Further mathematical connections between some Ramanujan equations concerning p(n) and τ(n), several equations concerning Mock Modularity in M-theory duality, various parameters concerning Particle Physics, ϕ and ζ(2). II

Michele Nardelli[1], **Antonio Nardelli**[2]

Abstract

In this paper we describe and analyze further new mathematical connections between some Ramanujan formulas concerning p(n) and τ(n), several equations concerning Mock Modularity in M-theory duality, various parameters concerning Particle Physics, ϕ and ζ(2).

[1] M.Nardelli studied at Dipartimento di Scienze della Terra Università degli Studi di Napoli Federico II, Largo S. Marcellino, 10 - 80138 Napoli, Dipartimento di Matematica ed Applicazioni "R. Caccioppoli" - Università degli Studi di Napoli "Federico II" – Polo delle Scienze e delle Tecnologie Monte S. Angelo, Via Cintia (Fuorigrotta), 80126 Napoli, Italy

[2] A. Nardelli studies at the Università degli Studi di Napoli Federico II - Dipartimento di Studi Umanistici – **Sezione Filosofia - scholar of Theoretical Philosophy**



https://blog.vedicmathsindia.org/srinivasa-ramanujan/

From:

Duality and Mock Modularity
Atish Dabholkar, Pavel Putrov, Edward Witten - arXiv:2004.14387v1 [hep-th] 29 Apr 2020

Let us consider how the effective two-dimensional theory in the $\mathfrak{u}(2)$ case is modified compared to $\mathfrak{su}(2)$ case. The analysis in Section 4.2 can be repeated for the 6d tensor multiples valued in the Cartan sub algebra of $\mathfrak{u}(2)$. In particular, the KK reduction of the self-dual 2-form field B now leads to $\widehat{\mathfrak{u}(2)}_1$ right-moving WZW CFT, instead of $\widehat{\mathfrak{su}(2)}_1 \cong \widehat{\mathfrak{u}(1)}_2$. This two-dimensional theory is now also absolute[20] and its character is

$$\bar{\chi}^{\widehat{\mathfrak{u}(2)}_1}_{0,0}(\tau;z) = \frac{1}{\overline{\eta(\tau)}^2}\sum_{n\in\mathbb{Z}^2}\bar{q}^{\frac{n_1^2+n_2^2}{2}+(n_1+n_2)\bar{z}} = \left[\frac{\overline{\vartheta_3(\tau;z)}}{\overline{\eta(\tau)}}\right]^2 \tag{B.1}$$

which again captures contribution of abelian instantons. We have included the fugacity e^z for the diagonal $\mathfrak{u}(1)$. From the 4d perspective such refinement is realized by adding the topological term $z\int_{\mathbb{CP}^1} c_1$ to the action on $\mathbb{CP}^2$. The decoupling of the diagonal $\mathfrak{u}(1)$, corresponding to the center of mass degrees of freedom, is then done via the following decomposition of characters:

$$\bar{\chi}^{\widehat{\mathfrak{u}(2)}_1}_{0,0}(\tau;z) = \bar{\chi}^{\widehat{\mathfrak{u}(1)}_2}_{0}(\tau;z)\bar{\chi}^{\widehat{\mathfrak{su}(2)}_1}_{0}(\tau) + \bar{\chi}^{\widehat{\mathfrak{u}(1)}_2}_{1}(\tau;z)\bar{\chi}^{\widehat{\mathfrak{su}(2)}_1}_{1}(\tau) \tag{B.2}$$

where

$$\bar{\chi}^{\widehat{\mathfrak{u}(1)}_2}_{\lambda}(\tau;z) := \frac{1}{\overline{\eta(\tau)}}\sum_{n\in\mathbb{Z}}\bar{q}^{(n+\lambda/2)^2+(2n+\lambda)\bar{z}}. \tag{B.3}$$

As an aside we note that if one considers periodic-periodic spin structure instead, the partition function of the chiral $\widehat{\mathfrak{u}(2)}_1$ WZW reads

$$\bar{\chi}^{\widehat{\mathfrak{u}(2)}_1}_{1,1}(\tau;z) = \frac{1}{\overline{\eta(\tau)}^2}\sum_{n\in\mathbb{Z}^2}(-1)^{n_1+n_2+1}\bar{q}^{\frac{(n_1+1/2)^2+(n_2+1/2)^2}{2}+(n_1+n_2+1)\bar{z}} = \left(\frac{\overline{\vartheta_1(z;\tau)}}{\overline{\eta(\tau)}}\right)^2. \tag{B.6}$$

It is modular function of the full $SL(2,\mathbb{Z})$ group, since it preserves the unique odd spin structure. From the 4d point of view the diagonal of $U(2)$ gauge group is replaced by a Spin^c structure, which results in half-integer shifts of the fluxes on the non-spin manifold $\mathbb{CP}^2$. This corresponds to Freed-Witten anomaly in string/M-theory setting. The character decomposition in this case reads

$$\bar{\chi}^{\widehat{\mathfrak{u}(2)}_1}_{1,1}(\tau;z) = \bar{\chi}^{\widehat{\mathfrak{u}(1)}_2}_{0}(\tau;z)\bar{\chi}^{\widehat{\mathfrak{su}(2)}_1}_{1}(\tau) - \bar{\chi}^{\widehat{\mathfrak{u}(1)}_2}_{1}(\tau;z)\bar{\chi}^{\widehat{\mathfrak{su}(2)}_1}_{0}(\tau). \tag{B.7}$$

Thence, we have:

$$\bar{\chi}^{\widehat{\mathfrak{u}(2)}_1}_{0,0}(\tau;z) = \frac{1}{\overline{\eta(\tau)}^2}\sum_{n\in\mathbb{Z}^2}\bar{q}^{\frac{n_1^2+n_2^2}{2}+(n_1+n_2)\bar{z}} = \left[\frac{\overline{\vartheta_3(\tau;z)}}{\overline{\eta(\tau)}}\right]^2$$

$$\bar{\chi}^{\widehat{\mathfrak{u}(2)}_1}_{1,1}(\tau;z) = \frac{1}{\overline{\eta(\tau)}^2}\sum_{n\in\mathbb{Z}^2}(-1)^{n_1+n_2+1}\bar{q}^{\frac{(n_1+1/2)^2+(n_2+1/2)^2}{2}+(n_1+n_2+1)\bar{z}} = \left(\frac{\overline{\vartheta_1(z;\tau)}}{\overline{\eta(\tau)}}\right)^2.$$

