\pi^{2}\cdot hbar\Big) + 420\cdot Mu0\cdot c\cdot q^{2}\cdot(\alpha^{2} - 21)\cdot LN\left(\frac{Mu0\cdot\alpha\cdot c\cdot q^{2} + 4\cdot\pi^{2}\cdot hbar}{c\cdot me}\right) + 4 \sim}{u0\cdot r^{2}\cdot(Mu0\cdot\alpha\cdot c\cdot q^{2} + 4\cdot\pi^{2}\cdot hbar)} \sim$$

$$\frac{20\cdot Mu0\cdot c\cdot q^{2}\cdot(21 - \alpha^{2})\cdot LN\left(\frac{\pi^{2}\cdot r}{2}\right) - Mu0\cdot c\cdot q^{2}\cdot(869\cdot\alpha^{2} + 1260\cdot\alpha - 14259) \sim}{\sim}$$

$$\frac{- 1680\cdot\pi^{2}\cdot hbar\cdot(\alpha - 21)\Big)}{} -$$

$$\frac{26\cdot\sqrt{30}\cdot\sqrt{\alpha}\cdot me\cdot\sqrt{(-c)}\cdot\sqrt{\Bigg(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN\left(\frac{Mu0\cdot\alpha\cdot c\cdot q^{2} + 4\cdot\pi^{2}\cdot hbar}{c\cdot me}\right) - 4 \sim}}{105\cdot\sqrt{Mu0}\cdot r^{2}\cdot(Mu0\cdot\alpha\cdot c\cdot q^{2} \sim}$$

$$\frac{20\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN\left(\frac{\pi^{2}\cdot r}{2}\right) - 599\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar\Bigg)}{+ 4\cdot\pi^{2}\cdot hbar)} +$$

$$\frac{2\cdot c\cdot me\cdot q\cdot(85\cdot\alpha - 14)}{7\cdot r^{2}\cdot(Mu0\cdot\alpha\cdot c\cdot q^{2} + 4\cdot\pi^{2}\cdot hbar)} = 0\Bigg)\cdot r^{2}$$

Simplifying:

$$\#248:\ \frac{\sqrt{30}\cdot me\cdot\Bigg(\sqrt{5}\cdot\sqrt{c}\cdot\sqrt{\Bigg(2\cdot\sqrt{30}\cdot\sqrt{Mu0}\cdot\sqrt{\alpha}\cdot q\cdot(3\cdot\alpha + 7)\cdot\sqrt{(-c)}\cdot\sqrt{\Bigg(420\cdot Mu0\cdot\alpha \sim\cdot c\cdot q^{2}\cdot LN\Bigg(-}}}{\sim}$$

$$\frac{u0\cdot\alpha\cdot c\cdot q^{2} + 4\cdot\pi^{2}\cdot hbar}{c\cdot me}\Bigg) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN\left(\frac{\pi^{2}\cdot r}{2}\right) - 599\cdot Mu0\cdot\alpha\cdot c\cdot q^{2} \sim$$

$$- 1680\cdot\pi^{2}\cdot hbar\Bigg) + 420\cdot Mu0\cdot c\cdot q^{2}\cdot(\alpha^{2} - 21)\cdot LN\left(\frac{Mu0\cdot\alpha\cdot c\cdot q^{2} + 4\cdot\pi^{2}\cdot hbar}{c\cdot me}\right) \sim$$

$$\frac{+ 420\cdot Mu0\cdot c\cdot q^{2}\cdot(21 - \alpha^{2})\cdot LN\left(\frac{\pi^{2}\cdot r}{2}\right) - Mu0\cdot c\cdot q^{2}\cdot(869\cdot\alpha^{2} + 1260\cdot\alpha - 14 \sim}{210\cdot\sqrt{Mu0}\cdot(Mu0\cdot\alpha\cdot c\cdot q^{2} + 4\cdot\pi^{2}\cdot hbar) \sim}$$

$$259) - 1680\cdot\pi^{2}\cdot hbar\cdot(\alpha - 21)\Bigg) - 2\cdot\sqrt{2}\cdot\Bigg(13\cdot\sqrt{2}\cdot\sqrt{\alpha}\cdot\sqrt{(-c)}\cdot\sqrt{\Bigg(420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}} \sim$$

$$\cdot LN\left(\frac{Mu0\cdot\alpha\cdot c\cdot q^{2} + 4\cdot\pi^{2}\cdot hbar}{c\cdot me}\right) - 420\cdot Mu0\cdot\alpha\cdot c\cdot q^{2}\cdot LN\left(\frac{\pi^{2}\cdot r}{2}\right) - 599\cdot Mu0\cdot\alpha \sim$$

$$\cdot c\cdot q^{2} - 1680\cdot\pi^{2}\cdot hbar\Bigg) + \sqrt{15}\cdot\sqrt{Mu0}\cdot c\cdot q\cdot(14 - 85\cdot\alpha)\Bigg)\Bigg) = 0$$

Substituting for our constants but not for α:

#249:

$$\frac{\sqrt{30}\cdot(+\ 9.1093821545\cdot 10^{-31})\cdot(\sqrt{5}\cdot\sqrt{299792458}\cdot\sqrt{(2\cdot\sqrt{30}\cdot\sqrt{(4\cdot\pi\cdot 10^{-7})}\cdot\sqrt{\alpha}\cdot(+\ 1.}}{}\ \sim$$

$$\frac{6021764874\cdot 10^{-19})\cdot(3\cdot\alpha + 7)\cdot\sqrt{(-299792458)}\cdot\sqrt{(420\cdot(4\cdot\pi\cdot 10^{-7})\cdot\alpha\cdot 29979245}}{}\ \sim$$

$$\frac{8\cdot(+\ 1.6021764874\cdot 10^{-19})^{2}\cdot \mathrm{LN}\left(\frac{(4\cdot\pi\cdot 10^{-7})\cdot\alpha\cdot 299792458\cdot(+\ 1.6021764874\cdot}{299792458\cdot(+\ 9.10}\right.}{}\ \sim$$

$$\frac{\left.\frac{10^{-19})^{2} + 4\cdot\pi^{2}\cdot(1.05457162853\cdot 10^{-34})}{93821545\cdot 10^{-31})}\right) - 420\cdot(4\cdot\pi\cdot 10^{-7})\cdot\alpha\cdot 299792458\cdot(}{}\ \sim$$

$$\frac{+\ 1.6021764874\cdot 10^{-19})^{2}\cdot \mathrm{LN}\left(\frac{\pi^{2}\cdot r}{2}\right) - 599\cdot(4\cdot\pi\cdot 10^{-7})\cdot\alpha\cdot 299792458\cdot(+\ 1.6}{}\ \sim$$

$$\frac{021764874\cdot 10^{-19})^{2} - 1680\cdot\pi^{2}\cdot(1.05457162853\cdot 10^{-34})) + 420\cdot(4\cdot\pi\cdot 10^{-7})\cdot 2}{}\ \sim$$

```
                                      -19 2    2                     -7
99792458·(+ 1.6021764874·10    ) ·(α  - 21)·LN⎛  (4·π·10   )·α·299792458~
                                              ⎜ ──────────────────────────~
                                              ⎝                           ~
────────────────────────────────────────────────────────────────────────────~
                                                                            ~
                                                                            ~

                   -19 2       2                         -34  ⎞            ~
·(+ 1.6021764874·10    )  + 4·π  ·(1.05457162853·10     )    ⎟            ~
──────────────────────────────────────────────────────────────⎟ + 420·(4·π·10~
                            -31                               ⎟            ~
299792458·(+ 9.1093821545·10    )                             ⎠            ~
────────────────────────────────────────────────────────────────────────────~
                                     -7            -7                       ~
                          210·√(4·π·10   )·((4·π·10   )·α·299792458·(+ 1.6~

                                                      ⎛  2   ⎞              ~
-7                                   -19 2        2   ⎜ π ·r ⎟           -  ~
  )·299792458·(+ 1.6021764874·10    ) ·(21 - α )·LN⎜ ───── ⎟ - (4·π·10   ~
                                                      ⎝   2  ⎠              ~
────────────────────────────────────────────────────────────────────────────~
             -19 2      2                     -34                           ~
021764874·10    )  + 4·π  ·(1.05457162853·10    ))                          ~

7                                  -19 2       2                            ~
 )·299792458·(+ 1.6021764874·10    ) ·(869·α  + 1260·α - 14259) - 1680~
                                                                            ~
────────────────────────────────────────────────────────────────────────────~
                                                                            ~

  2                           -34         ⎞         ⎛                      ⎛~
·π  ·(1.05457162853·10    )·(α - 21)     ⎟ - 2·√2· ⎜13·√2·√α·√(-299792458)·√⎜~
                                          ⎠         ⎝                      ⎝~
────────────────────────────────────────────────────────────────────────────~
                                                                            ~

                                                                   -7       ~
           -7                                 -19 2     ⎛ (4·π·10   )·α·2~
420·(4·π·10   )·α·299792458·(+ 1.6021764874·10    ) ·LN⎜ ──────────────~
                                                         ⎝                  ~
────────────────────────────────────────────────────────────────────────────~
                                                                            ~
```

```
                            -19 2       2                      -34  ⎞
99792458·(+ 1.6021764874·10    )  + 4·π ·(1.05457162853·10    )  ⎟ - 420
─────────────────────────────────────────────────────────────────⎟
                                  -31                            ⎟
         299792458·(+ 9.1093821545·10   )                        ⎠
───────────────────────────────────────────────────────────────────────────

                                                          ⎛  2    ⎞
          -7                                   -19 2      ⎜ π ·r  ⎟
·(4·π·10   )·α·299792458·(+ 1.6021764874·10    )  ·LN⎜──────⎟ - 599·(4·π
                                                          ⎝   2   ⎠
───────────────────────────────────────────────────────────────────────────

    -7                                  -19 2          2
·10   )·α·299792458·(+ 1.6021764874·10    )  - 1680·π ·(1.05457162853·1
───────────────────────────────────────────────────────────────────────────

     ⎞
 -34 ⎟                -7                                   -19
0   )⎟ + √15·√(4·π·10   )·299792458·(+ 1.6021764874·10    )·(14 - 85·α)
     ⎠
───────────────────────────────────────────────────────────────────────────

⎞⎞
⎟⎟
⎠⎠
─── = 0
```

