On the possible mathematical connections between several Ramanujan formulas, some equations concerning "*Feynman Rules for massive particles of any spin*" and some sectors of Number Theory.

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Abstract

In this research thesis, we describe and analyze the possible mathematical connections between several Ramanujan formulas, some equations concerning "Feynman Rules for massive particles of any spin" and some sectors of Number Theory.

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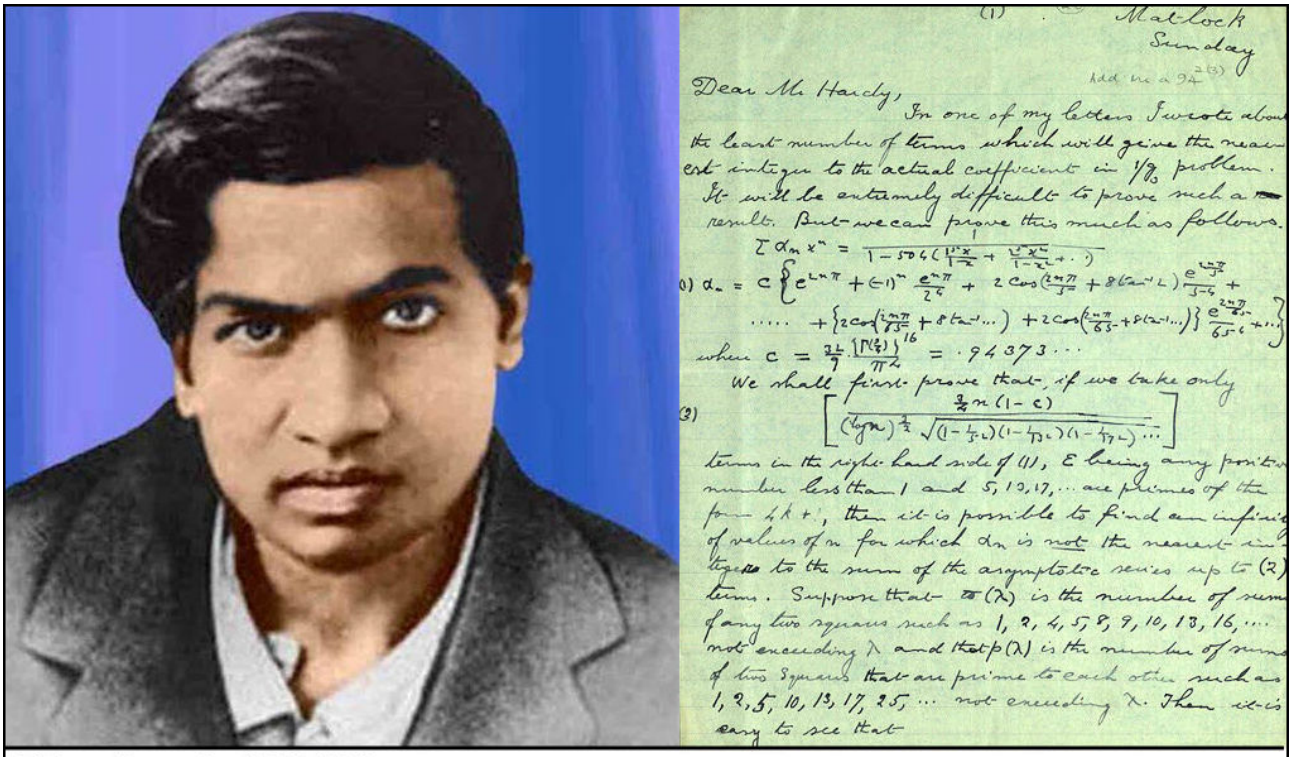


Srinivasa Ramanujan (1887-1920)

https://the-1000-year-view.com/2020/04/25/ramanujan-and-me/

From:

Weinberg, S. - **FEYNMAN RULES FOR ANY SPIN. III** - United States: N. p., 1969. Web. - doi:10.1103/PhysRev.181.1893.

We have that:

$$\omega/m=[\mathbf{p}^2+m^2]^{1/2}/m$$

Here $a(\mathbf{p},\lambda)$ is the annihilation operator for a particle of momentum $\mathbf{p}$, energy $p^0\equiv\omega(\mathbf{p})\equiv(\mathbf{p}^2+m^2)^{1/2}$, helicity λ, and spin j; $D_{\lambda\lambda'}{}^{(j)}$ is the usual unitary matrix representation of the three-dimensional rotation group; and

We obtain for momentum of the electron:

p = 9.1*10^{-31}*8*3*10^{8}/6 = 3.64*10^{-22} kgm/s and mass = 9.109383×10^{-31} kg

sqrt[(3.64e-22)^2+(9.1093837e-31)^2]

Input interpretation:

$$\sqrt{(3.64\times 10^{-22})^2+(9.1093837\times 10^{-31})^2}$$

Result:

$3.64000\ldots\times 10^{-22}$

3.64…*10^{-22}

or:

p = 0.72 MeV that regard p, i.e. momentum of the electron emitted in the beta decay; m = 9.1093837e-31 , we obtain:

Input interpretation:

convert 0.72 MeV/c^2 to kilograms

Result:

1.28×10^{-30} kg (kilograms)

$1.28*10^{-30}$ kg

sqrt[(1.28e-30)^2+(9.1093837e-31)^2]

Input interpretation:

$$\sqrt{(1.28 \times 10^{-30})^2 + (9.1093837 \times 10^{-31})^2}$$

Result:

$1.57105\ldots \times 10^{-30}$

$1.57105\ldots*10^{-30}$

Thence: $\omega = 3.64*10^{-22}$ or $\omega = 1.57105*10^{-30}$

For the helicity λ, we have that for the electrons, the value is equal to -1.

For

$$\text{energy } p^0 \equiv \omega(\mathbf{p}) \hat{\equiv} (\mathbf{p}^2 + m^2)^{1/2},$$

$$\omega/m = [\mathbf{p}^2 + m^2]^{1/2}/m$$

we have that also $p = 1.57105e\text{-}30$

Indeed, for $m = 9.1093837e\text{-}31$; $\omega = 1.57105e\text{-}30$; $p = 1.57105e\text{-}30$; $\lambda = -1$, we obtain:

$$\sqrt{(1.28 \times 10^{-30})^2 + (9.1093837 \times 10^{-31})^2}$$

$1.57105\ldots \times 10^{-30}$

$1.57105\ldots*10^{-30}$

From

$$\psi_n^{(+)}(x) = (2\pi)^{-3/2} \int d^3p [2\omega(\mathbf{p})]^{-1/2}$$

$$\times e^{ip\cdot x} D_{nm}[R(\hat{p})B(|\mathbf{p}|/m)] \sum_{\lambda} u_m(\lambda) a(\mathbf{p},\lambda), \qquad (2.4)$$

$v_m(\lambda)$ and $u_m(\lambda)$ are equal to 4 and 1

we obtain:

1.57105e-30[(2*1.57105e-30(1.28e-30))]^-0.5 * exp(i*1.57105e-30)

Input interpretation:

$$\frac{1.57105 \times 10^{-30} \exp(i \times 1.57105 \times 10^{-30})}{(2 \times 1.57105 \times 10^{-30} \times 1.28 \times 10^{-30})^{0.5}}$$

i is the imaginary unit

Result:

0.783385... +
1.23074... × 10^{-30} i

Alternate form:

0.783385
0.783385

p = 1.28e-30 m = 9.1093837e-31;

$B(u)$ is the boost along the z direction

$R(\hat{p})$ is the rotation which carries the z axis into the direction of **p**. Comparison of (2.1) with (2.2) shows that

with $v_m(\lambda)$ another "wave function" which also satisfies (2.5), and which we will see below to be just proportional to $u_m(\lambda)$.

We consider the following

(https://math.stackexchange.com/questions/1829265/understanding-power-method-for-finding-dominant-eigenvalues)

$$A = \begin{bmatrix} -2 & -3 \\ 6 & 7 \end{bmatrix}$$

Has eigenvalues $\lambda_1 = 4$ and $\lambda_2 = 1$ with corresponding eigenvectors $\mathbf{v}_1 = (1, -2)^t$ and $\mathbf{v}_2 = (1, -1)^t$. If we start with the arbitrary vector $\mathbf{x}_0 = (1, 1)^t$ and multiply by the matrix A we obtain

$$\mathbf{x}_1 = A\mathbf{x}_0 = \begin{bmatrix} -5 \\ 13 \end{bmatrix}, \quad \mathbf{x}_2 = A\mathbf{x}_1 = \begin{bmatrix} -29 \\ 61 \end{bmatrix}, \quad \mathbf{x}_3 = A\mathbf{x}_2 = \begin{bmatrix} -125 \\ 253 \end{bmatrix},$$

$$\mathbf{x}_4 = A\mathbf{x}_3 = \begin{bmatrix} -509 \\ 1021 \end{bmatrix}, \quad \mathbf{x}_5 = A\mathbf{x}_4 = \begin{bmatrix} -2045 \\ 4093 \end{bmatrix}, \quad \mathbf{x}_6 = A\mathbf{x}_5 = \begin{bmatrix} -8189 \\ 16381 \end{bmatrix}.$$