That is:

$$\frac{1}{\overline{\eta(\tau)}^2}\sum_{n\in\mathbb{Z}^2}(-1)^{n_1+n_2+1}\bar{q}^{\frac{(n_1+1/2)^2+(n_2+1/2)^2}{2}+(n_1+n_2+1)\bar{z}}=\left(\frac{\overline{\vartheta_1(z;\tau)}}{\overline{\eta(\tau)}}\right)^2.$$

Now, we have that:

For: n_1 =9/2 ; n_2 = 1/2 ; -3.05774*10^{16} = η(τ); n = 2; z = 3/2

From

$$\frac{1}{\overline{\eta(\tau)}^2}\sum_{n\in\mathbb{Z}^2}\bar{q}^{\frac{n_1^2+n_2^2}{2}+(n_1+n_2)\bar{z}}=\left[\frac{\overline{\vartheta_3(\tau;z)}}{\overline{\eta(\tau)}}\right]^2$$

we obtain:

1/(-3.05774e+16)^2 * (exp(2Pi))^(((81/4+1/4)/2)+(9/2+1/2)3/2)

Input interpretation:

$$\frac{1}{(-3.05774\times10^{16})^2}\exp^{\frac{1}{2}\left(\frac{81}{4}+\frac{1}{4}\right)+\left(\frac{9}{2}+\frac{1}{2}\right)\times\frac{3}{2}}(2\pi)$$

Result:

$2.91447\ldots\times10^{15}$

2.91447…*10^{15}

From which:

1/(1364-29)(((1/(-3.05774e+16)^2 * (exp(2Pi))^(((81/4+1/4)/2)+(9/2+1/2)3/2))))^3

where 1364 and 29 are Lucas numbers

Input interpretation:

$$\frac{1}{1364-29}\left(\frac{1}{(-3.05774\times10^{16})^2}\exp^{\frac{1}{2}\left(\frac{81}{4}+\frac{1}{4}\right)+\left(\frac{9}{2}+\frac{1}{2}\right)\times\frac{3}{2}}(2\pi)\right)^3$$

Result:

$1.85437... \times 10^{43}$

$1.85437\ldots*10^{43}$ result practically equal to the Planck frequency 1.8549×10^{43} Hz

We have also:

1/(2.718281828459)[1/(((1/(-3.05774e+16)^2 * (exp(2Pi))^(((81/4+1/4)/2)+(9/2+1/2)3/2))))]^1/3

Input interpretation:

$$\frac{1}{2.718281828459}\sqrt[3]{\frac{1}{\frac{1}{(-3.05774\times10^{16})^2}\exp^{\frac{1}{2}\left(\frac{81}{4}+\frac{1}{4}\right)+\left(\frac{9}{2}+\frac{1}{2}\right)\times\frac{3}{2}}(2\pi)}}$$

Result:

$2.57545... \times 10^{-6}$

$2.57545\ldots*10^{-6}$

Now, from:

SIAM REVIEW
Vol. 16, No. 4, October 1974

APPLICATIONS OF BASIC HYPERGEOMETRIC FUNCTIONS*

GEORGE E. ANDREWS†

For eq. (3.46)

$$: \sum_{n=-\infty}^{\infty} \frac{q^{5n+1}(1-q^2)(1+q^{5n+2})(1-q^{5n+2})}{(1-q^{5n+1})(1-q^{5n+3})^2}$$

and q = 0.5 , we obtain:

sum (((0.5^(5n+1)(1-0.5^2)(1+0.5^(5n+2))(1-0.5^(5n+2)))))/((((1-0.5^(5n+1))(1-0.5^(5n+3))^2))), n=-20..infinity

Input interpretation:

$$\sum_{n=-20}^{\infty} \frac{0.5^{5n+1}\,(1-0.5^2)\,(1+0.5^{5n+2})\,(1-0.5^{5n+2})}{(1-0.5^{5n+1})\,(1-0.5^{5n+3})^2}$$

Approximated sum:

$$\sum_{n=-20}^{\infty} \frac{0.5^{5n+1}\,(1-0.5^2)\,(1+0.5^{5n+2})\,(1-0.5^{5n+2})}{(1-0.5^{5n+1})\,(1-0.5^{5n+3})^2} \approx 63.5858$$

63.5858

Convergence tests:

By the ratio test, the series converges.

Partial sum formula:

$$\sum_{n=-20}^{m} \frac{0.5^{5n+1}\,(1-0.5^2)\,(1+0.5^{5n+2})\,(1-0.5^{5n+2})}{(1-0.5^{5n+1})\,(1-0.5^{5n+3})^2} \approx 0.288539\,\psi_{32}^{(0)}(m+1.2) - 1.15416\,\psi_{32}^{(0)}(m+1.6) - 0.249764\,\psi_{32}^{(1)}(m+1.6) + 3\,(m+1) + 62.1789$$

For q = exp(2Pi) = 535.49165 , we obtain:

sum (((535.49165^(5n+1)(1-0.5^2)(1+535.49165^(5n+2))(1-535.49165^(5n+2)))))/((((1-535.49165^(5n+1))(1-535.49165^(5n+3))^2))), n=-2..infinity

Input interpretation:

$$\sum_{n=-2}^{\infty} \frac{535.492^{5n+1}\,(1-0.5^2)\,(1+535.492^{5n+2})\,(1-535.492^{5n+2})}{(1-535.492^{5n+1})\,(1-535.492^{5n+3})^2}$$

Result:

$$\sum_{n=-2}^{\infty} \frac{535.492^{5n+1}\,(1-0.5^2)\,(1+535.492^{5n+2})\,(1-535.492^{5n+2})}{(1-535.492^{5n+1})\,(1-535.492^{5n+3})^2}$$ (sum diverges)

Convergence tests:

By the limit test, the series diverges.