Simplifying:

```
                              -149                            81
       4.0474203084572771 8·10     ·(1.69874892397444767·10   ·√(1.330084907338
#250:──────────────────────────────────────────────────────────────────────────
```

$$6651\cdot 10^{157}\cdot(3\cdot\alpha + 7)\cdot \mathrm{SIGN}(\alpha)\cdot\sqrt{(-\alpha)}\cdot\sqrt{(}3.29153637249496698\cdot 10^{59}\cdot\alpha\cdot \mathrm{LN}(4.$$

$$80390240459875173\cdot 10^{31}\cdot\alpha + 2.06813422034851182\cdot 10^{34}) - 3.291536372494$$

$$96698\cdot 10^{59}\cdot\alpha\cdot \mathrm{LN}(r) - 1.23103227401697132\cdot 10^{32}\cdot(2.8594657170230665\cdot 10^{2}$$

$$^{9}\cdot\alpha + 1.15110188343916245\cdot 10^{30})) + 2.64260824767925958\cdot 10^{62}\cdot(5.402315$$

$$33897189127\cdot 10^{124}\cdot(\alpha^{2} - 21)\cdot \mathrm{LN}(4.80390240459875173\cdot 10^{31}\cdot\alpha + 2.0681342$$

4.8

$$2034851182\cdot 10^{34}) + 5.40231533897189127\cdot 10^{124}\cdot(21 - \alpha^{2})\cdot \mathrm{LN}(r) - 1.2310$$

$$0390240459875173\cdot 10^{31}\cdot\alpha + 2.06813422034851182\cdot 10^{34}$$

$$3227401697132\cdot 10^{32}\cdot(4.7213801291441487\cdot 10^{94}\cdot\alpha^{2} + 1.90243971666336306\cdot$$

$$10^{95}\cdot\alpha - 4.9547970181649037\cdot 10^{96}))) - 2.60168411501955737\cdot 10^{146}\cdot \mathrm{SIGN}($$

$$\alpha)\cdot\sqrt{(-\alpha)}\cdot\sqrt{(}3.29153637249496698\cdot 10^{59}\cdot\alpha\cdot \mathrm{LN}(4.80390240459875173\cdot 10^{31}\cdot\alpha +$$

$2.06813422034851182 \cdot 10^{34}) - 3.29153637249496698 \cdot 10^{59} \cdot \alpha \cdot LN(r) - 1.231$ ~

$03227401697132 \cdot 10^{32} \cdot (2.8594657170230665 \cdot 10^{29} \cdot \alpha + 1.15110188343916245 \cdot$ ~

$10^{30})) + 1.53432205836566525 \cdot 10^{174} \cdot (85 \cdot \alpha - 14)) = 0$

Setting α = 0.95:

#251: $4.04742030845727718 \cdot 10^{-149} \cdot (1.69874892397444767 \cdot 10^{81} \cdot \sqrt{}(1.330084907338$ ~

$6651 \cdot 10^{157} \cdot (3 \cdot 0.95 + 7) \cdot SIGN(0.95) \cdot \sqrt{}(-0.95) \cdot \sqrt{}(3.29153637249496698 \cdot 10^{5}$ ~

${}^{9} \cdot 0.95 \cdot LN(4.80390240459875173 \cdot 10^{31} \cdot 0.95 + 2.06813422034851182 \cdot 10^{34}) -$ ~

$3.29153637249496698 \cdot 10^{59} \cdot 0.95 \cdot LN(r) - 1.23103227401697132 \cdot 10^{32} \cdot (2.85$ ~

$94657170230665 \cdot 10^{29} \cdot 0.95 + 1.15110188343916245 \cdot 10^{30})) + 2.6426082476$ ~

$925958 \cdot 10^{62} \cdot (5.40231533897189127 \cdot 10^{124} \cdot (0.95^{2} - 21) \cdot LN(4.803902404598$ ~

```
      31                                      34                          1 ~
75173·10   ·0.95 + 2.06813422034851182·10   ) + 5.40231533897189127·10  ~
─────────────────────────────────────────────────────────────────────────────~
                                                      31                      ~
                            4.80390240459875173·10   ·0.95 + 2.06813422034~

24           2                                       32                      ~
  ·(21 - 0.95 )·LN(r) - 1.23103227401697132·10   ·(4.7213801291441487·~
─────────────────────────────────────────────────────────────────────────────~
        34                                                                   ~
851182·10                                                                    ~

  94     2                         95                                 96  ~
10   ·0.95  + 1.90243971666336306·10   ·0.95 - 4.9547970181649037·10  )~
─────────────────────────────────────────────────────────────────────────────~
                                                                             ~
                                                                             ~

                                    146                                     ~
)) - 2.60168411501955737·10    ·SIGN(0.95)·√(-0.95)·√(3.29153637249496~
─────────────────────────────────────────────────────────────────────────────~
                                                                             ~
                                                                             ~

      59                                            31                      ~
698·10   ·0.95·LN(4.80390240459875173·10   ·0.95 + 2.06813422034851182·~
─────────────────────────────────────────────────────────────────────────────~
                                                                             ~
                                                                             ~

  34                                59                                     3~
10  ) - 3.29153637249496698·10   ·0.95·LN(r) - 1.23103227401697132·10  ~
─────────────────────────────────────────────────────────────────────────────~
                                                                             ~
                                                                             ~

2                        29                                  30            ~
 ·(2.8594657170230665·10   ·0.95 + 1.15110188343916245·10   )) + 1.5343~
─────────────────────────────────────────────────────────────────────────────~
                                                                             ~
                                                                             ~

                174
2205836566525·10    ·(85·0.95 - 14))
───────────────────────────────────── = 0
```

Simplifying:

```
                                  -102                                   188
#252:3.31719871101349148·10     ·√(2.86915991226080697·10     ·LN(r) +

                          191                                  158
       1.3124949348849616·10    + 3.37851941228725525·10    ·î·√(-
```

$$4.46708507695745518\cdot 10^{58}\cdot \mathrm{LN}(r) - 2.14910055897575393\cdot 10^{61})) +$$

$$1.99990834286455074\cdot 10^{-7} - 1.3101097576639036\cdot 10^{-36}\cdot \hat{\imath}\cdot \sqrt{(-}$$

$$4.46708507695745518\cdot 10^{58}\cdot \mathrm{LN}(r) - 2.14910055897575393\cdot 10^{61})$$

Setting r = 10^-n

$$\#253{:}3.31719871101349148\cdot 10^{-102}\cdot \sqrt{(}2.86915991226080697\cdot 10^{188}\cdot \mathrm{LN}(10^{-n}) +$$

$$1.3124949348849616\cdot 10^{191} + 3.37851941228725525\cdot 10^{158}\cdot \hat{\imath}\cdot \sqrt{(-}$$

$$4.46708507695745518\cdot 10^{58}\cdot \mathrm{LN}(10^{-n}) - 2.14910055897575393\cdot 10^{61})) +$$

$$1.99990834286455074\cdot 10^{-7} - 1.3101097576639036\cdot 10^{-36}\cdot \hat{\imath}\cdot \sqrt{(-}$$

$$4.46708507695745518\cdot 10^{58}\cdot \mathrm{LN}(10^{-n}) - 2.14910055897575393\cdot 10^{61})$$

Creating a function from the just above:

#254:funct(n) :=

$$3.31719871101349148\cdot 10^{-102}\cdot \sqrt{(}2.86915991226080697\cdot 10^{188}\cdot \mathrm{LN}(10^{-n}) +$$

$$1.3124949348849616\cdot 10^{191} + 3.37851941228725525\cdot 10^{158}\cdot \hat{\imath}\cdot \sqrt{(-}$$

$$4.46708507695745518\cdot 10^{58}\cdot \mathrm{LN}(10^{-n}) - 2.14910055897575393\cdot 10^{61})) +$$

$$1.99990834286455074\cdot 10^{-7} - 1.3101097576639036\cdot 10^{-36}\cdot \hat{\imath}\cdot \sqrt{(-}$$

$$4.46708507695745518\cdot 10^{58}\cdot \mathrm{LN}(10^{-n}) - 2.14910055897575393\cdot 10^{61})$$

#255:PrecisionDigits := 18

Generating values and using the imtermediate valuem theorem to find zeros:

#256:VECTOR([funct(n), n], n, 50, 225)

#257:

$6.52946875208153713\cdot10^{-6}$	50
$6.50927431210567786\cdot10^{-6}$	51
$6.489015047954671\cdot10^{-6}$	52
$6.46869033083301732\cdot10^{-6}$	53
$6.44829952170493909\cdot10^{-6}$	54
$6.42784197105916672\cdot10^{-6}$	55
$6.4073170186667267\cdot10^{-6}$	56
$6.38672399333147435\cdot10^{-6}$	57
$6.36606221263310375\cdot10^{-6}$	58
$6.34533098266235548\cdot10^{-6}$	59
$6.3245295977481303\cdot10^{-6}$	60
$6.30365734017620403\cdot10^{-6}$	61
$6.28271347989922519\cdot10^{-6}$	62
$6.26169727423766267\cdot10^{-6}$	63
$6.24060796757135517\cdot10^{-6}$	64
$6.21944479102129884\cdot10^{-6}$	65
$6.19820696212129222\cdot10^{-6}$	66
$6.17689368447904005\cdot10^{-6}$	67
$6.15550414742629903\cdot10^{-6}$	68