As a consequence, approximations to the dominant eigenvalue $\lambda_1 = 4$ are

$$\lambda_1^{(1)} = \frac{61}{13} = 4.6923, \quad \lambda_1^{(2)} = \frac{253}{61} = 4.14754, \quad \lambda_1^{(3)} = \frac{1021}{253} = 4.03557,$$

$$\lambda_1^{(4)} = \frac{4093}{1021} = 4.00881, \quad \lambda_1^{(5)} = \frac{16381}{4093} = 4.00200.$$

An approximate eigenvector corresponding to $\lambda_1^{(5)} = \frac{16381}{4093} = 4.00200$ is

We have also that (from

"http://vergil.chemistry.gatech.edu/notes/quantrev/node15.html "):

When a system is in an *eigenstate* of observable A (i.e., when the wavefunction is an eigenfunction of the operator $\hat{A}$) then the expectation value of A is the eigenvalue of the wavefunction

Thence, we can consider

$v_m(\lambda)$ and $u_m(\lambda)$ are equal to 4 and 1

With regard the boosts and rotations, we have that:

https://math.libretexts.org/Special:Search?qid=&fpid=230&fpth=&query=rotations+and+boosts&type=wiki

https://phys.libretexts.org/Bookshelves/Relativity/Book%3A_Special_Relativity_(Crowell)/08%3A_Rotation/8.03%3A_Boosts_and_Rotations

Rotations

As an example of how this works out for small rotations, let's take the vector

$$(0, 0, 1) \tag{8.3.1}$$

and apply the operations shown in Figure 8.3.1, but with rotations of only $\theta = 0.1$ radians rather than 90 degrees. Rotation by this angle about the x axis is given by the transformation

$$(x, y, z) \to (x, y\cos\theta - z\sin\theta, y\sin\theta + z\cos\theta) \tag{8.3.2}$$

and applying this to the original vector gives this:

$$(0.00000, -0.09983, 0.99500) \quad (\text{after } x) \tag{8.3.3}$$

After a further rotation by the same angle, this time about the y axis, we have

$$(0.09933, -0.09983, 0.99003) \quad (\text{after } x, \text{then } y) \tag{8.3.4}$$

Starting over from the original vector in Figure 8.3.1.1 and doing the operations in the opposite order gives these results:

$$(0.09983, 0.00000, 0.99500) \quad (\text{after } y) \tag{8.3.5}$$

$$(0.09983, -0.09933, 0.99003) \quad (\text{after } y, \text{then } x) \tag{8.3.6}$$

The discrepancy between (8.3.1.3) and (8.3.1.5) is a rotation by very nearly 0.005 radians in the xy plane. As claimed, this is on the order of θ^2 (in fact, it's almost exactly $\theta^2/2$). A single example can never prove anything, but this is an example of the general rule that rotations along different axes don't commute, and for small angles the discrepancy is a rotation in the plane defined by the two axes, with a magnitude whose maximum size is on the order of θ^2.

Boosts

Something similar happens for boosts. In $3+1$ dimensions, we start with the vector

$$(0,1,0,0) \tag{8.3.7}$$

pointing along the x axis. A Lorentz boost with $v = 0.1$ (Equation 1.4.1) in the x direction gives

$$(0.10050, 1.00504, 0.00000, 0.00000) \quad (\text{after } x) \tag{8.3.8}$$

and a second boost, now in the y direction, produces this:

$$(0.10101, 1.00504, 0.01010, 0.00000) \quad (\text{after } x, \text{then } y) \tag{8.3.9}$$

Starting over from (8.3.6) and doing the boosts in the opposite order, we have

$$(0.00000, 1.00000, 0.00000, 0.00000) \quad (\text{after } y) \tag{8.3.10}$$

$$(0.10050, 1.00504, 0.00000, 0.00000) \quad (\text{after } y, \text{then } x) \tag{8.3.11}$$

The discrepancy between (8.3.8) and (8.3.10) is a rotation in the xy plane by very nearly 0.01 radians. This is an example of a more general fact, which is that boosts along different axes don't commute, and for small angles the discrepancy is a rotation in the plane defined by the two boosts, with a magnitude whose maximum size is on the order of v^2, in units of radians.

For:

p = 1.28e-30 ; m = 9.1093837e-31;

R = 0.99003 ; B = 1.00504 ; $v_m(\lambda)$ and $u_m(\lambda)$ are equal to 4 and 1

and m = 9.1093837e-31 ; ω = 1.57105e-30 ; p = 1.57105e-30 ; λ = – 1 ,

D_{nm} = 3.5185

We have that:

$$\psi_n^{(+)}(x) = (2\pi)^{-3/2} \int d^3p [2\omega(\mathbf{p})]^{-1/2}$$

$$\times e^{ip\cdot x} D_{nm}[R(\hat{p})B(|\mathbf{p}|/m)] \sum_{\lambda} u_m(\lambda) a(\mathbf{p},\lambda),$$

(2Pi)^-1.5 * integrate(((1.57105e-30[(2*1.57105e-30(1.28e-30))]^-0.5*exp(i*1.57105e-30)*3.5185*0.99003 * (1.57105e-30)1.00504 * (1.28e-30 / 9.1093837e-31) *4*1.28e-30)))d^3x

Input interpretation:

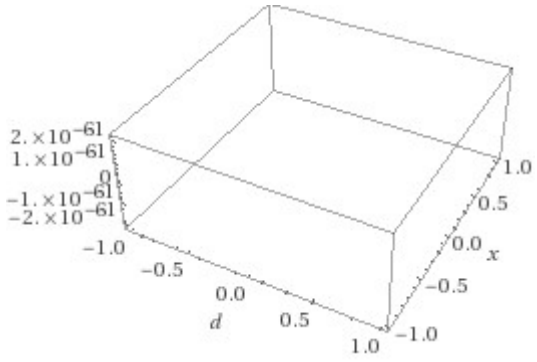
$$\frac{1}{(2\pi)^{1.5}} \left(\int \left(1.57105 \times 10^{-30} \exp(i \times 1.57105 \times 10^{-30}) \times 3.5185 \times 0.99003 \times 1.57105 \times 10^{-30} \left(1.00504 \times \frac{1.28 \times 10^{-30}}{9.1093837 \times 10^{-31}} \times 4 \times 1.28 \times 10^{-30} \right) \right) / (2 \times 1.57105 \times 10^{-30} \times 1.28 \times 10^{-30})^{0.5} \, d^3 x \, dx \right)$$

i is the imaginary unit

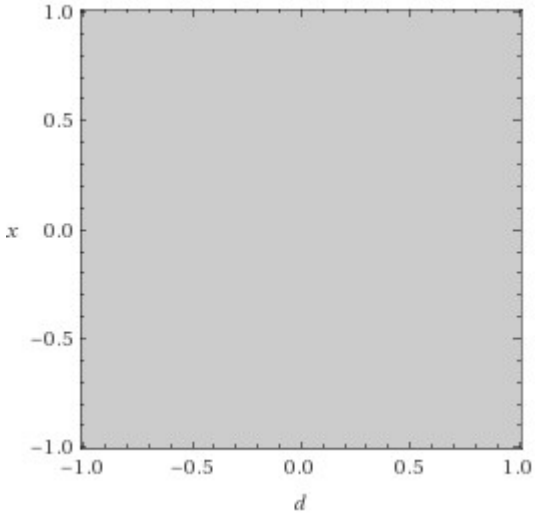
Result:

$$\left(9.84114 \times 10^{-61} + 1.54609 \times 10^{-90} \, i\right) d^3 x^2$$

3D plot:



Contour plot:



Alternate form:

$9.84114\times10^{-61}\,d^3\,x^2$

Alternate form assuming d and x are real:

$9.84114\times10^{-61}\,d^3\,x^2+i\left(1.54609\times10^{-90}\,d^3\,x^2+0\right)+0$

Indefinite integral assuming all variables are real:

$\left(3.28038\times10^{-61}+5.15364\times10^{-91}\,i\right)d^3\,x^3$ + constant

Input interpretation:

9.84114×10^{-61}

$9.84114*10^{-61}$ result equal to the value of volumetric flow rate of Planck

9.841252×10^{-61} m^3/s

Indeed:

$$Q_{\mathrm{P}} = \frac{l_{\mathrm{P}}^3}{t_{\mathrm{P}}} = l_{\mathrm{P}}^2 v_{\mathrm{P}} = \frac{4\pi\hbar G}{c^2}$$

(4Pi*1.054571817e-34*6.6743e-11)/(299792458)^2

Input interpretation:

$$\frac{4\pi \times 1.054571817 \times 10^{-34} \times 6.6743 \times 10^{-11}}{299\,792\,458^2}$$

Result:

$9.841251771634707427476822801513419612421433500468121 6\ldots \times 10^{-61}$

$9.841252*10^{-61}$ as above

From which, we obtain:

26*-ln((((4Pi*1.054571817e-34*6.6743e-11)/(299792458)^2)))+504 -2/5

Input interpretation:

$$26 \times (-1) \log\left(\frac{4\pi \times 1.054571817 \times 10^{-34} \times 6.6743 \times 10^{-11}}{299\,792\,458^2}\right) + 504 - \frac{2}{5}$$