Partial sum formula:

$$\sum_{n=-2}^{m} \frac{535.492^{5n+1}(1-0.5^2)(1+535.492^{5n+2})(1-535.492^{5n+2})}{(1-535.492^{5n+1})(1-535.492^{5n+3})^2} \approx$$
$$8.32545\times10^{-8}\,\psi_0^{(0)}(m+1.2) - 2.65006\times10^{-9}\,\psi_0^{(1)}(m+1.6) + 2.61551\times10^{-6}\,(m+1) + 4.9026\times10^{-9}$$

that is:

8.32545×10^-8 ψ_0^(0)(m+1.2) - 2.65006×10^-9 ψ_0^(1)(m+1.6)+2.61551×10^-6 (m+1)+4.9026×10^-9

We note that:

(((535.49165^(5*2+1)(1-0.5^2)(1+535.49165^(5*2+2))(1-535.49165^(5*2+2)))))/((((1-535.49165^(5*2+1))(1-535.49165^(5*2+3))^2)))

Input interpretation:

$$\frac{535.49165^{5\times2+1}(1-0.5^2)(1+535.49165^{5\times2+2})(1-535.49165^{5\times2+2})}{(1-535.49165^{5\times2+1})(1-535.49165^{5\times2+3})^2}$$

Result:

$2.615506821126064832531445863069184886735399933813948 7\ldots \times 10^{-6}$

2.615506821126….*10^-6 result very near to the value previously obtained 2.57545…*10^-6

From the above expression,

$$\frac{1}{(-3.05774\times10^{16})^2}\exp^{\frac{1}{2}\left(\frac{81}{4}+\frac{1}{4}\right)+\left(\frac{9}{2}+\frac{1}{2}\right)\times\frac{3}{2}}(2\pi)$$

we obtain also:

48log(((1/(-3.05774e+16)^2 * (exp(2Pi))^(((81/4+1/4)/2)+(9/2+1/2)3/2))))+18+2

Input interpretation:

$$48 \log\left(\frac{1}{(-3.05774\times 10^{16})^2}\exp^{\frac{1}{2}\left(\frac{81}{4}+\frac{1}{4}\right)+\left(\frac{9}{2}+\frac{1}{2}\right)\times\frac{3}{2}}(2\,\pi)\right)+18+2$$

$\log(x)$ is the natural logarithm

Result:

1729.206...

1729.206…

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)

From which:

(((48log(((1/(-3.05774e+16)^2 * (exp(2Pi))^(((81/4+1/4)/2)+(9/2+1/2)3/2))))+18+2)))^1/15

Input interpretation:

$$\sqrt[15]{48 \log\left(\frac{1}{(-3.05774\times 10^{16})^2}\exp^{\frac{1}{2}\left(\frac{81}{4}+\frac{1}{4}\right)+\left(\frac{9}{2}+\frac{1}{2}\right)\times\frac{3}{2}}(2\,\pi)\right)+18+2}$$

$\log(x)$ is the natural logarithm

Result:

1.6438283...

1.6438283….$\approx \zeta(2) = \frac{\pi^2}{6} = 1.644934$ ...

And again:

4log(((1/(-3.05774e+16)^2 * (exp(2Pi))^(((81/4+1/4)/2)+(9/2+1/2)3/2))))-Pi

Input interpretation:

$$4 \log\left(\frac{1}{(-3.05774\times 10^{16})^2}\exp^{\frac{1}{2}\left(\frac{81}{4}+\frac{1}{4}\right)+\left(\frac{9}{2}+\frac{1}{2}\right)\times\frac{3}{2}}(2\,\pi)\right)-\pi$$

log(x) is the natural logarithm

Result:

139.2923...

139.2923…. result practically equal to the rest mass of Pion meson 139.57 MeV

4log(((1/(-3.05774e+16)^2 * (exp(2Pi))^(((81/4+1/4)/2)+(9/2+1/2)3/2))))-18+1

Input interpretation:

$$4 \log\left(\frac{1}{(-3.05774\times 10^{16})^2}\exp^{\frac{1}{2}\left(\frac{81}{4}+\frac{1}{4}\right)+\left(\frac{9}{2}+\frac{1}{2}\right)\times\frac{3}{2}}(2\,\pi)\right)-18+1$$

log(x) is the natural logarithm

Result:

125.4339...

125.4339…. result very near to the Higgs boson mass 125.18 GeV

Now, from

$$\frac{1}{\overline{\eta(\tau)}^2}\sum_{n\in\mathbb{Z}^2}(-1)^{n_1+n_2+1}q^{\frac{(n_1+1/2)^2+(n_2+1/2)^2}{2}+(n_1+n_2+1)\bar{z}}$$

For: : n_1 =9/2 ; n_2 = 1/2 ; -3.05774*10^{16} = η(τ); -3.3805503749….*10^{34} = τ_2(n);

z = 3/2; we obtain:

1/(-3.05774e+16)^2 * (-1)^(9/2+1/2+1) *
(exp(2Pi))^[((((((9/2+1/2)^2+(1/2+1/2)^2))/2+(9/2+1/2+1)3/2)))]

Input interpretation:

$$\frac{1}{(-3.05774\times 10^{16})^2}(-1)^{9/2+1/2+1}\exp^{\frac{1}{2}\left(\left(\frac{9}{2}+\frac{1}{2}\right)^2+\left(\frac{1}{2}+\frac{1}{2}\right)^2\right)+\left(\frac{9}{2}+\frac{1}{2}+1\right)\times\frac{3}{2}}(2\,\pi)$$

Result:

$1.15281\ldots \times 10^{27}$

$1.15281\ldots*10^{27}$

From which, we obtain also:

2ln(((1/(-3.05774e+16)^2 * (-1)^(9/2+1/2+1) *
(exp(2Pi))^[(((((9/2+1/2)^2+(1/2+1/2)^2))/2+(9/2+1/2+1)3/2)))]))+1

Input interpretation:

$$2\log\left(\frac{1}{(-3.05774\times 10^{16})^2}(-1)^{9/2+1/2+1}\exp^{\frac{1}{2}\left(\left(\frac{9}{2}+\frac{1}{2}\right)^2+\left(\frac{1}{2}+\frac{1}{2}\right)^2\right)+\left(\frac{9}{2}+\frac{1}{2}+1\right)\times\frac{3}{2}(2\,\pi)}\right)+1$$

$\log(x)$ is the natural logarithm

Result:

125.6240...