-6

$6.13403752565762885\cdot 10$	69
$6.1124929788572907\cdot 10^{-6}$	70
$6.09086965131381443\cdot 10^{-6}$	71
$6.06916667152173144\cdot 10^{-6}$	72
$6.04738315176994674\cdot 10^{-6}$	73
$6.02551818771619729\cdot 10^{-6}$	74
$6.00357085794701698\cdot 10^{-6}$	75
$5.98154022352259919\cdot 10^{-6}$	76
$5.95942532750591805\cdot 10^{-6}$	77
$5.9372251944754366\cdot 10^{-6}$	78
$5.91493883002069643\cdot 10^{-6}$	79
$5.89256522022004677\cdot 10^{-6}$	80
$5.87010333109973294\cdot 10^{-6}$	81
$5.84755210807352327\cdot 10^{-6}$	82
$5.82491047536201047\cdot 10^{-6}$	83
$5.80217733539067763\cdot 10^{-6}$	84
$5.77935156816577066\cdot 10^{-6}$	85
$5.7564320306269669\cdot 10^{-6}$	86
$5.73341755597577536\cdot 10^{-6}$	87
$5.71030695297854508\cdot 10^{-6}$	88

$5.68709900524289659 \cdot 10^{-6}$	89
$5.66379247046632504 \cdot 10^{-6}$	90
$5.64038607965565327 \cdot 10^{-6}$	91
$5.61687853631593827 \cdot 10^{-6}$	92
$5.59326851560735442 \cdot 10^{-6}$	93
$5.56955466346849162 \cdot 10^{-6}$	94
$5.54573559570441545 \cdot 10^{-6}$	95
$5.52180989703773938 \cdot 10^{-6}$	96
$5.49777612012085509 \cdot 10^{-6}$	97
$5.47363278450735577 \cdot 10^{-6}$	98
$5.44937837558056888 \cdot 10^{-6}$	99
$5.42501134343698711 \cdot 10^{-6}$	100
$5.40053010172225032 \cdot 10^{-6}$	101
$5.37593302641718511 \cdot 10^{-6}$	102
$5.35121845457125194 \cdot 10^{-6}$	103
$5.32638468298058131 \cdot 10^{-6}$	104
$5.30142996680760037 \cdot 10^{-6}$	105
$5.27635251813905637 \cdot 10^{-6}$	106
$5.25115050447903513 \cdot 10^{-6}$	107

$5.22582204717334733 \cdot 10^{-6}$	108
$5.20036521976141348 \cdot 10^{-6}$	109
$5.17477804625151703 \cdot 10^{-6}$	110
$5.14905849931501334 \cdot 10^{-6}$	111
$5.12320449839477809 \cdot 10^{-6}$	112
$5.09721390772284949 \cdot 10^{-6}$	113
$5.07108453424186349 \cdot 10^{-6}$	114
$5.04481412542449567 \cdot 10^{-6}$	115
$5.01840036698470682 \cdot 10^{-6}$	116
$4.99184088047413647 \cdot 10^{-6}$	117
$4.96513322075649794 \cdot 10^{-6}$	118
$4.93827487335229503 \cdot 10^{-6}$	119
$4.91126325164560024 \cdot 10^{-6}$	120
$4.8840956939440034 \cdot 10^{-6}$	121
$4.85676946038215128 \cdot 10^{-6}$	122
$4.82928172965854864 \cdot 10^{-6}$	123
$4.80162959559447186 \cdot 10^{-6}$	124
$4.77381006350295065 \cdot 10^{-6}$	125
$4.74582004635479364 \cdot 10^{-6}$	126

−6

$4.71765636072755999 \cdot 10$	127
$4.68931572252220194 \cdot 10^{-6}$	128
$4.66079474243081015 \cdot 10^{-6}$	129
$4.63208992113747259 \cdot 10^{-6}$	130
$4.60319764423269265 \cdot 10^{-6}$	131
$4.57411417682008769 \cdot 10^{-6}$	132
$4.54483565779218533 \cdot 10^{-6}$	133
$4.51535809375003115 \cdot 10^{-6}$	134
$4.48567735253899205 \cdot 10^{-6}$	135
$4.45578915637055894 \cdot 10^{-6}$	136
$4.42568907449708623 \cdot 10^{-6}$	137
$4.39537251540322011 \cdot 10^{-6}$	138
$4.36483471847421917 \cdot 10^{-6}$	139
$4.33407074509741377 \cdot 10^{-6}$	140
$4.30307546914862812 \cdot 10^{-6}$	141
$4.27184356681043948 \cdot 10^{-6}$	142
$4.24036950566359828 \cdot 10^{-6}$	143
$4.20864753298669699 \cdot 10^{-6}$	144
$4.17667166319215555 \cdot 10^{-6}$	145
$4.14443566431867309 \cdot 10^{-6}$	146

$4.1119330434913452 \cdot 10^{-6}$	147
$4.07915703125050665 \cdot 10^{-6}$	148
$4.0461005646388477 \cdot 10^{-6}$	149
$4.01275626892325052 \cdot 10^{-6}$	150
$3.97911643781284561 \cdot 10^{-6}$	151
$3.94517301201769197 \cdot 10^{-6}$	152
$3.91091755597287904 \cdot 10^{-6}$	153
$3.87634123253030143 \cdot 10^{-6}$	154
$3.84143477539435278 \cdot 10^{-6}$	155
$3.80618845904770154 \cdot 10^{-6}$	156
$3.77059206587839911 \cdot 10^{-6}$	157
$3.73463485017891801 \cdot 10^{-6}$	158
$3.69830549864021739 \cdot 10^{-6}$	159
$3.66159208690822571 \cdot 10^{-6}$	160
$3.62448203170454697 \cdot 10^{-6}$	161
$3.58696203793567069 \cdot 10^{-6}$	162
$3.54901804012292903 \cdot 10^{-6}$	163
$3.51063513737568401 \cdot 10^{-6}$	164
$3.4717975209987007 \cdot 10^{-6}$	165

$3.4324883936662479 \cdot 10^{-6}$	166
$3.39268987890363456 \cdot 10^{-6}$	167
$3.35238291938324747 \cdot 10^{-6}$	168
$3.31154716225583724 \cdot 10^{-6}$	169
$3.27016082938462164 \cdot 10^{-6}$	170
$3.22820056991104894 \cdot 10^{-6}$	171
$3.18564129203194153 \cdot 10^{-6}$	172
$3.14245597017483627 \cdot 10^{-6}$	173
$3.09861542287631025 \cdot 10^{-6}$	174
$3.05408805553461469 \cdot 10^{-6}$	175
$3.00883956073630095 \cdot 10^{-6}$	176
$2.96283256692431545 \cdot 10^{-6}$	177
$2.91602622360695268 \cdot 10^{-6}$	178
$2.86837570784786829 \cdot 10^{-6}$	179
$2.81983163204889052 \cdot 10^{-6}$	180
$2.77033932646828384 \cdot 10^{-6}$	181
$2.71983796062565812 \cdot 10^{-6}$	182
$2.66825945433770852 \cdot 10^{-6}$	183
$2.61552710934711884 \cdot 10^{-6}$	184
-6	

$2.56155386257844261 \cdot 10$	185
$2.50624001547429503 \cdot 10^{-6}$	186
$2.44947021899276578 \cdot 10^{-6}$	187
$2.39110936896421711 \cdot 10^{-6}$	188
$2.33099684908847034 \cdot 10^{-6}$	189
$2.26893816083141928 \cdot 10^{-6}$	190
$2.20469220592576222 \cdot 10^{-6}$	191
$2.13795087067731966 \cdot 10^{-6}$	192
$2.06830386434060559 \cdot 10^{-6}$	193
$1.99517226805830733 \cdot 10^{-6}$	194
$1.91766571517943103 \cdot 10^{-6}$	195
$1.83421025592694081 \cdot 10^{-6}$	196
$1.74119234488574547 \cdot 10^{-6}$	197
$1.61976804916805677 \cdot 10^{-6}$	198
$1.52454808931642367 \cdot 10^{-6} + 7.85785888107446178 \cdot 10^{-8} \cdot î$	199
$1.45613850939871276 \cdot 10^{-6} + 1.15109163372496278 \cdot 10^{-7} \cdot î$	200
$1.38378221857987647 \cdot 10^{-6} + 1.42528751157611201 \cdot 10^{-7} \cdot î$	201
$1.30670538707987511 \cdot 10^{-6} + 1.65424831840689572 \cdot 10^{-7} \cdot î$	202
$1.22384246474965091 \cdot 10^{-6} + 1.85472062755454615 \cdot 10^{-7} \cdot î$	203
$1.13365416817054273 \cdot 10^{-6} + 2.03503341863626085 \cdot 10^{-7} \cdot î$	204

$1.03376675195076023\cdot10^{-6} + 2.19999571242443592\cdot10^{-7}\cdot\hat{\imath}$ 205

$9.20155635366290546\cdot10^{-7} + 2.35259578395826413\cdot10^{-7}\cdot\hat{\imath}$ 206

$7.84877490444521139\cdot10^{-7} + 2.49465114305900734\cdot10^{-7}\cdot\hat{\imath}$ 207

$6.06866073627912938\cdot10^{-7} + 2.62673474887909817\cdot10^{-7}\cdot\hat{\imath}$ 208

$2.00533736431269617\cdot10^{-7} + 1.69198130719967338\cdot10^{-7}\cdot\hat{\imath}$ 209

$2.0213152061302302\cdot10^{-7} - 1.46030921825243054\cdot10^{-7}\cdot\hat{\imath}$ 210

$2.02849974138915608\cdot10^{-7} - 3.03963893451906753\cdot10^{-7}\cdot\hat{\imath}$ 211

$2.03341628698158864\cdot10^{-7} - 4.23937016591896908\cdot10^{-7}\cdot\hat{\imath}$ 212

$2.03713044944336827\cdot10^{-7} - 5.24055377908142522\cdot10^{-7}\cdot\hat{\imath}$ 213

$2.04008194030548566\cdot10^{-7} - 6.11487378538961741\cdot10^{-7}\cdot\hat{\imath}$ 214

$2.04250385205391741\cdot10^{-7} - 6.89938166783021247\cdot10^{-7}\cdot\hat{\imath}$ 215

$2.04453688279825581\cdot10^{-7} - 7.61614595805923158\cdot10^{-7}\cdot\hat{\imath}$ 216

$2.04627310580821654\cdot10^{-7} - 8.27954711040442318\cdot10^{-7}\cdot\hat{\imath}$ 217

$2.04777621954052611\cdot10^{-7} - 8.89956076205072083\cdot10^{-7}\cdot\hat{\imath}$ 218

$2.04909213214242096\cdot10^{-7} - 9.48343448602022067\cdot10^{-7}\cdot\hat{\imath}$ 219

$2.05025499063252449\cdot10^{-7} - 1.00366250243120979\cdot10^{-6}\cdot\hat{\imath}$ 220

$2.05129084239787519\cdot10^{-7} - 1.05633590934460913\cdot10^{-6}\cdot\hat{\imath}$ 221

$2.05221997198676796\cdot10^{-7} - 1.10669873554092698\cdot10^{-6}\cdot\hat{\imath}$ 222

$2.0530584528489355\cdot10^{-7} - 1.15502176709155434\cdot10^{-6}\cdot\hat{\imath}$ 223

$$\begin{bmatrix} 2.05381921182258643 \cdot 10^{-7} - 1.20152743624237082 \cdot 10^{-6} \cdot \hat{\imath} & 224 \\ 2.05451277948878495 \cdot 10^{-7} - 1.24640102498951596 \cdot 10^{-6} \cdot \hat{\imath} & 225 \end{bmatrix}$$

There is no sign change in the real part of these numbers apparently showing no zeros.