$\log(x)$ is the natural logarithm

Result:

4096.049…

$4096.049\ldots \approx 4096 = 64^2$

From

Modular equations and approximations to π – *Srinivasa Ramanujan* - Quarterly Journal of Mathematics, XLV, 1914, 350 – 372

$$1 - 504 \sum_{r=1}^{r=\infty} \frac{r^5 q^{2r}}{1 - q^{2r}} = \left(\frac{2K}{\pi}\right)^6 (1 - 2K^2)(1 + \frac{1}{2}k^2 k'^2).$$

1-504*(exp(-Pi*sqrt(1/24)))^2 / (1-(exp(-Pi*sqrt(1/24)))^2) = ((2*1.16015265)/Pi)^6 (1-2*1.16015265^2) (1+1/2*1/2*1/2)

where $n = r/s, r$ and s being positive integers, is expressed by the modular equation of the rsth degree. If we suppose that $k = l', k' = l$, so that $K = L', K' = L$, then

$$q = e^{-\pi L'/L} = e^{-\pi\sqrt{n}},$$

q = exp(-Pi*sqrt(1/24)) ; k = 1/(sqrt2)

$$k = k' = 1/\sqrt{2}$$

$$K = 1 + \left(\frac{1}{2}\right)^2 k^2 + \left(\frac{1 \cdot 3}{2 \cdot 4}\right)^2 k^4 + \cdots.$$

1+1/4* (1/(sqrt2))^2 +9/64 * (1/(sqrt2))^4

Input:

$$1 + \frac{1}{4}\left(\frac{1}{\sqrt{2}}\right)^2 + \frac{9}{64}\left(\frac{1}{\sqrt{2}}\right)^4$$

Exact result:

$$\frac{297}{256}$$

Decimal form:

1.16015625

1.16015265 = K

1-504*(exp(-Pi*sqrt(1/24)))^2 / (1-(exp(-Pi*sqrt(1/24)))^2))

Input:

$$1 - 504 \times \frac{\exp^2\left(-\pi\sqrt{\frac{1}{24}}\right)}{1 - \exp^2\left(-\pi\sqrt{\frac{1}{24}}\right)}$$

Exact result:

$$1-\frac{504\,e^{-\pi/\sqrt{6}}}{1-e^{-\pi/\sqrt{6}}}$$

Decimal approximation:

−192.413038970675616632949047638170094979075054401599378476...

-192.41303897…

Property:

$1-\frac{504\,e^{-\pi/\sqrt{6}}}{1-e^{-\pi/\sqrt{6}}}$ is a transcendental number

Alternate forms:

$$1-\frac{504}{e^{\pi/\sqrt{6}}-1}$$

$$\frac{e^{\pi/\sqrt{6}}-505}{e^{\pi/\sqrt{6}}-1}$$

$$1+\frac{504\,e^{-\pi/\sqrt{6}}}{e^{-\pi/\sqrt{6}}-1}$$

Series representations:

$$1-\frac{504\exp^2\left(-\pi\sqrt{\frac{1}{24}}\right)}{1-\exp^2\left(-\pi\sqrt{\frac{1}{24}}\right)}=\frac{-1+505\exp^2\left(-\pi\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{23}{24}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)}{\left(-1+\exp\left(-\pi\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{23}{24}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)\right)\left(1+\exp\left(-\pi\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{23}{24}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)\right)}$$

$$1-\frac{504\exp^2\left(-\pi\sqrt{\frac{1}{24}}\right)}{1-\exp^2\left(-\pi\sqrt{\frac{1}{24}}\right)}=\left(-1+505\exp^2\left(-\pi\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(\frac{1}{24}-z_0\right)^k z_0^{-k}}{k!}\right)\right)\Bigg/$$
$$\left(\left(-1+\exp\left(-\pi\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(\frac{1}{24}-z_0\right)^k z_0^{-k}}{k!}\right)\right)\left(1+\exp\left(-\pi\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(\frac{1}{24}-z_0\right)^k z_0^{-k}}{k!}\right)\right)\right)$$
for $(\text{not } (z_0\in\mathbb{R} \text{ and } -\infty<z_0\le 0))$

$$1-\frac{504\exp^2\left(-\pi\sqrt{\frac{1}{24}}\right)}{1-\exp^2\left(-\pi\sqrt{\frac{1}{24}}\right)}=$$
$$\frac{-1+505\exp^2\left(\frac{\pi\sum_{j=0}^{\infty}\text{Res}_{s=-j}\left(-\frac{23}{24}\right)^{-s}\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)}{2\sqrt{\pi}}\right)}{\left(-1+\exp\left(\frac{\pi\sum_{j=0}^{\infty}\text{Res}_{s=-j}\left(-\frac{23}{24}\right)^{-s}\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)}{2\sqrt{\pi}}\right)\right)\left(1+\exp\left(\frac{\pi\sum_{j=0}^{\infty}\text{Res}_{s=-j}\left(-\frac{23}{24}\right)^{-s}\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)}{2\sqrt{\pi}}\right)\right)}$$

622.778(((((((2*1.16015265)/Pi)^6 (1-2*1.16015265^2) (1+1/2*1/2*1/2))))))

Input interpretation:

$$622.778\left(\left(\frac{2\times 1.16015265}{\pi}\right)^6\left(1-2\times 1.16015265^2\right)\left(1+\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\right)\right)$$

Result:

−192.413...

-192.413…

Alternative representations:

$$622.778\left(\frac{2\times 1.16015}{\pi}\right)^6\left(\left(1-2\times 1.16015^2\right)\left(1+\frac{1}{2\times 2\times 2}\right)\right)=700.625\left(1-2\times 1.16015^2\right)\left(\frac{2.32031}{180^\circ}\right)^6$$

$$622.778\left(\frac{2\times 1.16015}{\pi}\right)^6\left(\left(1-2\times 1.16015^2\right)\left(1+\frac{1}{2\times 2\times 2}\right)\right)=700.625\left(1-2\times 1.16015^2\right)\left(-\frac{2.32031}{i\log(-1)}\right)^6$$

$$622.778\left(\frac{2\times 1.16015}{\pi}\right)^6\left(\left(1-2\times 1.16015^2\right)\left(1+\frac{1}{2\times 2\times 2}\right)\right)=700.625\left(1-2\times 1.16015^2\right)\left(\frac{2.32031}{\cos^{-1}(-1)}\right)^6$$

Integral representations:

$$622.778\left(\frac{2\times 1.16015}{\pi}\right)^6\left(\left(1-2\times 1.16015^2\right)\left(1+\frac{1}{2\times 2\times 2}\right)\right)=-\frac{2890.37}{\left(\int_0^\infty \frac{1}{1+t^2}\,dt\right)^6}$$

$$622.778\left(\frac{2\times 1.16015}{\pi}\right)^6\left(\left(1-2\times 1.16015^2\right)\left(1+\frac{1}{2\times 2\times 2}\right)\right)=-\frac{45.162}{\left(\int_0^1 \sqrt{1-t^2}\,dt\right)^6}$$

$$622.778\left(\frac{2\times 1.16015}{\pi}\right)^6\left(\left(1-2\times 1.16015^2\right)\left(1+\frac{1}{2\times 2\times 2}\right)\right)=-\frac{2890.37}{\left(\int_0^\infty \frac{\sin(t)}{t}\,dt\right)^6}$$

Note that:

1-x*(exp(-Pi*sqrt(1/24)))^2 / (1-(exp(-Pi*sqrt(1/24))^2)) = -192.41303897

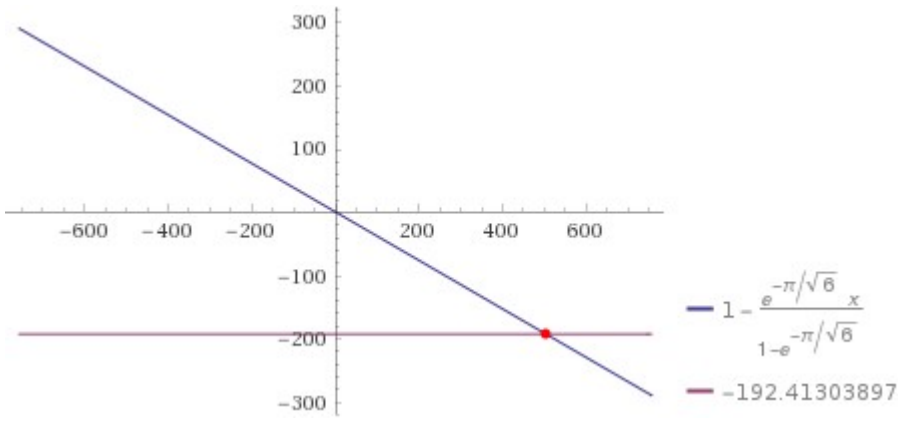
Input interpretation:

$$1-x\times\frac{\exp^2\left(-\pi\sqrt{\frac{1}{24}}\right)}{1-\exp^2\left(-\pi\sqrt{\frac{1}{24}}\right)}=-192.41303897$$

Result:

$$1-\frac{e^{-\pi/\sqrt{6}}\,x}{1-e^{-\pi/\sqrt{6}}}=-192.41303897$$

Plot:



Alternate form:

$$\frac{-x+e^{\pi/\sqrt{6}}-1}{e^{\pi/\sqrt{6}}-1}=-192.41303897$$

Solution:

$x \approx 504.000000$

504

We observe that:

-(1+golden ratio* -192.41303897/(((1-(exp(-Pi*sqrt(1/24)))^2 *1/ (1-(exp(-Pi*sqrt(1/24))^2))))) +1/5)

Input interpretation:

$$-\left(1+\phi\left(-\frac{192.41303897}{1-\exp^2\left(-\pi\sqrt{\frac{1}{24}}\right)\times\frac{1}{1-\exp^2\left(-\pi\sqrt{\frac{1}{24}}\right)}}\right)+\frac{1}{5}\right)$$

ϕ is the golden ratio

Result:

504.00711267...