125.6240…. result very near to the Higgs boson mass 125.18 GeV

2ln(((1/(-3.05774e+16)^2 * (-1)^(9/2+1/2+1) *
(exp(2Pi))^[(((((9/2+1/2)^2+(1/2+1/2)^2))/2+(9/2+1/2+1)3/2)))]))+18-3

Input interpretation:

$$2\log\left(\frac{1}{(-3.05774\times 10^{16})^2}(-1)^{9/2+1/2+1}\exp^{\frac{1}{2}\left(\left(\frac{9}{2}+\frac{1}{2}\right)^2+\left(\frac{1}{2}+\frac{1}{2}\right)^2\right)+\left(\frac{9}{2}+\frac{1}{2}+1\right)\times\frac{3}{2}(2\,\pi)}\right)+18-3$$

$\log(x)$ is the natural logarithm

Result:

139.6240...

139.6240…. result practically equal to the rest mass of Pion meson 139.57 MeV

27*1/2(((2ln(((1/(-3.05774e+16)^2 (-1)^(9/2+1/2+1)(exp(2Pi))^[((((9/2+1/2)^2+(1/2+1/2)^2))/2+(9/2+1/2+1)3/2)]))))+Pi)))+4

Input interpretation:

$$27\times\frac{1}{4}\left(2\log\left(\frac{1}{(-3.05774\times10^{16})^2}(-1)^{9/2+1/2+1}\exp^{\frac{1}{2}\left(\left(\frac{9}{2}+\frac{1}{2}\right)^2+\left(\frac{1}{2}+\frac{1}{2}\right)^2\right)+\left(\frac{9}{2}+\frac{1}{2}+1\right)\times\frac{3}{2}(2\pi)}\right)+\pi\right)+$$

$\log(x)$ is the natural logarithm

Result:

1728.836...

1728.836….

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)

With regard 27 (From Wikipedia):

"The fundamental group of the complex form, compact real form, or any algebraic version of E_6 is the cyclic group $\boldsymbol{Z}/3\boldsymbol{Z}$, and its outer automorphism group is the cyclic group $\boldsymbol{Z}/2\boldsymbol{Z}$. Its fundamental representation is 27-dimensional (complex), and a basis is given by the 27 lines on a cubic surface. The dual representation, which is inequivalent, is also 27-dimensional. In particle physics, E_6 plays a role in some grand unified theories".

(((((27*1/2(((2ln(((1/(-3.05774e+16)^2 (-1)^(9/2+1/2+1)(exp(2Pi))^[((((9/2+1/2)^2+(1/2+1/2)^2))/2+(9/2+1/2+1)3/2)]))))+Pi)))+4)))))^1/15

Input interpretation:

$$\left(27\times\frac{1}{2}\left(2\log\left(\frac{1}{(-3.05774\times10^{16})^2}(-1)^{9/2+1/2+1}\exp^{\frac{1}{2}\left(\left(\frac{9}{2}+\frac{1}{2}\right)^2+\left(\frac{1}{2}+\frac{1}{2}\right)^2\right)+\left(\frac{9}{2}+\frac{1}{2}+1\right)\times\frac{3}{2}}(2\pi)\right)+\pi\right)+4\right)\text{ ^ }(1/15)$$

log(x) is the natural logarithm

Result:

1.6438048...

$1.6438048\ldots\approx\zeta(2)=\frac{\pi^2}{6}=1.644934\ldots$

Dividing with the previous result, i.e.

$$\frac{1}{(-3.05774\times10^{16})^2}\exp^{\frac{1}{2}\left(\frac{81}{4}+\frac{1}{4}\right)+\left(\frac{9}{2}+\frac{1}{2}\right)\times\frac{3}{2}}(2\pi)$$

$2.91447\ldots*10^{15}$

we obtain:

((((1/(-3.05774e+16)^2 * (-1)^(9/2+1/2+1) * (exp(2Pi))^[(((((9/2+1/2)^2+(1/2+1/2)^2))/2+(9/2+1/2+1)3/2)))])))*1/(2.91447*10^15)

Input interpretation:

$$\left(\frac{1}{(-3.05774\times10^{16})^2}(-1)^{9/2+1/2+1}\exp^{\frac{1}{2}\left(\left(\frac{9}{2}+\frac{1}{2}\right)^2+\left(\frac{1}{2}+\frac{1}{2}\right)^2\right)+\left(\frac{9}{2}+\frac{1}{2}+1\right)\times\frac{3}{2}}(2\pi)\right)\times\frac{1}{2.91447\times10^{15}}$$

Result:

$3.95548\ldots\times10^{11}$

$3.95548\ldots*10^{11}$

From which, we obtain:

1/(64Pi)*((((1/(-3.05774e+16)^2 * (-1)^(9/2+1/2+1) * (exp(2Pi))^[(((((9/2+1/2)^2+(1/2+1/2)^2))/2+(9/2+1/2+1)3/2)))]))))*1/(2.91447*10^15)

Input interpretation:

$$\frac{1}{64\,\pi}\left(\frac{1}{(-3.05774\times 10^{16})^2}\,(-1)^{9/2+1/2+1}\,\exp^{\frac{1}{2}\left(\left(\frac{9}{2}+\frac{1}{2}\right)^2+\left(\frac{1}{2}+\frac{1}{2}\right)^2\right)+\left(\frac{9}{2}+\frac{1}{2}+1\right)\times\frac{3}{2}(2\,\pi)}\right)\times\frac{1}{2.91447\times 10^{15}}$$

Result:

$1.96729\ldots\times 10^{9}$

$1.96729\ldots*10^{9}$ result very near to the value of the Planck energy 1.9561×10^{9} J

From:

Mock modularity and a secondary elliptic genus
Davide Gaiotto and Theo Johnson-Freyd - arXiv:1904.05788v1 [hep-th] 11 Apr 2019

We have that:

The canonical example is a $(0,1)$ sigma model with target $\mathbb{R}^2$ and a $U(1)$ isometry acting as rotations of $\mathbb{R}^2$. The corresponding flavoured Witten genus is a meromorphic Jacobi form of weight 1 and index -1:

$$Z_{RR}(\mathbb{R}^2)[\xi;\tau] = \frac{\eta(\tau)^3}{\theta(\xi;\tau)} = \frac{1}{x^{\frac{1}{2}}-x^{-\frac{1}{2}}}\prod_{n=1}^{\infty}\frac{(1-q^n)^2}{(1-xq^n)(1-x^{-1}q^n)} \qquad (2.1)$$

with $q = \exp 2\pi i\tau$ and $x = \exp 2\pi i\xi$. The analogue of TMF for the flavoured SQFTs does not appear to be well-studied [GPPV18]. It would be very interesting to do so.