Thus we must reject this solution. This completes our investigation of α = 0.95.

We next investigate the case where α = 1.05.

$$\#258: \frac{q \cdot \alpha}{(2 \cdot \pi \cdot R) \cdot (\pi \cdot r^2)}$$

This just above is the (positive) average charge density of the positron ring for since the volume of the toroid is the surface area of a ring cross section times the circumference of the circle made having the large radius by a theorem of Pappas.

Thus, to normalize lambda[Rho} and make it dimensionless, we must divide it (#10) by this average ring density. And, further, we can make the variable "Rho" also dimensionless too, by noting that Rho = (r rhor), where rhor is dimensionless.

Thus we set NVDlambda[rhor], the normalized ring charge density function, as:

$$\#259: \frac{b0 + \dfrac{r \cdot res}{Rho} + \dfrac{b1 \cdot Rho}{r} + \dfrac{b2 \cdot Rho^2}{r^2}}{\dfrac{q \cdot \alpha}{(2 \cdot \pi \cdot R) \cdot (\pi \cdot r^2)}}$$

and then we set Rho = (r rhor):

$$\#260: \frac{b0 + \frac{r\cdot res}{r\cdot rhor} + \frac{b1\cdot(r\cdot rhor)}{r} + \frac{b2\cdot(r\cdot rhor)^2}{r^2}}{\frac{q\cdot\alpha}{(2\cdot\pi\cdot R)\cdot(\pi\cdot r^2)}}$$

Simplifying:

$$\#261: \frac{2\cdot\pi^2\cdot R\cdot r^2\cdot(b0\cdot rhor + b1\cdot rhor^2 + b2\cdot rhor^3 + res)}{\alpha\cdot q\cdot rhor}$$

This just above is NVDlambda(rhor), the normalized interior charge density.

Substituting for res using res21 (from #), b0 using b021 from (#), b1 using b121 (from #), and b2 using b221 (from #):

Substituting:

$$\#262: \frac{(1.25663706143591729\cdot10^{-6})\cdot\alpha\cdot299792458\cdot(+\ 1.6021764874\cdot10^{-19})^2 + 4\cdot\pi^2}{4\cdot\pi^2\cdot299792458\cdot(+\ 9.1093821545\cdot10^{-31})}$$

$$\frac{(1.05457162853\cdot10^{-34})}{}$$

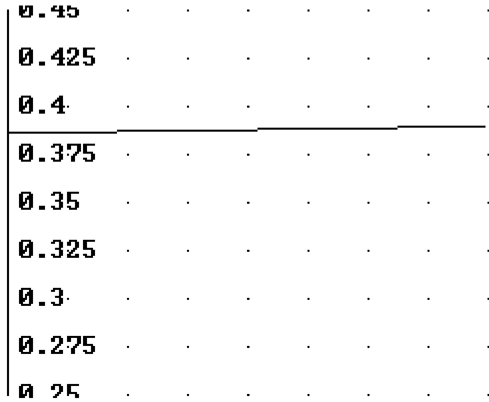
Simplifying:

$$\#263: 8.96978252199944368\cdot10^{-16}\cdot\alpha + 3.86159264290476046\cdot10^{-13}$$

This just above is ”R” as a linear function of α.

Plotting after multiplying by 10^12 so it’s not too small for Derive 5 to plot:

$$\#264: (8.96978252199944368\cdot10^{-16}\cdot\alpha + 3.86159264290476046\cdot10^{-13})\cdot10^{12}$$



This is #247 plotted from α = 0 to α = 4, and it must be multipled by 10^12 to obtain R.

We note that it is a slowly increasing linear function of α since the smaller the value of α, the less mass energy whence the larger the volume in space it is contained in as the smaller the charge, mass, and spin.

Yes, the value of ”r” FOR α = 0.95 is exceedingly small; but it’s not the magnitude of ”r” that’s important, but rather what can be done with it. If ”r” were set equal to zero (as some advise), then we would be back to the problems tht Prof. Richard Feynman used to talk about; namely, if particles are considered to be just points (i.e. spheres of zero radius), then the binding energy they must have to prevent them from exploding -- under very strong Coulomb forces -- must then be infinite. And so he complained that there were all these infinities in calculating with these point particles in the standard model that had (somehow) to be (as he put it) ”swept under the rug.” And thus, particle physics had become more of an art than a science. (Here the rings with small radius being zero -- but with their large radius not vanishing -- are still circles having one quantum of charge and whose electrostatic energy is then infinite.)

But this does not occur at all in the Bergman-Allen charge ring modeling. You can actually and straightforwardly calculate unambiguously using our modeling of the electron and the proton. There is no more: ”now you see it; now you don’t.” And, remember, we are not saying that real electrons and positrons are just like our models of them, but only that -- so far -- the things we calculate with them are verified experimentally. As to just what positrons and electrons really are, how are we to determine this when they’re so very, very small? No, we can’t; instead, we are reduced to simply modeling them.

Next we note that we can calculate R, r, and our normalized interior charge density equation for α = 1.05 by first substituting for α in #211 to obtain our equation for r at α = 1.05 using res21, b021, b121, and b221 that gave us .

We recall #211:

#265:

$$\frac{\sqrt{15}\cdot\sqrt{\left(\alpha\cdot\left(840\cdot(4\cdot\pi\cdot10^{-7})\cdot\alpha\cdot299792458\cdot(+\ 1.6021764874\cdot10^{-19})^{2}\cdot\mathrm{LN}\left(8\cdot\frac{(4\cdot}{}\right.\right.\right.}}{}$$

$$\frac{\frac{\cdot10^{-7})\cdot\alpha\cdot299792458\cdot(+\ 1.6021764874\cdot10^{-19})^{2} + 4\cdot\pi^{2}\cdot(1.05457162853\cdot10^{-}}{4\cdot\pi^{2}\cdot299792458\cdot(+\ 9.1093821545\cdot10^{-31})}}{}$$

$$\frac{\left.\frac{{}^{4})}{}\right) - 840\cdot(4\cdot\pi\cdot10^{-7})\cdot\alpha\cdot299792458\cdot(+\ 1.6021764874\cdot10^{-19})^{2}\cdot\mathrm{LN}(r) + 2\cdot}{}$$

```
                                                                              ~
           -7                                 -19                          ⎛            - ~
30•√(4•π•10   )•√α•(+ 1.6021764874•10    )•√(-299792458)•√⎜420•(4•π•10  ~
                                                                           ⎝                ~
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                                                                                            ~
                                                                      2                   - ~
                                                              84•π  •√(4•π•10  ~
                                                                                            ~

                                                                                            ~
7                                                                         -7
                                              -19 2 ⎛    (4•π•10   )•α•299792458•( ~
 )•α•299792458•(+ 1.6021764874•10    ) •LN⎜8•────────────────────────── ~
                                                       ⎜                                 2  ~
                                                       ⎝                           4•π  • ~
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            -7                                       -19 2        2                         ~
7   (4•π•10   )•α•299792458•(+ 1.6021764874•10    )  + 4•π •(1.05457162 ~
 )•────────────────────────────────────────────────────────────────── ~
                                        2                        -31                        ~
                                   4•π  •299792458•(+ 9.1093821545•10    )  ~

                          -19 2       2                         -34 ⎞                          ~
+ 1.6021764874•10    )  + 4•π •(1.05457162853•10    ) ⎟                        -7 ~
───────────────────────────────────────────────── ⎟ - 420•(4•π•10  ~
                                        -31                          ⎟                        ~
299792458•(+ 9.1093821545•10    )                         ⎠                        ~
──────────────────────────────────────────────────────────────────────── ~
       -34                                                                                  ~
853•10    )                                                                                 ~
─────────•√(-299792458)                                                                     ~
                                                                                            ~
                                                                                            ~

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                                              -19 2                           -7             ~
)•α•299792458•(+ 1.6021764874•10    ) •LN(r) - 599•(4•π•10   )•α•299792 ~
                                                                                            ~
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──────────────────────────────────────────────────────────────────────── ~
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$$458\cdot\left(+\ 1.6021764874\cdot 10^{-19}\right)^{2} - 1680\cdot\pi^{2}\cdot\left(1.05457162853\cdot 10^{-34}\right)\Bigg) - 1213\cdot(\sim$$

$$4\cdot\pi\cdot 10^{-7})\cdot\alpha\cdot 299792458\cdot\left(+\ 1.6021764874\cdot 10^{-19}\right)^{2} - 3360\cdot\pi^{2}\cdot(1.0545716285 \sim$$

$$3\cdot 10^{-34})\Bigg)\Bigg)$$

$-$

$$13\cdot\sqrt{30}\cdot\sqrt{\alpha}\cdot\sqrt{\Bigg(420\cdot(4\cdot\pi\cdot 10^{-7})\cdot\alpha\cdot 299792458\cdot\left(+\ 1.6021764874\cdot 10^{-19}\right)^{2}\cdot \mathrm{LN}\Bigg(8\cdot \sim}$$