504.00711267….

Series representations:

$$-\left(1+\frac{\phi\,(-192.413038970000)}{1-\frac{\exp^2\left(-\pi\sqrt{\frac{1}{24}}\right)}{1-\exp^2\left(-\pi\sqrt{\frac{1}{24}}\right)}}+\frac{1}{5}\right)=$$
$$\left(96.20651948500\left(0.0062365835830237-1.00000000000000\,\phi-\right.\right.$$
$$0.0124731671660474\exp^2\left(-\pi\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{23}{24}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)+$$
$$\left.\left.1.00000000000000\,\phi\exp^2\left(-\pi\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{23}{24}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)\right)\right)\Big/$$
$$\left(-0.50000000000000+1.00000000000000\exp^2\left(-\pi\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{23}{24}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)\right)$$

$$-\left(1+\frac{\phi(-192.413038970000)}{1-\frac{\exp^2\left(-\pi\sqrt{\frac{1}{24}}\right)}{1-\exp^2\left(-\pi\sqrt{\frac{1}{24}}\right)}}+\frac{1}{5}\right)=$$

$$\left(96.20651948500\left(0.0062365835830237-1.00000000000000\,\phi-\right.\right.$$

$$0.0124731671660474\exp^2\left(-\pi\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(\frac{1}{24}-z_0\right)^k z_0^{-k}}{k!}\right)+$$

$$\left.\left.1.00000000000000\,\phi\exp^2\left(-\pi\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(\frac{1}{24}-z_0\right)^k z_0^{-k}}{k!}\right)\right)\right)\Big/$$

$$\left(-0.50000000000000+1.00000000000000\right.$$

$$\left.\exp^2\left(-\pi\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(\frac{1}{24}-z_0\right)^k z_0^{-k}}{k!}\right)\right)$$

for $\left(\text{not}\left(z_0\in\mathbb{R}\text{ and }-\infty<z_0\le 0\right)\right)$

$$-\left(1+\frac{\phi(-192.413038970000)}{1-\frac{\exp^2\left(-\pi\sqrt{\frac{1}{24}}\right)}{1-\exp^2\left(-\pi\sqrt{\frac{1}{24}}\right)}}+\frac{1}{5}\right)=$$

$$\left(96.20651948500\left(0.0062365835830237-1.00000000000000\,\phi-\right.\right.$$

$$0.0124731671660474\exp^2\left(\frac{\pi\sum_{j=0}^{\infty}\operatorname{Res}_{s=-j}\left(-\frac{23}{24}\right)^{-s}\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)}{2\sqrt{\pi}}\right)+$$

$$\left.\left.1.00000000000000\,\phi\exp^2\left(\frac{\pi\sum_{j=0}^{\infty}\operatorname{Res}_{s=-j}\left(-\frac{23}{24}\right)^{-s}\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)}{2\sqrt{\pi}}\right)\right)\right)\Big/$$

$$\left(-0.50000000000000+1.00000000000000\right.$$

$$\left.\exp^2\left(\frac{\pi\sum_{j=0}^{\infty}\operatorname{Res}_{s=-j}\left(-\frac{23}{24}\right)^{-s}\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)}{2\sqrt{\pi}}\right)\right)$$

26*-ln((((4Pi*1.054571817e-34*6.6743e-11)/(299792458)^2)))+[-(1+golden ratio* -192.41303897/(((1-(exp(-Pi*sqrt(1/24)))^2 *1/ (1-(exp(-Pi*sqrt(1/24))^2))))) +1/5)] -2/5

Input interpretation:

$$26\times(-1)\log\left(\frac{4\pi\times 1.054571817\times 10^{-34}\times 6.6743\times 10^{-11}}{299\,792\,458^2}\right)-\left(1+\phi\left(-\frac{192.41303897}{1-\exp^2\left(-\pi\sqrt{\frac{1}{24}}\right)\times\frac{1}{1-\exp^2\left(-\pi\sqrt{\frac{1}{24}}\right)}}\right)+\frac{1}{5}\right)-\frac{2}{5}$$

$\log(x)$ is the natural logarithm

ϕ is the golden ratio

Result:

4096.056...

4096.056… ≈ 4096 = 64^2

sqrt[26*-ln((((4Pi*1.054571817e-34*6.6743e-11)/(299792458)^2)))+[-(1+golden ratio* -192.41303897/(((1-(exp(-Pi*sqrt(1/24)))^2 *1/ (1-(exp(-Pi*sqrt(1/24))^2))))) +1/5)] -2/5]

Input interpretation:

$$\sqrt{\left(26\times(-1)\log\left(\frac{4\pi\times 1.054571817\times 10^{-34}\times 6.6743\times 10^{-11}}{299\,792\,458^2}\right)-\left(1+\phi\left(-\frac{192.41303897}{1-\exp^2\left(-\pi\sqrt{\frac{1}{24}}\right)\times\frac{1}{1-\exp^2\left(-\pi\sqrt{\frac{1}{24}}\right)}}\right)+\frac{1}{5}\right)-\frac{2}{5}\right)}$$

$\log(x)$ is the natural logarithm

ϕ is the golden ratio

Result:

64.00044...

64.00044… ≈ 64 = 8^2

Or, approximating 192.41303897 to 24*8 = 192, we obtain:

sqrt[26*-ln((((4Pi*1.054571817e-34*6.6743e-11)/(299792458)^2)))+[-(1+golden ratio* -(24*8)/(((1-(exp(-Pi*sqrt(1/24)))^2 *1/ (1-(exp(-Pi*sqrt(1/24))^2))))) +1/5)] -2/5]

Input interpretation:

$$\sqrt{\left(26\times(-1)\log\left(\frac{4\pi\times 1.054571817\times 10^{-34}\times 6.6743\times 10^{-11}}{299\,792\,458^2}\right)-\left(1+\phi\left(-\frac{24\times 8}{1-\exp^2\left(-\pi\sqrt{\frac{1}{24}}\right)\times\frac{1}{1-\exp^2\left(-\pi\sqrt{\frac{1}{24}}\right)}}\right)+\frac{1}{5}\right)-\frac{2}{5}\right)}$$

$\log(x)$ is the natural logarithm

ϕ is the golden ratio

Result:

63.99196...

63.99196… ≈ 64 = 8^2

2sqrt[26*-ln((((4Pi*1.054571817e-34*6.6743e-11)/(299792458)^2)))+[-(1+golden ratio* -(24*8)/(((1-(exp(-Pi*sqrt(1/24)))^2 *1/ (1-(exp(-Pi*sqrt(1/24))^2))))) +1/5)] -2/5]-Pi

Input interpretation:

$$2\sqrt{\left(26\times(-1)\log\left(\frac{4\pi\times 1.054571817\times 10^{-34}\times 6.6743\times 10^{-11}}{299\,792\,458^2}\right)-\left(1+\phi\left(-\frac{24\times 8}{1-\exp^2\left(-\pi\sqrt{\frac{1}{24}}\right)\times\frac{1}{1-\exp^2\left(-\pi\sqrt{\frac{1}{24}}\right)}}\right)+\frac{1}{5}\right)-\frac{2}{5}\right)}-\pi$$

$\log(x)$ is the natural logarithm

ϕ is the golden ratio

Result:

124.8423…

124.8423… result very near to the Higgs boson mass 125.18 GeV

or:

- (-192.41303897-1)/(((exp(-Pi*sqrt(1/24)))^2 / (1-(exp(-Pi*sqrt(1/24))^2))))

Input interpretation:

$$-\frac{-192.41303897-1}{\frac{\exp^2\left(-\pi\sqrt{\frac{1}{24}}\right)}{1-\exp^2\left(-\pi\sqrt{\frac{1}{24}}\right)}}$$

Result:

504.00000000…

504

Series representations:

$$-\frac{-192.413038970000-1}{\frac{\exp^2\left(-\pi\sqrt{\frac{1}{24}}\right)}{1-\exp^2\left(-\pi\sqrt{\frac{1}{24}}\right)}} = -193.413038970000 + \frac{193.413038970000}{\exp^2\left(-\pi\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{23}{24}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)}$$

$$-\frac{-192.413038970000-1}{\frac{\exp^2\left(-\pi\sqrt{\frac{1}{24}}\right)}{1-\exp^2\left(-\pi\sqrt{\frac{1}{24}}\right)}} =$$

$$-193.413038970000 + \frac{193.413038970000}{\exp^2\left(-\pi\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(\frac{1}{24}-z_0\right)^k z_0^{-k}}{k!}\right)}$$

for $(\text{not } (z_0 \in \mathbb{R} \text{ and } -\infty < z_0 \leq 0))$

$$-\frac{-192.413038970000-1}{\frac{\exp^2\left(-\pi\sqrt{\frac{1}{24}}\right)}{1-\exp^2\left(-\pi\sqrt{\frac{1}{24}}\right)}} =$$

$$-193.413038970000 + \frac{193.413038970000}{\exp^2\left(\frac{\pi\sum_{j=0}^{\infty}\text{Res}_{s=-j}\left(-\frac{23}{24}\right)^{-s}\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)}{2\sqrt{\pi}}\right)}$$

26*-ln((((4Pi*1.054571817e-34*6.6743e-11)/(299792458)^2))) - (-192.41303897-1)/(((exp(-Pi*sqrt(1/24)))^2 / (1-(exp(-Pi*sqrt(1/24))^2))))-2/5

Input interpretation:

$$26\times(-1)\log\left(\frac{4\pi\times 1.054571817\times 10^{-34}\times 6.6743\times 10^{-11}}{299\,792\,458^2}\right) - \frac{-192.41303897-1}{\frac{\exp^2\left(-\pi\sqrt{\frac{1}{24}}\right)}{1-\exp^2\left(-\pi\sqrt{\frac{1}{24}}\right)}} - \frac{2}{5}$$

$\log(x)$ is the natural logarithm

Result:

4096.049…

4096.049… ≈ 4096 = 64^2

sqrt[26*-ln((((4Pi*1.054571817e-34*6.6743e-11)/(299792458)^2))) - (-192.41303897-1)/(((exp(-Pi*sqrt(1/24)))^2 / (1-(exp(-Pi*sqrt(1/24))^2))))-2/5]

Input interpretation:

$$\sqrt{26\times(-1)\log\left(\frac{4\pi\times 1.054571817\times 10^{-34}\times 6.6743\times 10^{-11}}{299\,792\,458^2}\right)-\frac{-192.41303897-1}{\frac{\exp^2\left(-\pi\sqrt{\frac{1}{24}}\right)}{1-\exp^2\left(-\pi\sqrt{\frac{1}{24}}\right)}}-\frac{2}{5}}$$

$\log(x)$ is the natural logarithm

Result:

64.00038…

64.00038… ≈ 64 = 8^2

2sqrt[26*-ln((((4Pi*1.054571e-34*6.6743e-11)/(299792458)^2))) - (-192.413038-1)/(((exp(-Pi*sqrt(1/24)))^2 / (1-(exp(-Pi*sqrt(1/24))^2))))-2/5]-3

Input interpretation:

$$2\sqrt{26\times(-1)\log\left(\frac{4\pi\times 1.054571\times 10^{-34}\times 6.6743\times 10^{-11}}{299\,792\,458^2}\right)-\frac{-192.413038-1}{\frac{\exp^2\left(-\pi\sqrt{\frac{1}{24}}\right)}{1-\exp^2\left(-\pi\sqrt{\frac{1}{24}}\right)}}-\frac{2}{5}}-3$$

$\log(x)$ is the natural logarithm

Result:

125.0008…

125.0008… result very near to the Higgs boson mass 125.18 GeV

From

$$\psi_n^{(-)}(x) = (2\pi)^{-3/2} \int d^3p [2\omega(\mathbf{p})]^{-1/2}$$

$$\times e^{-ip\cdot x} D_{nm}[R(\hat{p})B(|\mathbf{p}|/m)]$$

$$\times \sum_{\lambda} v_m(\lambda)(-)^{j-\lambda} b^{\dagger}(\mathbf{p}, -\lambda), \quad (2.6)$$

For the same previous data, and for D_{nm} = 4*3.5185 ; we obtain:

(2Pi)^-1.5 * integrate(((1.57105e-30[(2*1.57105e-30(1.28e-30))]^-0.5*exp-(i*1.57105e-30)*4*3.5185*0.99003 * (1.57105e-30)1.00504 * (1.28e-30 / 9.1093837e-31) *-1.28e-30)))d^3x

Input interpretation:

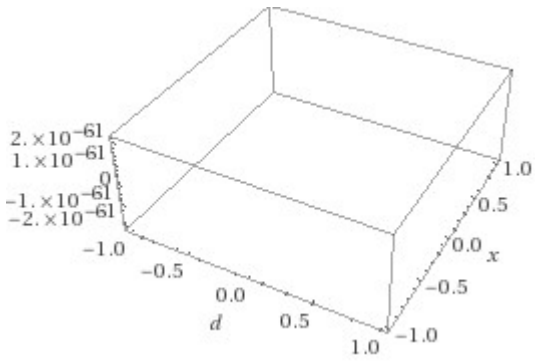
$$\frac{1}{(2\pi)^{1.5}} \int \left(1.57105 \times 10^{-30} \exp\left(-\left(i \times 1.57105 \times 10^{-30}\right)\right) \times 4 \times 3.5185 \times 0.99003 \times 1.57105 \times 10^{-30} \left(1.00504 \times \frac{1.28 \times 10^{-30}}{9.1093837 \times 10^{-31}} \left(-1.28 \times 10^{-30}\right)\right)\right) \Big/ \left(2 \times 1.57105 \times 10^{-30} \times 1.28 \times 10^{-30}\right)^{0.5} d^3x\, dx$$

i is the imaginary unit

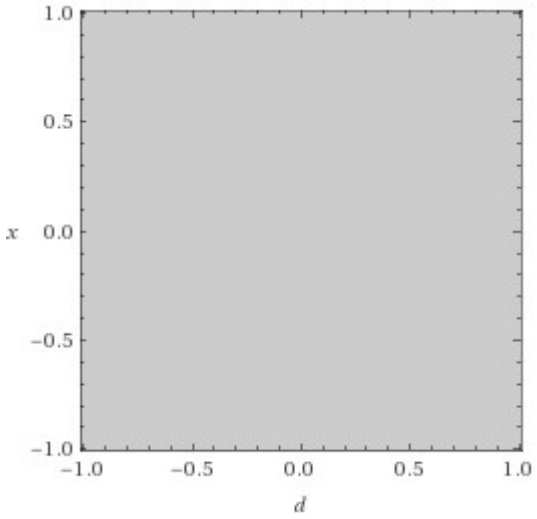
Result:

$$\left(-9.84114 \times 10^{-61} + 1.54609 \times 10^{-90}\, i\right) d^3 x^2$$

3D plot:



Contour plot:



Alternate form:

$$-9.84114\times10^{-61}\,d^3\,x^2$$

-9.84114*10^-61 as above (see page 10)

Alternate form assuming d and x are real:

$$-9.84114\times10^{-61}\,d^3\,x^2+i\left(1.54609\times10^{-90}\,d^3\,x^2+0\right)+0$$

Indefinite integral assuming all variables are real:

$$\left(-3.28038\times10^{-61}+5.15364\times10^{-91}\,i\right)d^3\,x^3+\text{constant}$$

We observe that, from the result:

$$\left(-9.84114\times10^{-61}+1.54609\times10^{-90}\,i\right)d^3\,x^2$$

We obtain:

[ln(-9.84114×10^-61 + 1.54609×10^-90 i)]^1/10

Input interpretation:

$$\sqrt[10]{\log\left(-9.84114\times10^{-61}+1.54609\times10^{-90}\,i\right)}$$

$\log(x)$ is the natural logarithm

i is the imaginary unit

Result:

1.55804079... +
0.502325193... i

Polar coordinates:

$r = 1.63702$ (radius), $\theta = 17.8697°$ (angle)

$1.63702 \approx \zeta(2) = \frac{\pi^2}{6} = 1.644934 \ldots$

10^3[ln(-9.84114×10^-61 + 1.54609×10^-90 i)]^1/9

Input interpretation:

$$10^3 \sqrt[9]{\log\left(-9.84114 \times 10^{-61} + 1.54609 \times 10^{-90}\, i\right)}$$

$\log(x)$ is the natural logarithm

i is the imaginary unit

Result:

1626.37290... +
587.303331... i

Polar coordinates:

$r = 1729.17$ (radius), $\theta = 19.8553°$ (angle)

1729.17

This result is very near to the mass of candidate glueball **$f_0(1710)$ scalar meson.** Furthermore, 1728 occurs in the algebraic formula for the j-invariant of an elliptic curve. The number 1728 is one less than the Hardy–Ramanujan number 1729 (taxicab number)

(((10^3[ln(-9.84114×10^-61 + 1.54609×10^-90 i)]^1/9)))^1/15

Input interpretation:

$$\sqrt[15]{10^3 \sqrt[9]{\log\left(-9.84114 \times 10^{-61} + 1.54609 \times 10^{-90}\, i\right)}}$$