For q = exp(2Pi) = 535.49165; x = exp(-2Pi) = 0.001867442731708; n = 2 we obtain:

1/(((0.001867442731708^0.5-0.001867442731708^-0.5)))*((1-535.49165^2)^2) / (((1-0.001867442731708*535.49165^2)(1-0.001867442731708^-1*535.49165^2)))

Input interpretation:

$$\frac{1}{\sqrt{0.001867442731708} - \frac{1}{0.001867442731708^{0.5}}} \times \frac{(1 - 535.49165^2)^2}{(1 + 535.49165^2 \times (-0.001867442731708))\left(1 - \frac{535.49165^2}{0.001867442731708}\right)}$$

Result:

−0.0433755...

-0.0433755…

From which:

-5/((((1/(((0.0018674427^0.5-0.0018674427^-0.5)))*((1-535.49165^2)^2) / (((1-0.0018674427*535.49165^2)(1-0.0018674427^-1*535.49165^2)))))))+21+Pi

Input interpretation:

$$-\frac{5}{\frac{1}{\sqrt{0.0018674427} - \frac{1}{0.0018674427^{0.5}}} \times \frac{(1-535.49165^2)^2}{(1+535.49165^2 \times (-0.0018674427))\left(1-\frac{535.49165^2}{0.0018674427}\right)}} + 21 + \pi$$

Result:

139.414...

139.414…. result practically equal to the rest mass of Pion meson 139.57 MeV

Series representations:

$$-\frac{5}{\frac{(1-535.492^2)^2}{\left(1-0.00186744 \times 535.492^2\right)\left(1-\frac{535.492^2}{0.00186744}\right)\left(\sqrt{0.00186744} - \frac{1}{0.00186744^{0.5}}\right)}} + 21 + \pi =$$

$$136.273 + 4\sum_{k=0}^{\infty} \frac{(-1)^k}{1+2k}$$

$$-\frac{5}{\frac{(1-535.492^2)^2}{\left(1-0.00186744 \times 535.492^2\right)\left(1-\frac{535.492^2}{0.00186744}\right)\left(\sqrt{0.00186744} - \frac{1}{0.00186744^{0.5}}\right)}} + 21 + \pi =$$

$$134.273 + 2\sum_{k=1}^{\infty} \frac{2^k}{\binom{2k}{k}}$$

$$-\frac{5}{\frac{(1-535.492^2)^2}{\left(\left(1-0.00186744\times 535.492^2\right)\left(1-\frac{535.492^2}{0.00186744}\right)\right)\left(\sqrt{0.00186744}-\frac{1}{0.00186744^{0.5}}\right)}}+21+\pi=$$
$$136.273+\sum_{k=0}^{\infty}\frac{2^{-k}\,(-6+50\,k)}{\binom{3k}{k}}$$

Integral representations:

$$-\frac{5}{\frac{(1-535.492^2)^2}{\left(\left(1-0.00186744\times 535.492^2\right)\left(1-\frac{535.492^2}{0.00186744}\right)\right)\left(\sqrt{0.00186744}-\frac{1}{0.00186744^{0.5}}\right)}}+21+\pi=$$
$$136.273+2\int_0^{\infty}\frac{1}{1+t^2}\,dt$$

$$-\frac{5}{\frac{(1-535.492^2)^2}{\left(\left(1-0.00186744\times 535.492^2\right)\left(1-\frac{535.492^2}{0.00186744}\right)\right)\left(\sqrt{0.00186744}-\frac{1}{0.00186744^{0.5}}\right)}}+21+\pi=$$
$$136.273+4\int_0^{1}\sqrt{1-t^2}\,dt$$

$$-\frac{5}{\frac{(1-535.492^2)^2}{\left(\left(1-0.00186744\times 535.492^2\right)\left(1-\frac{535.492^2}{0.00186744}\right)\right)\left(\sqrt{0.00186744}-\frac{1}{0.00186744^{0.5}}\right)}}+21+\pi=$$
$$136.273+2\int_0^{\infty}\frac{\sin(t)}{t}\,dt$$

-5/((((1/(((0.0018674427^0.5-0.0018674427^-0.5)))*((1-535.49165^2)^2) / (((1-0.0018674427*535.49165^2)(1-0.0018674427^-1*535.49165^2)))))))+11-1

Input interpretation:

$$-\frac{5}{\frac{1}{\sqrt{0.0018674427}-\frac{1}{0.0018674427^{0.5}}}\times\frac{(1-535.49165^2)^2}{\left(1+535.49165^2\times(-0.0018674427)\right)\left(1-\frac{535.49165^2}{0.0018674427}\right)}}+11-1$$

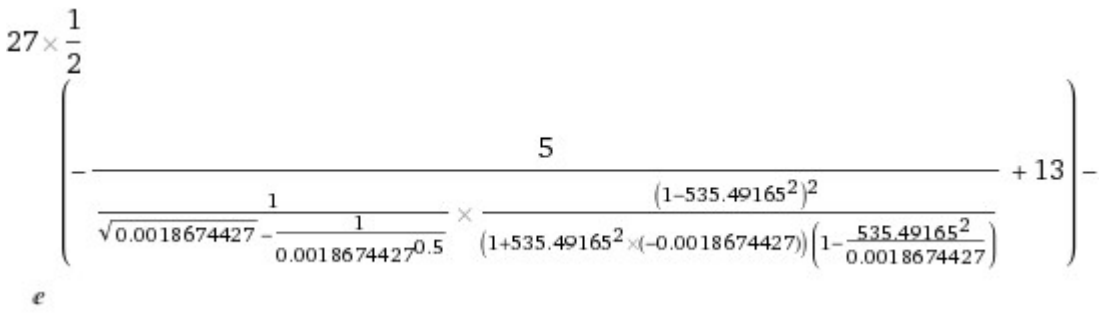
Result:

125.273...