```
           -7                                      -19 2       2              ~
 (4·π·10   )·α·299792458·(+ 1.6021764874·10    )  + 4·π ·(1.05457162853~
─────────────────────────────────────────────────────────────────────────~
                       2                                 -31               ~
                    4·π ·299792458·(+ 9.1093821545·10    )                  ~
─────────────────────────────────────────────────────────────────────────~
                                                          -7                ~
                            2           -7     (4·π·10   )·α·299792458·(+  ~
                      210·π ·√(4·π·10   )·─────────────────────────────────~
                                                                     2      ~
                                                                4·π ·29~

   -34   ⎞                                                                   ~
·10    ) ⎟                  -7                                -19 2          ~
─────────⎟ - 420·(4·π·10   )·α·299792458·(+ 1.6021764874·10    ) ·LN(r)  ~
         ⎟                                                                   ~
         ⎠                                                                   ~
─────────────────────────────────────────────────────────────────────────~
              -19 2      2                       -34                        ~
1.6021764874·10    )  + 4·π ·(1.05457162853·10    )                        ~
───────────────────────────────────────────────────·√(-299792458)        ~
                                        -31                                 ~
9792458·(+ 9.1093821545·10    )                                             ~

                                                                             ~
          -7                                          -19 2          2      ~
- 599·(4·π·10   )·α·299792458·(+ 1.6021764874·10    )  - 1680·π ·(1.054~
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               ⎞
         -34   ⎟
57162853·10    )⎟
               ⎟
               ⎠
──────────────── +
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$$\frac{71\cdot\alpha\cdot(+\ 1.6021764874\cdot10^{-19})}{14\cdot\pi^{2}\cdot\dfrac{(4\cdot\pi\cdot10^{-7})\cdot\alpha\cdot299792458\cdot(+\ 1.6021764874\cdot10^{-19})^{2}+4\cdot\pi^{2}\cdot(1.0545}{4\cdot\pi^{2}\cdot299792458\cdot(+\ 9.1093821545\cdot10^{-31})}}\sim$$

$$\frac{}{7162853\cdot10^{-34})}$$

Simplifying:

$$\#266:\ \frac{4.409132843707647\,36\cdot10^{27}\cdot\alpha}{4.80390240459875173\cdot10^{31}\cdot\alpha+2.06813422034851182\cdot10^{34}}+$$

$$\frac{\hat{\imath}\cdot(0.0257933942879619984\cdot\sqrt{\alpha}\cdot\sqrt{(}5.4858939541582783\cdot10^{58}\cdot\alpha\cdot\mathrm{LN}(4.803902\sim}{}$$

$$\frac{0459875173\cdot10^{31}\cdot\alpha+2.06813422034851182\cdot10^{34})-5.4858939541582783\cdot10\sim}{}$$

$$\frac{{}^{58}\cdot\alpha\cdot\mathrm{LN}(r)-4.10344091338990441\cdot10^{31}\cdot(1.42973285851153325\cdot10^{29}\cdot\alpha+5\sim}{}$$

$$\frac{.75550941719581225\cdot10^{29}))-2.75741542732880525\cdot10^{-34}\cdot\sqrt{(}1.07884029948\sim}{}$$

$076242\cdot 10^{62}\cdot\alpha\cdot(1.64549342691644871\cdot 10^{59}\cdot\alpha\cdot LN(4.80390240459875173\cdot 10^{31}$

$\cdot\alpha + 2.06813422034851182\cdot 10^{34}) - 1.64549342691644871\cdot 10^{59}\cdot\alpha\cdot LN(r) - 6$

$4.80390240459875173\cdot 10^{31}\cdot\alpha + 2.06813422034851182\cdot 10^{34}$

$.15516137008485662\cdot 10^{31}\cdot(2.8594657170230665\cdot 10^{29}\cdot\alpha + 1.15090970814613$

$545\cdot 10^{30})) - 2.02565551521693487\cdot 10^{91}\cdot SIGN(\alpha)\cdot(-\alpha)^{1.5}\cdot\sqrt{(}5.48589395415$

$82783\cdot 10^{58}\cdot\alpha\cdot LN(4.80390240459875173\cdot 10^{31}\cdot\alpha + 2.06813422034851182\cdot 10^{34}$

$) - 5.4858939541582783\cdot 10^{58}\cdot\alpha\cdot LN(r) - 4.10344091338990441\cdot 10^{31}\cdot(1.429$

$73285851153325\cdot 10^{29}\cdot\alpha + 5.75550941719581225\cdot 10^{29}))))$

Setting $\alpha = 1.05$:

$$\#267: \frac{4.40913284370764736\cdot 10^{27}\cdot 1.05}{4.80390240459875173\cdot 10^{31}\cdot 1.05 + 2.06813422034851182\cdot 10^{34}} +$$

$\hat{\imath}\cdot(0.0257933942879619984\cdot\sqrt{1.05}\cdot\sqrt{(}5.4858939541582783\cdot 10^{58}\cdot 1.05\cdot LN(4.8$

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                    31                                34                ~
0390240459875173·10   ·1.05 + 2.06813422034851182·10   ) - 5.4858939541~
────────────────────────────────────────────────────────────────────────~
                                                                        ~
                                                                        ~

          58                                      31                    ~
582783·10   ·1.05·LN(r) - 4.10344091338990441·10   ·(1.4297328585115332~
────────────────────────────────────────────────────────────────────────~
                                                                        ~
                                                                        ~

   29                              29                              -34  ~
5·10   ·1.05 + 5.75550941719581225·10   )) - 2.75741542732880525·10    ·~
────────────────────────────────────────────────────────────────────────~
                                                                        ~
                                                                        ~

                         62                                59           ~
√(1.07884029948076242·10   ·1.05·(1.64549342691644871·10   ·1.05·LN(4.8~
────────────────────────────────────────────────────────────────────────~
                                                                        ~
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                    31                                34                ~
0390240459875173·10   ·1.05 + 2.06813422034851182·10   ) - 1.6454934269~
────────────────────────────────────────────────────────────────────────~
                                                    31                  ~
                        4.80390240459875173·10   ·1.05 + 2.068134220348~

           59                                      31                   ~
1644871·10   ·1.05·LN(r) - 6.15516137008485662·10   ·(2.859465717023066~
────────────────────────────────────────────────────────────────────────~
         34                                                             ~
51182·10                                                                ~

   29                              30                              91   ~
5·10   ·1.05 + 1.15090970814613545·10   )) - 2.02565551521693487·10   ·S~
────────────────────────────────────────────────────────────────────────~
                                                                        ~
                                                                        ~

                  1.5                          58                       ~
IGN(1.05)·(-1.05)    ·√(5.4858939541582783·10   ·1.05·LN(4.803902404598~
────────────────────────────────────────────────────────────────────────~
                                                                        ~
                                                                        ~

         31                                34                        58~
75173·10   ·1.05 + 2.06813422034851182·10   ) - 5.4858939541582783·10   ~
────────────────────────────────────────────────────────────────────────~
                                                                        ~
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```

$$\cdot 1.05\cdot \mathrm{LN}(r) - 4.10344091338990441\cdot 10^{31}\cdot (1.42973285851153325\cdot 10^{29}\cdot 1.05 \sim$$

$$+ 5.75550941719581225\cdot 10^{29}))))$$

Simplifying:

$$\#268{:}- 1.88096424740992387\cdot 10^{-68}\cdot \hat{\imath}\cdot \sqrt{(}- 9.78592572595352376\cdot 10^{120}\cdot \mathrm{LN}(r) -$$
$$4.28579949323106575\cdot 10^{123} + 5.96870577573701947\cdot 10^{91}\cdot \hat{\imath}\cdot \sqrt{(}-$$
$$1.92006288395539 74\cdot 10^{57}\cdot \mathrm{LN}(r) - 8.40867715229228801\cdot 10^{59})) +$$
$$2.23308793362360039\cdot 10^{-7} + 6.98276000444516632\cdot 10^{-36}\cdot \hat{\imath}\cdot \sqrt{(}-$$
$$1.9200628839553974\cdot 10^{57}\cdot \mathrm{LN}(r) - 8.40867715229228801\cdot 10^{59})$$

Setting r = 10^-n:

$$\#269{:}- 1.88096424740992387\cdot 10^{-68}\cdot \hat{\imath}\cdot \sqrt{(}- 9.78592572595352376\cdot 10^{120}\cdot \mathrm{LN}(10^{-n}) -$$
$$4.28579949323106575\cdot 10^{123} + 5.96870577573701947\cdot 10^{91}\cdot \hat{\imath}\cdot \sqrt{(}-$$
$$1.9200628839553974\cdot 10^{57}\cdot \mathrm{LN}(10^{-n}) - 8.40867715229228801\cdot 10^{59})) +$$
$$2.23308793362360039\cdot 10^{-7} + 6.98276000444516632\cdot 10^{-36}\cdot \hat{\imath}\cdot \sqrt{(}-$$
$$1.9200628839553974\cdot 10^{57}\cdot \mathrm{LN}(10^{-n}) - 8.40867715229228801\cdot 10^{59})$$

$$\#270{:}\mathrm{FFN}(n) := - 1.88096424740992387\cdot 10^{-68}\cdot \hat{\imath}\cdot \sqrt{(}-$$
$$9.78592572595352376\cdot 10^{120}\cdot \mathrm{LN}(10^{-n}) - 4.28579949323106575\cdot 10^{123} +$$
$$5.96870577573701947\cdot 10^{91}\cdot \hat{\imath}\cdot \sqrt{(}- 1.9200628839553974\cdot 10^{57}\cdot \mathrm{LN}(10^{-n}) -$$
$$8.40867715229228801\cdot 10^{59})) + 2.23308793362360039\cdot 10^{-7} +$$

$6.98276000444516632\cdot 10^{-36}\cdot \hat{\imath}\cdot\sqrt{(- 1.92006288395539 74\cdot 10^{57}\cdot \mathrm{LN}(10^{-n}) - 8.40867715229228801\cdot 10^{59})}$

#271: VECTOR([FFN(n), n], n, 50, 225)