$\log(x)$ is the natural logarithm

i is the imaginary unit

Result:

1.643387068... +
0.03797337489... i

Polar coordinates:

$r = 1.64383$ (radius), $\theta = 1.32369°$ (angle)

$1.64383 \approx \zeta(2) = \frac{\pi^2}{6} = 1.644934 \ldots$

[ln(-9.84114×10^-61 + 1.54609×10^-90 i)]-golden ratio

Input interpretation:

$$\log\left(-9.84114 \times 10^{-61} + 1.54609 \times 10^{-90}\, i\right) - \phi$$

$\log(x)$ is the natural logarithm

i is the imaginary unit

ϕ is the golden ratio

Result:

− 139.78915... +
3.1415927... i

Polar coordinates:

$r = 139.824$ (radius), $\theta = 178.713°$ (angle)

139.824 result practically equal to the rest mass of Pion meson 139.57 MeV

[ln(-9.84114×10^-61 + 1.54609×10^-90 i)]-golden ratio+11+Pi

Input interpretation:

$$\log\left(-9.84114 \times 10^{-61} + 1.54609 \times 10^{-90}\, i\right) - \phi + 11 + \pi$$

$\log(x)$ is the natural logarithm

i is the imaginary unit

ϕ is the golden ratio

Result:

$-125.64756\ldots + 3.1415927\ldots\, i$

Polar coordinates:

$r = 125.687$ (radius), $\theta = 178.568°$ (angle)

125.687 result very near to the Higgs boson mass 125.18 GeV

Now, we have that:

$$\psi_{ab}^{(AB,+)}(x) = (2\pi)^{-3/2} \int d^3p [2\omega(\mathbf{p})]^{-1/2} \sum_{a'b'\lambda} D_{a,a'}^{(A)}[R(\mathbf{p})] D_{b,b'}^{(B)}[R(\hat{p})] \times \left(\frac{|\mathbf{p}| + \omega(\mathbf{p})}{m}\right)^{b'-a'} C_{AB}(j\lambda; a'b') a(\mathbf{p},\lambda) e^{ip\cdot x}, \quad (2.10)$$

$$\psi_{ab}^{(AB,-)}(x) = (2\pi)^{-3/2} \int d^3p [2\omega(\mathbf{p})]^{-1/2} \sum_{a'b'\lambda} D_{a,a'}^{(A)}[R(\hat{p})] D_{b,b'}^{(B)}[R(\hat{p})] \times \left(\frac{|\mathbf{p}| + \omega(\mathbf{p})}{m}\right)^{b'-a'} C_{AB}(j\lambda; a'b')(-)^{j-\lambda} b^{\dagger}(\mathbf{p}, -\lambda) e^{-ip\cdot x}. \quad (2.11)$$

From eq. (2.10),

$$\psi_{ab}^{(AB,+)}(x) = (2\pi)^{-3/2} \int d^3p [2\omega(\mathbf{p})]^{-1/2} \sum_{a'b'\lambda} D_{a,a'}^{(A)}[R(\mathbf{p})] D_{b,b'}^{(B)}[R(\hat{p})] \times \left(\frac{|\mathbf{p}| + \omega(\mathbf{p})}{m}\right)^{b'-a'} C_{AB}(j\lambda; a'b') a(\mathbf{p},\lambda) e^{ip\cdot x}$$

we obtain:

(1.57105e-30)(2*1.57105e-30*(1.28e-30))^-0.5 * 3.5185^2 * [(0.99003^2(1.57105e-30))*(1.28e-30)] ((((1.28e-30)+(1.57105e-30)(1.28e-30))))/(9.1093837e-31) * (-4) * [(1.28e-30)*(-exp(i*1.57105e-30))]

Input interpretation:

$$\left(1.57105\times10^{-30}\times3.5185^2\left((0.99003^2\times1.57105\times10^{-30})\times1.28\times10^{-30}\right)\left(\frac{1.28\times10^{-30}+1.57105\times10^{-30}\times1.28\times10^{-30}}{9.1093837\times10^{-31}}\times(-4)\left(1.28\times10^{-30}\left(-\exp\left(i\times1.57105\times10^{-30}\right)\right)\right)\right)\right)\Big/\left(2\times1.57105\times10^{-30}\times1.28\times10^{-30}\right)^{0.5}$$

i is the imaginary unit

Result:

$1.37524\ldots\times10^{-88}+$
$2.16057\ldots\times10^{-118}\,i$

Alternate form:

1.37524×10^{-88}

$1.37524*10^{-88}$

and:

(2Pi)^-1.5 * integrate(1.37524×10^-88)d^3x

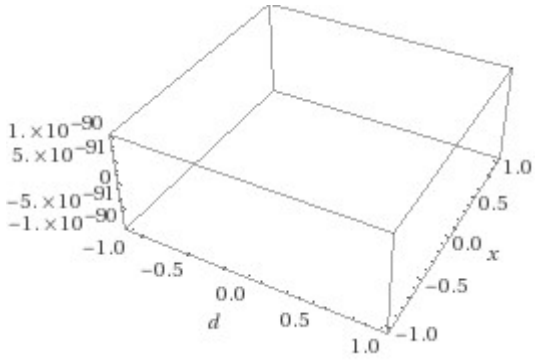
Input interpretation:

$$\frac{1}{(2\pi)^{1.5}}\int 1.37524\times10^{-88}\,d^3x\,dx$$

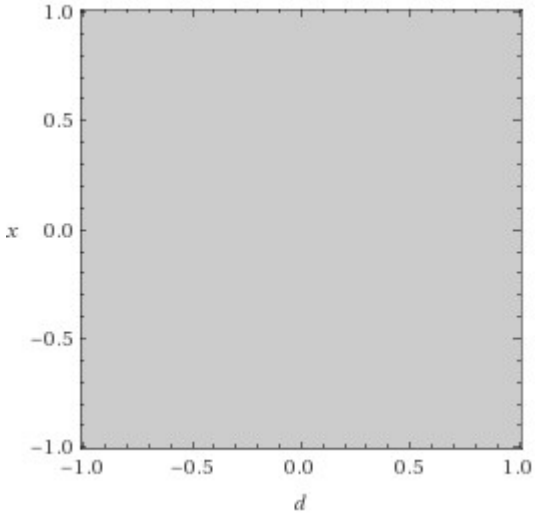
Result:

$4.36595\times10^{-90}\,d^3x^2$

3D plot:



Contour plot:



Alternate form assuming d and x are real:

$4.36595 \times 10^{-90}\, d^3\, x^2 + 0$

$4.36595*10^{-90}$

From the following Hausdorff dimension, equal about to 1.5236 , we obtain:

$$\log_2\left(\frac{1+\sqrt[3]{73-6\sqrt{87}}+\sqrt[3]{73+6\sqrt{87}}}{3}\right)$$

((((Log base 2 (((1+((73-6sqrt87))^1/3+(73+6sqrt87)^1/3)*1/3))+729/10^4))))^5 *(1/(2Pi)^1.5) * integrate(1.37524×10^-88)d^3x

Input interpretation:

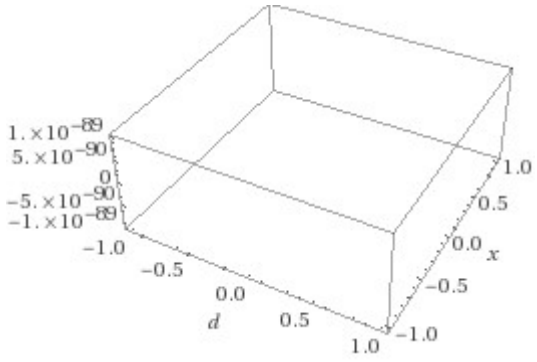
$$\left(\log_2\left(\left(1+\sqrt[3]{73-6\sqrt{87}}+\sqrt[3]{73+6\sqrt{87}}\right)\times\frac{1}{3}\right)+\frac{729}{10^4}\right)^5\times\frac{1}{(2\pi)^{1.5}}\int 1.37524\times10^{-88}\,d^3x\,dx$$

$\log_b(x)$ is the base-b logarithm

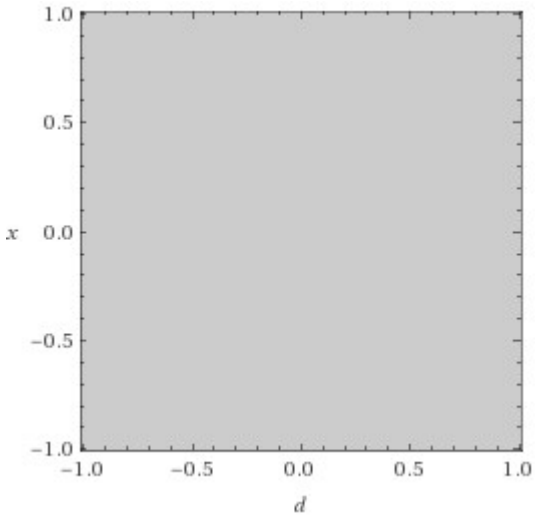
Result:

$4.52856\times10^{-89}\,d^3\,x^2$

3D plot:



Contour plot:



Alternate form assuming d and x are real:

$4.52856 \times 10^{-89}\, d^3\, x^2 + 0$

$4.52856*10^{-89}$ result very near to the value of the Planck thermal insulator $4.544023 \times 10^{-89}\ m^2 \cdot K/W$

$$\left(\frac{l_P}{\lambda_{\Theta P}} = \Omega_{\Theta P}\, l_P^2 = \sqrt{\frac{64\pi^3 \hbar^3 G^3}{c^{11} k_B^2}} \right) = 4.544023 \times 10^{-89}\ m^2 \cdot K/W$$

We have that:

p = 1.28e-30 ; m = 9.1093837e-31 ;

R = 0.99003 ; B = 1.00504 ≈ 1 ; $v_m(\lambda)$ and $u_m(\lambda)$ are equal to 4 and 1

For m = 9.1093837e-31 ; ω = 1.57105e-30 ; p = 1.57105e-30 ; λ = – 1 ,

$D_{nn'}$ = 3.5185

$$\tilde{\psi}_{a,b}^{(AB)}(x) \equiv (2\pi)^{-3/2} \int d^3p [2\omega(\mathbf{p})]^{-1/2}$$
$$\times \sum_{a'b'\lambda} D_{aa'}^{(A)}[R(\hat{p})] D_{bb'}^{(B)}[R(\hat{p})]$$
$$\times \left(\frac{|\mathbf{p}| + \omega(\mathbf{p})}{m} \right)^{b'-a'} C_{AB}(j\lambda; a'b')$$
$$\times [b(\mathbf{p},\lambda) e^{ip\cdot x} + (-)^{2B+j-\lambda} a^\dagger(\mathbf{p}, -\lambda) e^{-ip\cdot x}]. \qquad (2.13)$$

(1.57105e-30)(2*1.57105e-30(1.28e-30))^-0.5 * 3.5185^2 * (0.99003(1.57105e-30))^2 * ((((1.28e-30)+(1.57105e-30)(1.28e-30))))/(9.1093837e-31) * (-4) * [(1.28e-30)*(-exp(i*1.57105e-30))-(1.28e-30)(exp-(i*1.57105e-30))]

a)

(1.57105e-30)(2*1.57105e-30(1.28e-30))^-0.5 * 3.5185^2 (0.99003(1.57105e-30))^2 ((((1.28e-30)+(1.57105e-30)(1.28e-30))))/(9.1093837e-31) (-4)

Input interpretation:

$$\frac{1.57105\times10^{-30}\times3.5185^2}{(2\times1.57105\times10^{-30}\times1.28\times10^{-30})^{0.5}}\,(0.99003\times1.57105\times10^{-30})^2\times\frac{1.28\times10^{-30}+1.57105\times10^{-30}\times1.28\times10^{-30}}{9.1093837\times10^{-31}}\times(-4)$$

Result:

$-1.31871\ldots\times10^{-58}$

-1.31871…*10^{-58}

b)

-1.31871× 10^-58 * [(1.28e-30)*(-exp(i*1.57105e-30))-(1.28e-30)(exp-(i*1.57105e-30))]

Input interpretation:

$$-1.31871\times10^{-58}\left(1.28\times10^{-30}\left(-\exp\left(i\times1.57105\times10^{-30}\right)\right)-1.28\times10^{-30}\exp\left(-\left(i\times1.57105\times10^{-30}\right)\right)\right)$$

i is the imaginary unit

Result:

$3.37590\ldots\times10^{-88}$

3.37590…*10^{-88}

Alternate form:

3.3759×10^{-88}

c)

(2Pi)^-1.5 * integrate (((-1.31871×10^(-58) (1.28×10^(-30) (-exp(i×1.57105×10^(-30))) - 1.28×10^(-30) exp(-(i×1.57105×10^(-30)))))))d^3x

Input interpretation:

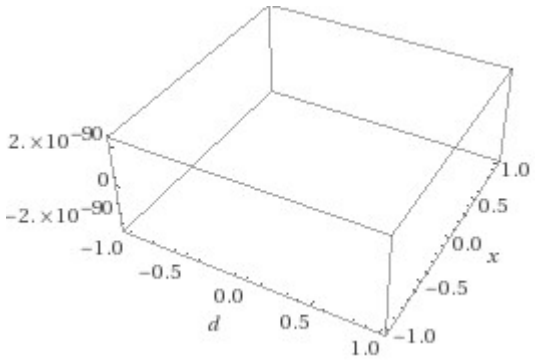
$$\frac{1}{(2\pi)^{1.5}} \int (-1.31871 \times 10^{-58} (1.28 \times 10^{-30} (-\exp(i \times 1.57105 \times 10^{-30})) - 1.28 \times 10^{-30} \exp(-(i \times 1.57105 \times 10^{-30})))) d^3 x \, dx$$

i is the imaginary unit

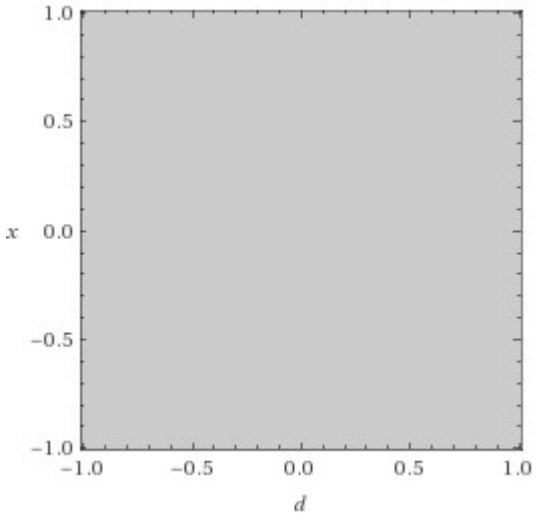
Result:

$$(1.07174 \times 10^{-89} + 0\,i)\, d^3 x^2$$

3D plot:



Contour plot:



Alternate form:

$1.07174 \times 10^{-89} d^3 x^2$

$1.07174*10^{-89}$

Alternate form assuming d and x are real:

$1.07174 \times 10^{-89} d^3 x^2 + 0$

Indefinite integral assuming all variables are real:

$(3.57247 \times 10^{-90} + 0\, i)\, d^3 x^3 + \text{constant}$

Note that:

sqrt18* (2Pi)^-1.5 * integrate (((-1.31871×10^(-58) (1.28×10^(-30) (-exp(i×1.57105×10^(-30))) - 1.28×10^(-30) exp(-(i×1.57105×10^(-30)))))))d^3x

Input interpretation:

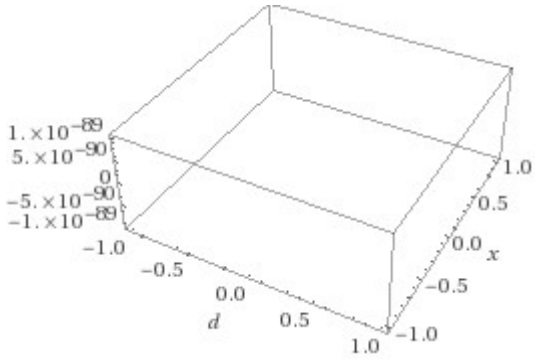
$$\frac{1}{(2\pi)^{1.5}} \sqrt{18} \int (-1.31871 \times 10^{-58} (1.28 \times 10^{-30} (-\exp(i \times 1.57105 \times 10^{-30})) - 1.28 \times 10^{-30} \exp(-(i \times 1.57105 \times 10^{-30})))) d^3 x\, dx$$

i is the imaginary unit

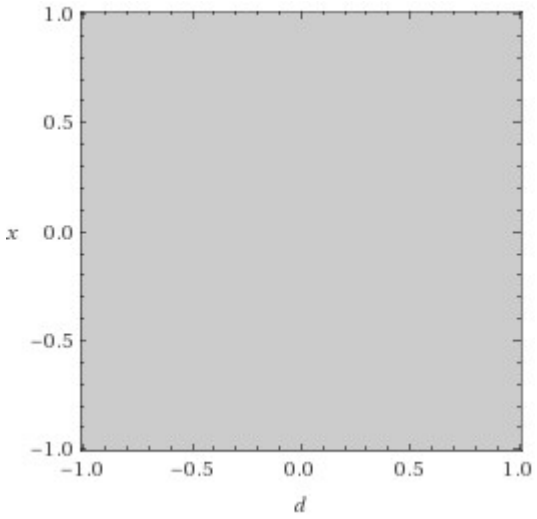
Result:

$(4.54701 \times 10^{-89} + 0\, i)\, d^3 x^2$

3D plot:



Contour plot:



Alternate form:

$4.54701 \times 10^{-89}\, d^3\, x^2$

Alternate form assuming d and x are real:

$4.54701 \times 10^{-89}\, d^3\, x^2 + 0$

$4.54701 * 10^{-89}$ result practically equal to the value of the Planck thermal insulator 4.544023×10^{-89} $m^2 \cdot K/W$

We note that form the result of the following expression:

$$\frac{1}{(2\pi)^{1.5}} \int (-1.31871 \times 10^{-58} (1.28 \times 10^{-30} (-\exp(i \times 1.57105 \times 10^{-30})) - 1.28 \times 10^{-30} \exp(-(i \times 1.57105 \times 10^{-30})))) d^3 x \, dx$$

$$1.07174 \times 10^{-89} d^3 x^2$$

We obtain also:

4*[-5ln(1.07174×10^-89)] -2*((sqrt5-1)/2)

Input interpretation:

$$4(-5 \log(1.07174 \times 10^{-89})) - 2\left(\frac{1}{2}\left(\sqrt{5} - 1\right)\right)$$

$\log(x)$ is the natural logarithm

Result:

4095.9797...