125.273…. result very near to the Higgs boson mass 125.18 GeV

27*1/2(((-5/((((1/(((0.0018674427^0.5-0.0018674427^-0.5)))*((1-535.49165^2)^2) / (((1-0.0018674427*535.49165^2)(1-0.0018674427^-1*535.49165^2)))))))+13)))-e

Input interpretation:



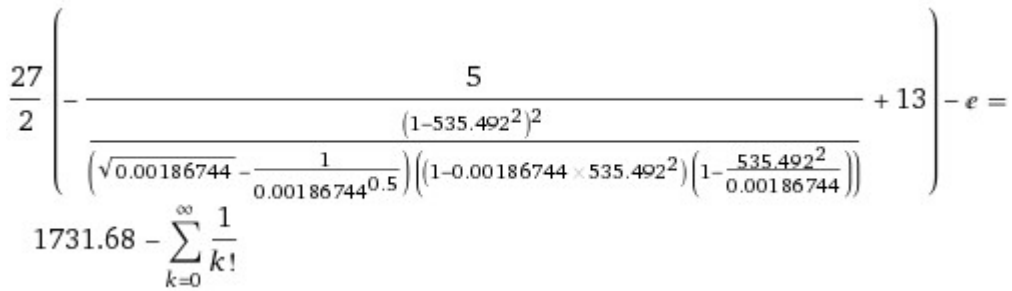
Result:

1728.96...

1728.96…

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)

Series representations:



$$\frac{27}{2}\left(-\frac{5}{\frac{(1-535.492^2)^2}{\left(\sqrt{0.00186744}-\frac{1}{0.00186744^{0.5}}\right)\left(\left(1-0.00186744\times 535.492^2\right)\left(1-\frac{535.492^2}{0.00186744}\right)\right)}}+13\right)-e=$$

$$1728.68+\sum_{k=0}^{\infty}\frac{1+k}{(3+k)!}$$

$$\frac{27}{2}\left(-\frac{5}{\frac{(1-535.492^2)^2}{\left(\sqrt{0.00186744}-\frac{1}{0.00186744^{0.5}}\right)\left(\left(1-0.00186744\times 535.492^2\right)\left(1-\frac{535.492^2}{0.00186744}\right)\right)}}+13\right)-e=$$

$$1731.68-\frac{\sum_{k=0}^{\infty}\frac{-1+k+z}{k!}}{z}$$

$n!$ is the factorial function

[27*1/2(((-5/((((1/(((0.0018674427^0.5-0.0018674427^-0.5)))*((1-535.49165^2)^2) / (((1-0.0018674427*535.49165^2)(1-0.0018674427^-1*535.49165^2)))))))+13)))-e]^1/15

Input interpretation:

$$\left(27\times\frac{1}{2}\left(-\left(5\Big/\left(\frac{1}{\sqrt{0.0018674427}-\frac{1}{0.0018674427^{0.5}}}\times\frac{(1-535.49165^2)^2}{(1+535.49165^2\times(-0.0018674427))\left(1-\frac{535.49165^2}{0.0018674427}\right)}\right)\right)+13\right)-e\right)\text{^}(1/15)$$

Result:

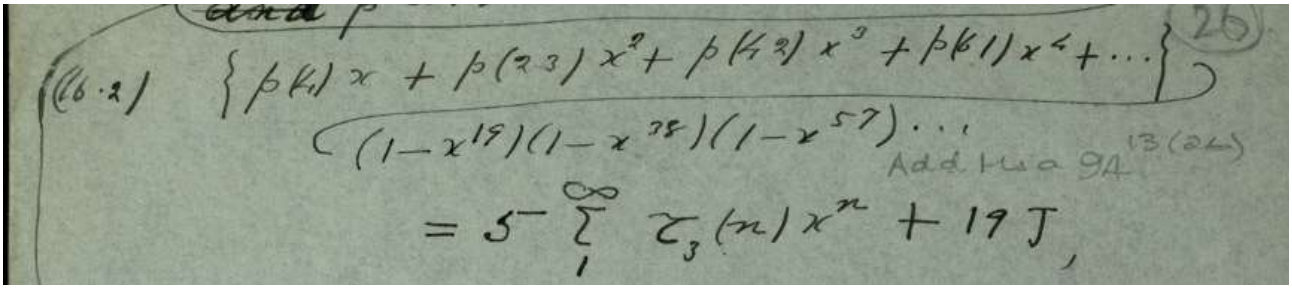
1.643813...

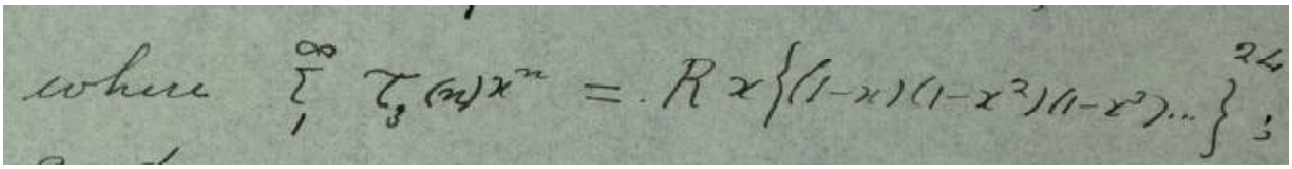
$1.643813\ldots\approx\zeta(2)=\frac{\pi^2}{6}=1.644934\ldots$

Now, we have that:

From

https://mss-cat.trin.cam.ac.uk/manuscripts/uv/view.php?n=Add.Ms.a.94.13#?c=0&m=0&s=0&cv=26&xywh=-269%2C1068%2C4667%2C2707





For x = 2 , Q = -312.388; 11J = 3071.13; J = 279.1936; R = 9.83114i

we obtain:

p(4)*2 + p(23)*2^2 + p(42)*2^3 + p(61)*2^4 (1-2^19)(1-2^38)(1-2^57) = 5* 2*9.83114i((1-2)(1-2^2)(1-2^3))^24 +19*279.1936