#272:

$$\begin{bmatrix} -4.20903463641249752\cdot 10^{-6} & 50 \\ -4.19317034628506559\cdot 10^{-6} & 51 \\ -4.17724896676300471\cdot 10^{-6} & 52 \\ -4.16126987704681962\cdot 10^{-6} & 53 \\ -4.14523244500365264\cdot 10^{-6} & 54 \\ -4.12913602687548705\cdot 10^{-6} & 55 \\ -4.11297996697761954\cdot 10^{-6} & 56 \\ -4.09676359738700214\cdot 10^{-6} & 57 \\ -4.0804862376200344\cdot 10^{-6} & 58 \\ -4.06414719429936619\cdot 10^{-6} & 59 \\ -4.04774576080924937\cdot 10^{-6} & 60 \\ -4.03128121693895378\cdot 10^{-6} & 61 \\ -4.01475282851373821\cdot 10^{-6} & 62 \\ -3.9981598470128416\cdot 10^{-6} & 63 \\ -3.98150150917393187\cdot 10^{-6} & 64 \\ -3.96477703658342102\cdot 10^{-6} & 65 \\ -3.94798563525202432\cdot 10^{-6} & 66 \\ -3.93112649517490881\cdot 10^{-6} & 67 \\ -3.91419878987574151\cdot 10^{-6} & 68 \\ {}^{-6} & \end{bmatrix}$$

$- 3.89720167593391129 \cdot 10$	69
$- 3.88013429249415914 \cdot 10^{-6}$	70
$- 3.86299576075781003 \cdot 10^{-6}$	71
$- 3.8457851834547557 \cdot 10^{-6}$	72
$- 3.82850164429529064 \cdot 10^{-6}$	73
$- 3.81114420740085364 \cdot 10^{-6}$	74
$- 3.79371191671267429 \cdot 10^{-6}$	75
$- 3.77620379537726704 \cdot 10^{-6}$	76
$- 3.75861884510765526 \cdot 10^{-6}$	77
$- 3.74095604551914336 \cdot 10^{-6}$	78
$- 3.72321435343838629 \cdot 10^{-6}$	79
$- 3.70539270218443273 \cdot 10^{-6}$	80
$- 3.6874900008203397 \cdot 10^{-6}$	81
$- 3.66950513337387286 \cdot 10^{-6}$	82
$- 3.65143695802571725 \cdot 10^{-6}$	83
$- 3.63328430626352745 \cdot 10^{-6}$	84
$- 3.6150459820000435 \cdot 10^{-6}$	85
$- 3.59672076065338942 \cdot 10^{-6}$	86
$- 3.57830738818755282 \cdot 10^{-6}$	87
$- 3.55980458011091833 \cdot 10^{-6}$	88

$-3.54121102043059143 \cdot 10^{-6}$	89
$-3.5225253605601038 \cdot 10^{-6}$	90
$-3.50374621817793445 \cdot 10^{-6}$	91
$-3.48487217603411253 \cdot 10^{-6}$	92
$-3.46590178070198597 \cdot 10^{-6}$	93
$-3.44683354127204487 \cdot 10^{-6}$	94
$-3.42766592798447753 \cdot 10^{-6}$	95
$-3.40839737079690974 \cdot 10^{-6}$	96
$-3.38902625788353221 \cdot 10^{-6}$	97
$-3.36955093406155561 \cdot 10^{-6}$	98
$-3.34996969914064563 \cdot 10^{-6}$	99
$-3.33028080619067981 \cdot 10^{-6}$	100
$-3.3104824597228308 \cdot 10^{-6}$	101
$-3.29057281377861627 \cdot 10^{-6}$	102
$-3.27054996992115883 \cdot 10^{-6}$	103
$-3.25041197512246934 \cdot 10^{-6}$	104
$-3.2301568195400989 \cdot 10^{-6}$	105
$-3.20978243417599542 \cdot 10^{-6}$	106
$-3.18928668840984607 \cdot 10^{-6}$	107

$-3.16866738739858175\cdot 10^{-6}$	108
$-3.14792226933305943\cdot 10^{-6}$	109
$-3.12704900254221677\cdot 10^{-6}$	110
$-3.10604518243420399\cdot 10^{-6}$	111
$-3.08490832826313385\cdot 10^{-6}$	112
$-3.06363587970914309\cdot 10^{-6}$	113
$-3.04222519325841908\cdot 10^{-6}$	114
$-3.02067353836870254\cdot 10^{-6}$	115
$-2.99897809340452095\cdot 10^{-6}$	116
$-2.97713594132502224\cdot 10^{-6}$	117
$-2.95514406510575225\cdot 10^{-6}$	118
$-2.93299934287403312\cdot 10^{-6}$	119
$-2.9106985427357358\cdot 10^{-6}$	120
$-2.88823831726917581\cdot 10^{-6}$	121
$-2.86561519765957253\cdot 10^{-6}$	122
$-2.84282558744497104\cdot 10^{-6}$	123
$-2.81986575584169945\cdot 10^{-6}$	124
$-2.79673183061428668\cdot 10^{-6}$	125
$-2.7734197904512548\cdot 10^{-6}$	126

−6

$-\ 2.74992545680427656 \cdot 10$	127
$-\ 2.72624448514379802 \cdot 10^{-6}$	128
$-\ 2.70237235557930376 \cdot 10^{-6}$	129
$-\ 2.67830436278687344 \cdot 10^{-6}$	130
$-\ 2.65403560518045839 \cdot 10^{-6}$	131
$-\ 2.62956097325629452 \cdot 10^{-6}$	132
$-\ 2.60487513703194796 \cdot 10^{-6}$	133
$-\ 2.57997253249252656 \cdot 10^{-6}$	134
$-\ 2.5548473469464245 \cdot 10^{-6}$	135
$-\ 2.52949350318141419 \cdot 10^{-6}$	136
$-\ 2.5039046422987388 \cdot 10^{-6}$	137
$-\ 2.47807410508783346 \cdot 10^{-6}$	138
$-\ 2.45199491178710771 \cdot 10^{-6}$	139
$-\ 2.4256597400564932 \cdot 10^{-6}$	140
$-\ 2.39906090096476905 \cdot 10^{-6}$	141
$-\ 2.37219031276850642 \cdot 10^{-6}$	142
$-\ 2.34503947222920771 \cdot 10^{-6}$	143
$-\ 2.31759942318011178 \cdot 10^{-6}$	144
$-\ 2.28986072201329928 \cdot 10^{-6}$	145
$-\ 2.26181339971007743 \cdot 10^{-6}$	146

$-2.23344691998183049 \cdot 10^{-6}$	147
$-2.20475013302298066 \cdot 10^{-6}$	148
$-2.17571122430043615 \cdot 10^{-6}$	149
$-2.14631765771247297 \cdot 10^{-6}$	150
$-2.11655611234138993 \cdot 10^{-6}$	151
$-2.08641241189473859 \cdot 10^{-6}$	152
$-2.05587144577477152 \cdot 10^{-6}$	153
$-2.02491708052907195 \cdot 10^{-6}$	154
$-1.99353206020966636 \cdot 10^{-6}$	155
$-1.96169789389378808 \cdot 10^{-6}$	156
$-1.92939472828470533 \cdot 10^{-6}$	157
$-1.89660120289999476 \cdot 10^{-6}$	158
$-1.86329428484701434 \cdot 10^{-6}$	159
$-1.82944907955454331 \cdot 10^{-6}$	160
$-1.79503861304061203 \cdot 10^{-6}$	161
$-1.76003358030293506 \cdot 10^{-6}$	162
$-1.72440205315774955 \cdot 10^{-6}$	163
$-1.68810913924089672 \cdot 10^{-6}$	164
$-1.65111658180637632 \cdot 10^{-6}$	165

$-1.61338228725307571\cdot10^{-6}$	166
$-1.57485976375733138\cdot10^{-6}$	167
$-1.53549744967246745\cdot10^{-6}$	168
$-1.49523790402485922\cdot10^{-6}$	169
$-1.4540168228324191\cdot10^{-6}$	170
$-1.41176183312494021\cdot10^{-6}$	171
$-1.36839099999743651\cdot10^{-6}$	172
$-1.32381095854347738\cdot10^{-6}$	173
$-1.27791454860439799\cdot10^{-6}$	174
$-1.23057778035241413\cdot10^{-6}$	175
$-1.18165588365796384\cdot10^{-6}$	176
$-1.1309780785693897\cdot10^{-6}$	177
$-1.07834052127870491\cdot10^{-6}$	178
$-1.02349658143885961\cdot10^{-6}$	179
$-9.6614310222033661\cdot10^{-7}$	180
$-9.05900406438222919\cdot10^{-7}$	181
$-8.42282172039886009\cdot10^{-7}$	182
$-7.74648093099066277\cdot10^{-7}$	183
$-7.02125518336734814\cdot10^{-7}$	184

−7

$- 6.23470880433325032\cdot 10$ 185

$- 5.36802377746948449\cdot 10^{-7}$ 186

$- 4.39018145976560544\cdot 10^{-7}$ 187

$- 3.24278277846235071\cdot 10^{-7}$ 188

$- 1.78578139564502514\cdot 10^{-7}$ 189

$6.6049927370728515\cdot 10^{-8}$ 190

$2.31171779044133277\cdot 10^{-7} + 3.36696516168011283\cdot 10^{-7}\cdot \hat{\imath}$ 191

$2.31171779044133278\cdot 10^{-7} + 5.0397848555211726\cdot 10^{-7}\cdot \hat{\imath}$ 192

$2.31171779044133279\cdot 10^{-7} + 6.28191120439580423\cdot 10^{-7}\cdot \hat{\imath}$ 193

$2.31171779044133279\cdot 10^{-7} + 7.31610452152554479\cdot 10^{-7}\cdot \hat{\imath}$ 194

$2.31171779044133279\cdot 10^{-7} + 8.22121416579446\cdot 10^{-7}\cdot \hat{\imath}$ 195

$2.31171779044133279\cdot 10^{-7} + 9.03611306645907768\cdot 10^{-7}\cdot \hat{\imath}$ 196

$2.31171779044133279\cdot 10^{-7} + 9.78336937561929392\cdot 10^{-7}\cdot \hat{\imath}$ 197

$2.31171779044133279\cdot 10^{-7} + 1.04774659784596023\cdot 10^{-6}\cdot \hat{\imath}$ 198