4095.9797… ≈ 4096 = 64^2

and:

sqrt((((4*[-5ln(1.07174×10^-89)] -2*((sqrt5-1)/2)))))

Input interpretation:

$$\sqrt{4(-5 \log(1.07174 \times 10^{-89})) - 2\left(\frac{1}{2}\left(\sqrt{5} - 1\right)\right)}$$

$\log(x)$ is the natural logarithm

Result:

63.9998416...

63.9998416… ≈ 64 = 8^2

Observations

From:
https://www.scientificamerican.com/article/mathematics-ramanujan/?fbclid=IwAR2caRXrn_RpOSvJ1QxWsVLBcJ6KVgd_Af_hrmDYBNyU8mpSjRs1BDeremA

Ramanujan's statement concerned the deceptively simple concept of partitions—the different ways in which a whole number can be subdivided into smaller numbers. Ramanujan's original statement, in fact, stemmed from the observation of patterns, such as the fact that p(9) = 30, p(9 + 5) = 135, p(9 + 10) = 490, p(9 + 15) = 1,575 and so on are all divisible by 5. Note that here the n's come at intervals of five units.

Ramanujan posited that this pattern should go on forever, and that similar patterns exist when 5 is replaced by 7 or 11—there are infinite sequences of p(n) that are all divisible by 7 or 11, or, as mathematicians say, in which the "moduli" are 7 or 11.

Then, in nearly oracular tone Ramanujan went on: "There appear to be corresponding properties," he wrote in his 1919 paper, "in which the moduli are powers of 5, 7 or 11...and no simple properties for any moduli involving primes other than these three." (Primes are whole numbers that are only divisible by themselves or by 1.) Thus, for instance, there should be formulas for an infinity of n's separated by 5^3 = 125 units, saying that the corresponding p(n)'s should all be divisible by 125.
In the past methods developed to understand partitions have later been applied to physics problems such as the theory of the strong nuclear force or the entropy of black holes.

From Wikipedia

In particle physics, Yukawa's interaction or Yukawa coupling, named after Hideki Yukawa, is an interaction between a scalar field ϕ and a Dirac field ψ. The Yukawa interaction can be used to describe the nuclear force between nucleons (which are fermions), mediated by pions (which are pseudoscalar mesons). The Yukawa interaction is also used in the Standard Model to describe the coupling between the Higgs field and massless quark and lepton fields (i.e., the fundamental fermion particles). Through spontaneous symmetry breaking, these fermions acquire a mass proportional to the vacuum expectation value of the Higgs field.

Can be this the motivation that from the development of the Ramanujan's equations we obtain results very near to the dilaton mass calculated as a type of Higgs boson: 125 GeV for T = 0 and to the Higgs boson mass 125.18 GeV and practically equal to the rest mass of Pion meson 139.57 MeV

Note that:

$$g_{22} = \sqrt{(1+\sqrt{2})}.$$

Hence

$$\begin{aligned} 64g_{22}^{24} &= e^{\pi\sqrt{22}} - 24 + 276e^{-\pi\sqrt{22}} - \cdots, \\ 64g_{22}^{-24} &= 4096e^{-\pi\sqrt{22}} + \cdots, \end{aligned}$$

so that

$$64(g_{22}^{24} + g_{22}^{-24}) = e^{\pi\sqrt{22}} - 24 + 4372e^{-\pi\sqrt{22}} + \cdots = 64\{(1+\sqrt{2})^{12} + (1-\sqrt{2})^{12}\}.$$

Hence

$$e^{\pi\sqrt{22}} = 2508951.9982\ldots.$$

Thence:

$$64g_{22}^{-24} = 4096e^{-\pi\sqrt{22}} + \cdots$$

And

$$64(g_{22}^{24} + g_{22}^{-24}) = e^{\pi\sqrt{22}} - 24 + 4372e^{-\pi\sqrt{22}} + \cdots = 64\{(1+\sqrt{2})^{12} + (1-\sqrt{2})^{12}\}$$

That are connected with 64, 128, 256, 512, 1024 and 4096 = 64^2

(Modular equations and approximations to π - S. Ramanujan - Quarterly Journal of Mathematics, XLV, 1914, 350 – 372)

All the results of the most important connections are signed in blue throughout the drafting of the paper. We highlight as in the development of the various equations we use always the constants π, ϕ, 1/ϕ, the Fibonacci and Lucas numbers, linked to the golden ratio, that play a fundamental role in the development, and therefore, in the final results of the analyzed expressions.

In mathematics, the Fibonacci numbers, commonly denoted F_n, form a sequence, called the Fibonacci sequence, such that each number is the sum of the two preceding ones, starting from 0 and 1. Fibonacci numbers are strongly related to the golden ratio: Binet's formula expresses the nth Fibonacci number in terms of n and the golden ratio, and implies that the ratio of two consecutive Fibonacci numbers tends to the golden ratio as n increases.
Fibonacci numbers are also closely related to Lucas numbers ,in that the Fibonacci and Lucas numbers form a complementary pair of Lucas sequences

The beginning of the sequence is thus:

0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, 377, 610, 987, 1597, 2584, 4181, 6765, 10946, 17711, 28657, 46368, 75025, 121393, 196418, 317811, 514229, 832040, 1346269, 2178309, 3524578, 5702887, 9227465, 14930352, 24157817, 39088169, 63245986, 102334155...

The Lucas numbers or Lucas series are an integer sequence named after the mathematician François Édouard Anatole Lucas (1842–91), who studied both that sequence and the closely related Fibonacci numbers. Lucas numbers and Fibonacci numbers form complementary instances of Lucas sequences.

The Lucas sequence has the same recursive relationship as the Fibonacci sequence, where each term is the sum of the two previous terms, but with different starting values. This produces a sequence where the ratios of successive terms approach the golden ratio, and in fact the terms themselves are roundings of integer powers of the golden ratio.[1] The sequence also has a variety of relationships with the Fibonacci numbers, like the fact that adding any two Fibonacci numbers two terms apart in the Fibonacci sequence results in the Lucas number in between.

The sequence of Lucas numbers is:

2, 1, 3, 4, 7, 11, 18, 29, 47, 76, 123, 199, 322, 521, 843, 1364, 2207, 3571, 5778, 9349, 15127, 24476, 39603, 64079, 103682, 167761, 271443, 439204, 710647, 1149851, 1860498, 3010349, 4870847, 7881196, 12752043, 20633239, 33385282, 54018521, 87403803……

All Fibonacci-like integer sequences appear in shifted form as a row of the Wythoff array; the Fibonacci sequence itself is the first row and the Lucas sequence is the second row. Also like all Fibonacci-like integer sequences, the ratio between two consecutive Lucas numbers converges to the golden ratio.

A Lucas prime is a Lucas number that is prime. The first few Lucas primes are:

2, 3, 7, 11, 29, 47, 199, 521, 2207, 3571, 9349, 3010349, 54018521, 370248451, 6643838879, ... (sequence A005479 in the OEIS).

In geometry, a golden spiral is a logarithmic spiral whose growth factor is φ, the golden ratio.[1] That is, a golden spiral gets wider (or further from its origin) by a factor of φ for every quarter turn it makes. Approximate logarithmic spirals can occur in nature, for example the arms of spiral galaxies[3] - golden spirals are one special case of these logarithmic spirals

We observe that 1728 and 1729 are results very near to the mass of candidate glueball **f_0(1710) scalar meson.** Furthermore, 1728 occurs in the algebraic formula for the j-invariant of an elliptic curve. As a consequence, it is sometimes called a Zagier as a pun on the Gross–Zagier theorem. The number 1728 is one less than the Hardy–Ramanujan number 1729 (taxicab number).

Furthermore, we obtain as results of our computations, always values very near to the Higgs boson mass 125.18 GeV and practically equals to the rest mass of Pion meson 139.57 MeV. In conclusion we obtain also many results that are very good approximations to the value of the golden ratio 1.618033988749... and to ζ(2) = $\frac{\pi^2}{6} = 1.644934 \ldots$

We note how the following three values: 137.508 (golden angle), 139.57 (mass of the Pion - meson Pi) and 125.18 (mass of the Higgs boson), are connected to each other. In fact, just add 2 to 137.508 to obtain a result very close to the mass of the Pion and subtract 12 to 137.508 to obtain a result that is also very close to the mass of the Higgs boson. We can therefore hypothesize that it is the golden angle (and the related golden ratio inherent in it) to be a fundamental ingredient both in the structures of the microcosm and in those of the macrocosm.

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