$2.31171779044133279\cdot 10^{-7} + 1.11283543401417358\cdot 10^{-6}\cdot \hat{\imath}$ 199

$2.31171779044133279\cdot 10^{-7} + 1.17432213344433045\cdot 10^{-6}\cdot \hat{\imath}$ 200

$2.31171779044133279\cdot 10^{-7} + 1.23274581443092867\cdot 10^{-6}\cdot \hat{\imath}$ 201

$2.31171779044133279\cdot 10^{-7} + 1.28852319067089491\cdot 10^{-6}\cdot \hat{\imath}$ 202

$2.31171779044133279\cdot 10^{-7} + 1.341984270696357\cdot 10^{-6}\cdot \hat{\imath}$ 203

$2.31171779044133279\cdot 10^{-7} + 1.39339569135840339\cdot 10^{-6}\cdot \hat{\imath}$ 204

$$2.31171779044133279\cdot 10^{-7} + 1.44297654956547812\cdot 10^{-6}\cdot \hat{\imath} \quad 205$$

$$2.31171779044133279\cdot 10^{-7} + 1.49090948501095213\cdot 10^{-6}\cdot \hat{\imath} \quad 206$$

$$2.31171779044133279\cdot 10^{-7} + 1.53734864698784325\cdot 10^{-6}\cdot \hat{\imath} \quad 207$$

$$2.31171779044133279\cdot 10^{-7} + 1.58242555347639721\cdot 10^{-6}\cdot \hat{\imath} \quad 208$$

$$2.31171779044133279\cdot 10^{-7} + 1.6262534864512395\cdot 10^{-6}\cdot \hat{\imath} \quad 209$$

$$2.31171779044133279\cdot 10^{-7} + 1.66893084700791051\cdot 10^{-6}\cdot \hat{\imath} \quad 210$$

$$2.31171779044133279\cdot 10^{-7} + 1.71054375623492057\cdot 10^{-6}\cdot \hat{\imath} \quad 211$$

$$2.31171779044133279\cdot 10^{-7} + 1.7511680992680289\cdot 10^{-6}\cdot \hat{\imath} \quad 212$$

$$2.31171779044133279\cdot 10^{-7} + 1.7908711516448443\cdot 10^{-6}\cdot \hat{\imath} \quad 213$$

$$2.31171779044133279\cdot 10^{-7} + 1.82971288777596489\cdot 10^{-6}\cdot \hat{\imath} \quad 214$$

$$2.31171779044133279\cdot 10^{-7} + 1.86774704432725323\cdot 10^{-6}\cdot \hat{\imath} \quad 215$$

$$2.31171779044133279\cdot 10^{-7} + 1.90502199239088057\cdot 10^{-6}\cdot \hat{\imath} \quad 216$$

$$2.31171779044133279\cdot 10^{-7} + 1.94158145886095905\cdot 10^{-6}\cdot \hat{\imath} \quad 217$$

$$2.31171779044133279\cdot 10^{-7} + 1.97746512770576558\cdot 10^{-6}\cdot \hat{\imath} \quad 218$$

$$2.31171779044133279\cdot 10^{-7} + 2.01270914470822375\cdot 10^{-6}\cdot \hat{\imath} \quad 219$$

$$2.31171779044133279\cdot 10^{-7} + 2.04734654396656536\cdot 10^{-6}\cdot \hat{\imath} \quad 220$$

$$2.31171779044133279\cdot 10^{-7} + 2.08140761048660748\cdot 10^{-6}\cdot \hat{\imath} \quad 221$$

$$2.31171779044133279\cdot 10^{-7} + 2.11492019019425385\cdot 10^{-6}\cdot \hat{\imath} \quad 222$$

$$2.31171779044133279\cdot 10^{-7} + 2.14790995639738787\cdot 10^{-6}\cdot \hat{\imath} \quad 223$$

$$\begin{bmatrix} 2.31171779044133279\cdot 10^{-7} + 2.18040063994917192\cdot 10^{-6}\cdot \hat{\imath} & 224 \\ 2.31171779044133279\cdot 10^{-7} + 2.2124142289793944\cdot 10^{-6}\cdot \hat{\imath} & 225 \end{bmatrix}$$

We see that there is a zero between 189 & 190 by the intermediate value property.

We employ newton's method to solve for r starting with a trial value of 10^-189:

$$\#273{:}\mathrm{NEWTON}(-\ 1.88096424740992387\cdot 10^{-68}\cdot \hat{\imath}\cdot\sqrt{(-\ 9.78592572595352376\cdot 10^{120}\cdot \mathrm{LN}(r) - 4.28579949323106575\cdot 10^{123} + 5.96870577573701947\cdot 10^{91}\cdot \hat{\imath}\cdot\sqrt{(-\ 1.9200628839553974\cdot 10^{57}\cdot \mathrm{LN}(r) - 8.40867715229228801\cdot 10^{59}}))} + 2.23308793362360039\cdot 10^{-7} + 6.98276000444516632\cdot 10^{-36}\cdot \hat{\imath}\cdot\sqrt{(-\ 1.9200628839553974\cdot 10^{57}\cdot \mathrm{LN}(r) - 8.40867715229228801\cdot 10^{59})}, r, 10^{-190}, 20)$$

Execute:

$$\#274{:}[10^{-190}, 1.35714560716467406\cdot 10^{-190}, 1.51799609494548906\cdot 10^{-190}, 1.5349201297992888\cdot 10^{-190}, 1.53507003357082268\cdot 10^{-190}, 1.53507004507474739\cdot 10^{-190}, 1.53507004507474748\cdot 10^{-190}, 1.53507004507474752\cdot 10^{-190}, 1.53507004507474751\cdot 10^{-190}, 1.53507004507474762\cdot 10^{-190}, 1.53507004507474756\cdot 10^{-190}, 1.53507004507474768\cdot 10^{-190}, 1.53507004507474749\cdot 10^{-190}, 1.53507004507474751\cdot 10^{-190}, 1.53507004507474749\cdot 10^{-190}, 1.53507004507474753\cdot 10^{-190}, 1.53507004507474745\cdot 10^{-190},$$

$$1.53507004507474746\cdot10^{-190},\ 1.53507004507474745\cdot10^{-190},$$

$$1.53507004507474755\cdot10^{-190},\ 1.53507004507474767\cdot10^{-190}]$$

We have convergence, and so our value for r here is:

#275: $1.53507004507474767\cdot10^{-190}$

We can now obtain our completely normalized charge density function by substituting into #229 for α = 1.05 and r as just above:

#276:

$$\sqrt{15}\cdot(3\cdot rhor^{2} - 4\cdot rhor + 1)\cdot\sqrt{\left(1.05\cdot\left(840\cdot(4\cdot\pi\cdot10^{-7})\cdot1.05\cdot299792458\cdot(+\ 1 \sim\right.\right.}$$

$$6021764874\cdot10^{-19})^{2}\cdot LN\left(\frac{2\cdot((4\cdot\pi\cdot10^{-7})\cdot1.05\cdot299792458\cdot(+\ 1.6021764874\cdot \sim}{\pi^{2}\cdot299792458\cdot(+\ 9.109 \sim}\right.$$

$$\left.\frac{0^{-19})^{2} + 4\cdot\pi^{2}\cdot(1.05457162853\cdot10^{-34}))}{821545\cdot10^{-31})}\right) - 840\cdot(4\cdot\pi\cdot10^{-7})\cdot1.05\cdot29979245 \sim$$

$$8\cdot(+\ 1.6021764874\cdot10^{-19})^{2}\cdot LN(1.53507004507474767\cdot10^{-190}) + 2\cdot\sqrt{30}\cdot\sqrt{(4 \sim}$$

```
                                                                       ⎛                     ~
      -7                               -19                             ⎜             -7      ~
π·10   )·√1.05·(+ 1.6021764874·10        )·√(-299792458)·√⎜420·(4·π·10   )·1 ~
                                                                       ⎜                     ~
                                                                       ⎝                     ~
──────────────────────────────────────────────────────────────────────────────── ~
                                                                                             ~
                                                                           42·√(4· ~
                                                                                             ~
                                                             ⎛              -7                ~
                                       -19 2                 ⎜ 2·((4·π·10   )·1.05·29979245 ~
.05·299792458·(+ 1.6021764874·10        ) ·LN⎜───────────────────────────── ~
                                                             ⎜                           2   ~
                                                             ⎝                          π  · ~
──────────────────────────────────────────────────────────────────────────────── ~
      -7                                -19                                                  ~
π·10   )·1.05·(+ 1.6021764874·10        )·rhor·√(-299792458)

                                  -19 2       2                    -34 ⎞                     ~
8·(+ 1.6021764874·10      )  + 4·π  ·(1.05457162853·10      ))⎟                     ~
────────────────────────────────────────────────────────────── ⎟ - 420·(4·π· ~
                                              -31                                 ⎟                     ~
299792458·(+ 9.1093821545·10       )                                   ⎠                     ~
──────────────────────────────────────────────────────────────────────────────── ~
                                                                                             ~
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                                                                                             ~
  -7                                              -19 2                                      ~
10   )·1.05·299792458·(+ 1.6021764874·10        ) ·LN(1.53507004507474767·1 ~
                                                                                             ~
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 -190                    -7                                                -19 2             ~
0     ) - 599·(4·π·10   )·1.05·299792458·(+ 1.6021764874·10        )  - 1680 ~
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                                            ⎞                                                ~
  2                               -34      ⎟                      -7                         ~
·π  ·(1.05457162853·10      )⎟ - 1213·(4·π·10   )·1.05·299792458·(+ 1.6021 ~
                                            ⎟                                                ~
                                            ⎠                                                ~
──────────────────────────────────────────────────────────────────────────────── ~
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                 -19 2            2                          -34   ⎞⎞
764874·10    )  − 3360·π  ·(1.05457162853·10     )  ⎟⎟
                                                                   ⎠⎠
──────────────────────────────────────────────────────────── +


                    3                  2
 √15·⎛√2·(14·rhor  − 24·rhor  + 11·rhor − 1)·√(−299792458)·√⎛420·(4·π ~
     ⎝                                                       ⎝          ~
─────────────────────────────────────────────────────────────────────── ~


   −7                                           −19 2        ⎛         −7
·10   )·1.05·299792458·(+ 1.6021764874·10     ) ·LN⎜ (4·π·10   )·1.05·299 ~
                                                    ⎜───────────────────── ~
                                                    ⎝                      ~
─────────────────────────────────────────────────────────────────────── ~


                                 −19 2        2                    −34  ⎞
792458·(+ 1.6021764874·10      )  + 4·π  ·(1.05457162853·10     )  ⎟ − 420·( ~
────────────────────────────────────────────────────────────────── ⎟        ~
                                  −31                               ⎟        ~
    299792458·(+ 9.1093821545·10     )                              ⎠        ~
─────────────────────────────────────────────────────────────────────── ~


                                                                  ⎛  2          ~
       −7                                            −19 2        ⎜ π  ·(1.5350700450 ~
4·π·10   )·1.05·299792458·(+ 1.6021764874·10      ) ·LN⎜──────────────── ~
                                                                  ⎝              2 ~
─────────────────────────────────────────────────────────────────────── ~
                     −7                                     −19
    105·√(4·π·10    )·√1.05·299792458·(+ 1.6021764874·10     )·rhor     ~

          −190  ⎞                                                          ~
7474767·10     )⎟                      −7                               −  ~
────────────────⎟ − 599·(4·π·10   )·1.05·299792458·(+ 1.6021764874·10  ~
                ⎠                                                          ~
─────────────────────────────────────────────────────────────────────── ~
```

$$\frac{\left.{}^{19})^2 - 1680\cdot\pi^2\cdot(1.05457162853\cdot10^{-34})\right) + \sqrt{15}\cdot\sqrt{(4\cdot\pi\cdot10^{-7})}\cdot\sqrt{1.05\cdot2997924}\ \sim}{}$$

$$\frac{\left.58\cdot(+\ 1.6021764874\cdot10^{-19})\cdot(84\cdot rhor^3 - 186\cdot rhor^2 + 115\cdot rhor - 13)\right)}{}$$

Simplifying:

$$\#277: \quad -\ 2\cdot rhor^2 + 6\cdot rhor + \frac{2}{rhor} - 6$$

Again, as in the case where α = 0.95, we haave the SAME completely normalized charge density function here where α = 1.05) having one digit integer coefficients! And the same is true for α = 1 as well.

Recalling #70, the total ring electrostatic energy using b12 for b1:

$$\#278: \frac{\alpha\cdot c\cdot(Mu0\cdot\alpha\cdot c\cdot q^2 + 2\cdot\pi^2\cdot hbar)}{4\cdot\pi^2\cdot R}$$

Substituting for our R from #80 and then for our constants:

$$\#279: \quad \frac{\alpha\cdot c\cdot(Mu0\cdot\alpha\cdot c\cdot q^2 + 2\cdot\pi^2\cdot hbar)}{4\cdot\pi^2\cdot\dfrac{Mu0\cdot\alpha\cdot c\cdot q^2 + 4\cdot\pi^2\cdot hbar}{4\cdot\pi^2\cdot c\cdot me}}$$

$$\#280: \quad \frac{\alpha\cdot299792458\cdot((4\cdot\pi\cdot10^{-7})\cdot\alpha\cdot299792458\cdot(+\ 1.6021764874\cdot10^{-19})^2 \sim + 2\cdot\pi^2\cdot(1}{4\cdot\pi^2\cdot\dfrac{(4\cdot\pi\cdot10^{-7})\cdot\alpha\cdot299792458\cdot(+\ 1.6021764874\cdot10^{-19})^2 + \sim 4\cdot\pi^2\cdot(1.05}{4\cdot\pi^2\cdot299792458\cdot(+\ 9.1093821545\cdot10^{-31})}}$$

$$\frac{05457162853\cdot 10^{-34}))}{57162853\cdot 10^{-34})}$$

Setting α = 1.05:

$$\#281: \quad \frac{1.05\cdot 299792458\cdot((4\cdot\pi\cdot 10^{-7})\cdot 1.05\cdot 299792458\cdot(+\ 1.6021764874\cdot 10^{-19})^{2} + 2}{4\cdot\pi^{2}\cdot\frac{(4\cdot\pi\cdot 10^{-7})\cdot 1.05\cdot 299792458\cdot(+\ 1.6021764874\cdot 10^{-19})^{2} + 4\cdot\pi^{2}\cdot(}{4\cdot\pi^{2}\cdot 299792458\cdot(+\ 9.1093821545\cdot 10^{-31})}}$$

$$\frac{\pi^{2}\cdot(1.05457162853\cdot 10^{-34}))}{.05457162853\cdot 10^{-34})}$$

Simplifying:

$$\#282: \quad 4.30868750935682204\cdot 10^{-14}$$

This just aboove is the total electrostatic energy.

Recalling #75, the total ring magneticc energy using b12 for b1:

$$\#283: \frac{\alpha\cdot c\cdot hbar}{2\cdot R}$$

Substituting for our R from #80 and then for our constants:

$$\#284: \quad \frac{\alpha\cdot c\cdot hbar}{2\cdot\frac{Mu0\cdot\alpha\cdot c\cdot q^{2} + 4\cdot\pi^{2}\cdot hbar}{4\cdot\pi^{2}\cdot c\cdot me}}$$

$$\#285: \quad 2\cdot\frac{\dfrac{\alpha\cdot 299792458\cdot(1.05457162853\cdot 10^{-34})}{(4\cdot\pi\cdot 10^{-7})\cdot\alpha\cdot 299792458\cdot(+\ 1.6021764874\cdot 10^{-19})^2 + 4\cdot\pi^2\cdot(1.0545716285\text{~}}}{4\cdot\pi^2\cdot 299792458\cdot(+\ 9.1093821545\cdot 10^{-31})}$$

$$\overline{\underline{3\cdot 10^{-34})}}$$

Setting $\alpha = 1.05$:

$$\#286: \quad 2\cdot\frac{\dfrac{1.05\cdot 299792458\cdot(1.05457162853\cdot 10^{-34})}{(4\cdot\pi\cdot 10^{-7})\cdot 1.05\cdot 299792458\cdot(+\ 1.6021764874\cdot 10^{-19})^2 + 4\cdot\pi^2\cdot(1.054571\text{~}}}{4\cdot\pi^2\cdot 299792458\cdot(+\ 9.1093821545\cdot 10^{-31})}$$

$$\overline{\underline{2853\cdot 10^{-34})}}$$

Simplifying:

$$\#287: \quad 4.28777209641528363\cdot 10^{-14}$$

Subtracting the just above total ring magnetic energy from the total ring electric energy (#282):

$$\#288: 4.30868750935682204\cdot 10^{-14} - 4.28777209641528363\cdot 10^{-14}$$

Simplifying:

$$\#289: \quad 2.09154129415384102\cdot 10^{-16}$$

We see that the total ring (with $\alpha = 1.05$ here) electrical energy minus the total ring magnetic energy is two orders of magnitudes smaller that either of the two.

We take the total ring electric energy converted to mass by dividing by c^2 to be the ring gravitational mass in line with Morton Spears's capacitance theory of gravity, and then we take the total ring inertial mass as the total ring magnetic energy divided by c^2. Hence, the gravitational ring mass is slightly larger than the ring inertial mass.

We next consider all this but with α = 0.95.

Setting α = 0.95 into #280:

$$\#290: \quad \frac{0.95\cdot 299792458\cdot((4\cdot\pi\cdot 10^{-7})\cdot 0.95\cdot 299792458\cdot(+\ 1.6021764874\cdot 10^{-19})^{2}\ +\ 2 \ldots}{4\cdot\pi^{2}\cdot\dfrac{(4\cdot\pi\cdot 10^{-7})\cdot 0.95\cdot 299792458\cdot(+\ 1.6021764874\cdot 10^{-19})^{2}\ +\ 4\cdot\pi^{2}\cdot(\ldots}{4\cdot\pi^{2}\cdot 299792458\cdot(+\ 9.1093821545\cdot 10^{-31}) \ldots}}$$

$$\frac{\pi^{2}\cdot(1.05457162853\cdot 10^{-34}))}{.05457162853\cdot 10^{-34})}$$

Simplifying:

$$\#291: \quad 3.897437184523603 70\cdot 10^{-14}$$

This just aboove is the total electrostatic energy if α = 0.95.

We set α = 0.95 in #285, the ring total magnetic energy as a function of α:

$$\#292: \quad \frac{0.95\cdot 299792458\cdot(1.05457162853\cdot 10^{-34})}{2\cdot\dfrac{(4\cdot\pi\cdot 10^{-7})\cdot 0.95\cdot 299792458\cdot(+\ 1.6021764874\cdot 10^{-19})^{2}\ +\ 4\cdot\pi^{2}\cdot(1.054571 \ldots}{4\cdot\pi^{2}\cdot 299792458\cdot(+\ 9.1093821545\cdot 10^{-31})}}$$

$$2853 \cdot 10^{-34})$$

Simplifying:

#293: $3.88031198260353953 \cdot 10^{-14}$

Subtracting the just above total ring magnetic energy from the total ring electric energy (#282):

#294: $3.89743718452360370 \cdot 10^{-14} - 3.88031198260353953 \cdot 10^{-14}$

Simplifying:

#295: $1.71252019200641698 \cdot 10^{-16}$

We see that the total ring (with α = 0.95 here) electrical energy minus the total ring magnetic energy is two orders of magnitudes smaller that either of the two.

We take the total ring electric energy converted to mass by dividing by c^2 to be the ring gravitational mass in line with Morton Spears's capacitance theory of gravity, and then we take the total ring inertial mass as the total ring magnetic energy divided by c^2. Hence, the gravitational ring mass is slightly larger than the ring inertial mass here as well. But, the difference between the two is smaller here where α = 0.95:

#296: $$\frac{1.71252019200641698 \cdot 10^{-16}}{2.09154129415384102 \cdot 10^{-16}}$$

Simplifying:

#297: 0.818783830275384674

But:

#298: $$\frac{0.95}{1.05}$$

Simplifying:

#299: 0.904761904761904761