(((5*2 + 1255*2^2 + 53174*2^3 + 1121505*2^4 (1-2^19)(1-2^38)(1-2^57))))x = 5* 2*9.83114*i*((1-2)(1-2^2)(1-2^3))^24 +19*279.1936

Input interpretation:

$$\left(5\times 2+1255\times 2^2+53\,174\times 2^3+1\,121\,505\times 2^4\left(\left(1-2^{19}\right)\left(1-2^{38}\right)\left(1-2^{57}\right)\right)\right)x = 5\times 2\times 9.83114\,i\left((1-2)\left(1-2^2\right)\left(1-2^3\right)\right)^{24}+19\times 279.1936$$

i is the imaginary unit

Result:

$$-372\,683\,250\,013\,591\,498\,178\,716\,599\,252\,844\,221\,538\,458\,x = 5304.68+5.31945\times 10^{33}\,i$$

Alternate form:

$$-372\,683\,250\,013\,591\,498\,178\,716\,599\,252\,844\,221\,538\,458\,x - (5304.68 + 5.31945\times10^{33}\,i) = 0$$

Complex solution:

$$x = -1.42337\times10^{-38} - 1.42734\times10^{-8}\,i$$

Input interpretation:

$$-1.42337\times10^{-38} - 1.42734\times10^{-8}\,i$$

i is the imaginary unit

Result:

$$-1.42337...\times10^{-38} - 1.42734...\times10^{-8}\,i$$

Polar coordinates:

$r = 1.42734\times10^{-8}$ (radius), $\theta = -90°$ (angle)

$1.42734*10^{-8}$

Indeed, we have that:

(((5*2 + 1255*2^2 + 53174*2^3 + 1121505*2^4 (1-2^19)(1-2^38)(1-2^57))))*(1.42734e-8)

Input interpretation:

$$(5\times2 + 1255\times2^2 + 53\,174\times2^3 + 1\,121\,505\times2^4\,((1-2^{19})(1-2^{38})(1-2^{57})))\times 1.42734\times10^{-8}$$

Result:

$$-5.319457100743996890104093507775546711707026417 2\times10^{33}$$

Repeating decimal:

$$-5.319457100743996890104093507775546711707026417 2\times10^{33}$$

$-5.3194571…*10^{33}$

5* 2*9.83114*i*((1-2)(1-2^2)(1-2^3))^24 +19*279.1936

Input interpretation:

$5 \times 2 \times 9.83114\, i\, ((1-2)(1-2^2)(1-2^3))^{24} + 19 \times 279.1936$

i is the imaginary unit

Result:

5304.68... +
$5.31945... \times 10^{33}\, i$

Polar coordinates:

$r = 5.31945 \times 10^{33}$ (radius), $\theta = 90°$ (angle)

$5.31945*10^{33}$

From

$(5 \times 2 + 1255 \times 2^2 + 53\,174 \times 2^3 + 1\,121\,505 \times 2^4\, ((1-2^{19})(1-2^{38})(1-2^{57}))) \times 1.42734 \times 10^{-8}$

we obtain:

-1/((((((5*2 + 1255*2^2 + 53174*2^3 + 1121505*2^4 (1-2^19)(1-2^38)(1-2^57))))*(1.42734e-8)))) * 10^16

Input interpretation:

$-\left(10^{16} \Big/ ((5 \times 2 + 1255 \times 2^2 + 53\,174 \times 2^3 + 1\,121\,505 \times 2^4\, ((1-2^{19})(1-2^{38})(1-2^{57}))) \times 1.42734 \times 10^{-8})\right)$

Result:

$1.879891088622815827639671383672324079474746808907396 5... \times 10^{-18}$

$1.8798910886…*10^{-18}$ result very near to the value of the Planck charge $1.875545956(41)\times10^{-18}$ C

And:

1/(2207+322-18)((((((5*2 + 1255*2^2 + 53174*2^3 + 1121505*2^4 (1-2^19)(1-2^38)(1-2^57))))*(1.42734e-8))))^4 * 1.616255e-35

where 2207, 322 and 18 are Lucas numbers, while 1.616255e-35 is the Planck length

Input interpretation:

$$\frac{1}{2207+322-18}\left((5\times 2+1255\times 2^2+53\,174\times 2^3+1\,121\,505\times 2^4\left((1-2^{19})(1-2^{38})(1-2^{57})\right)\right)\times 1.42734\times 10^{-8}\right)^4\times 1.616255\times 10^{-35}$$

Result:

$5.153857565724382555353723291096565650152527952705440 2\ldots\times 10^{96}$

$5.15385756\ldots*10^{96}$ result very near to the value of Planck density

5.1550×10^{96} kg/m^3

We have also:

11*2log(((((5*2 + 1255*2^2 + 53174*2^3 + 1121505*2^4 (1-2^19)(1-2^38)(1-2^57))))*(1.42734e-8)))+18

Input interpretation:

$$11\times 2\log\left(\left(5\times 2+1255\times 2^2+53\,174\times 2^3+1\,121\,505\times 2^4\left((1-2^{19})(1-2^{38})(1-2^{57})\right)\right)\times 1.42734\times 10^{-8}\right)+18$$

$\log(x)$ is the natural logarithm

Result:

1726.4469... +
69.115038... i

Polar coordinates:

$r = 1727.83$ (radius), $\theta = 2.2925°$ (angle)

1727.83….

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)

(((11*2log(((((5*2 + 1255*2^2 + 53174*2^3 + 1121505*2^4 (1-2^19)(1-2^38)(1-2^57))))*(1.42734e-8)))+18)))^1/15

Input interpretation:

$$(11 \times 2 \log((5 \times 2 + 1255 \times 2^2 + 53\,174 \times 2^3 + 1\,121\,505 \times 2^4 ((1 - 2^{19})(1 - 2^{38})(1 - 2^{57}))) \times 1.42734 \times 10^{-8}) + 18)\,\hat{}\,(1/15)$$

$\log(x)$ is the natural logarithm

Result:

1.64373519... +
0.00438459106... i

Polar coordinates:

$r = 1.64374$ (radius), $\theta = 0.152834°$ (angle)

$1.64374 \approx \zeta(2) = \frac{\pi^2}{6} = 1.644934 \ldots$

And again:

2log(((((5*2 + 1255*2^2 + 53174*2^3 + 1121505*2^4 (1-2^19)(1-2^38)(1-2^57))))*(1.42734e-8)))-18+2

Input interpretation:

$$2 \log((5 \times 2 + 1255 \times 2^2 + 53\,174 \times 2^3 + 1\,121\,505 \times 2^4 ((1 - 2^{19})(1 - 2^{38})(1 - 2^{57}))) \times 1.42734 \times 10^{-8}) - 18 + 2$$

$\log(x)$ is the natural logarithm

Result:

139.31336... +
6.2831853... i

Polar coordinates:

$r = 139.455$ (radius), $\theta = 2.58235°$ (angle)

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

2log(((((5*2 + 1255*2^2 + 53174*2^3 + 1121505*2^4 (1-2^19)(1-2^38)(1-2^57))))*(1.42734e-8)))-29-1

Input interpretation:

$$2\log((5\times 2+1255\times 2^2+53\,174\times 2^3+1\,121\,505\times 2^4((1-2^{19})(1-2^{38})(1-2^{57})))\times 1.42734\times 10^{-8})-29-1$$

$\log(x)$ is the natural logarithm

Result:

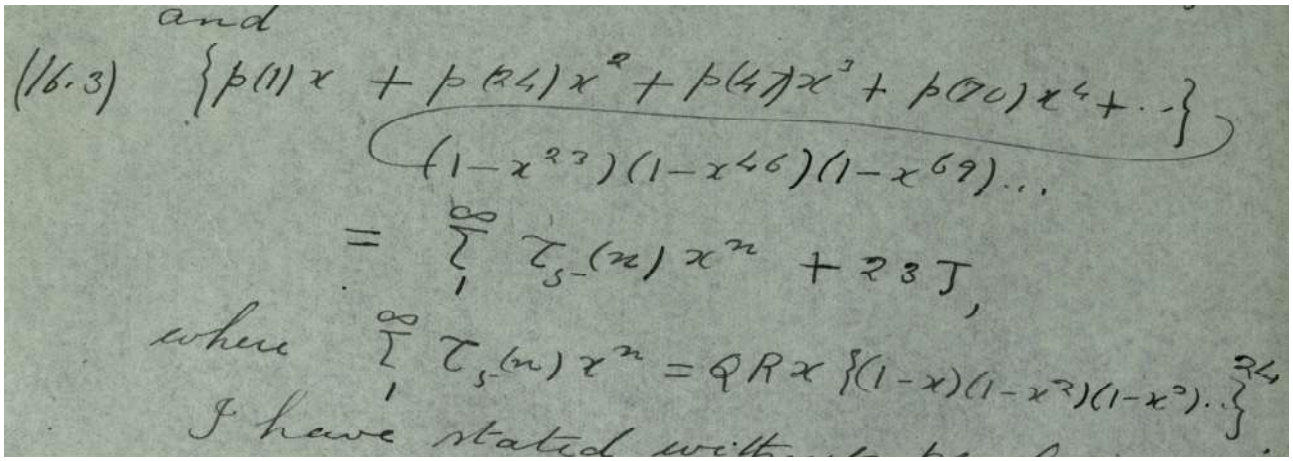
125.31336... +
6.2831853... i

Polar coordinates:

$r = 125.471$ (radius), $\theta = 2.87039°$ (angle)

125.471 result very near to the Higgs boson mass 125.18 GeV

Now, we have:



For x = 2 , Q = -312.388; 11J = 3071.13; J = 279.1936; R = 9.83114i

we obtain:

(1*2+1575*2^2+124754*2^3+4087968*2^4)*(1-2^23)(1-2^46)(1-2^69)

Input:

$$(1\times 2+1575\times 2^2+124\,754\times 2^3+4\,087\,968\times 2^4)(1-2^{23})(1-2^{46})(1-2^{69})$$

Result:

$-23\,141\,139\,750\,613\,175\,811\,079\,364\,355\,582\,041\,947\,403\,851\,571\,922$

Result:

$-2.314113975061317581107936435558204194740385157192 2\times 10^{49}$

$-2.314113975\ldots.*10^{49}$

(-312.388*9.831141i)*2(((((1-2)(1-2^2)(1-2^3)))))^24

Input interpretation:

$(-312.388\times 9.831141\,i)\times 2\left((1-2)\left(1-2^2\right)\left(1-2^3\right)\right)^{24}$

i is the imaginary unit

Result:

-0

$3.32347...\times 10^{35}\,i$

Polar coordinates:

$r = 3.32347\times 10^{35}$ (radius), $\theta = -90°$ (angle)

$3.32347*10^{35}$

We have that:

(-6.96295×10^13 i)*((((-312.388*9.831141i)*2(((((1-2)(1-2^2)(1-2^3)))))^24)))

Input interpretation:

$\left(-6.96295\times 10^{13}\,i\right)\left((-312.388\times 9.831141\,i)\times 2\left((1-2)\left(1-2^2\right)\left(1-2^3\right)\right)^{24}\right)$

i is the imaginary unit

Result:

$-23\,141\,132\,732\,825\,011\,171\,211\,765\,990\,445\,654\,368\,965\,130\,832\,732$

Result:

$-2.314113273282501117121176599044565436896513083273 2\times 10^{49}$

$-2.31411327328\ldots.*10^{49}$

From the previous expression:

$$(5\times 2+1255\times 2^2+53\,174\times 2^3+1\,121\,505\times 2^4\,((1-2^{19})(1-2^{38})(1-2^{57})))\times 1.42734\times 10^{-8}$$

we obtain, performing the ratio between the two results:

sqrt55/(((((((5*2 + 1255*2^2 + 53174*2^3 + 1121505*2^4 (1-2^19)(1-2^38)(1-2^57))))*(1.42734e-8) / (-2314113273282501117121176599044565436896513083273 2))))))^2

Input interpretation:

$$\left(\sqrt{55}\right)\Big/\left((5\times 2+1255\times 2^2+53\,174\times 2^3+1\,121\,505\times 2^4\,((1-2^{19})(1-2^{38})(1-2^{57}))\right)\left(-\frac{1.42734\times 10^{-8}}{23\,141\,132\,732\,825\,011\,171\,211\,765\,990\,445\,654\,368\,965\,130\,832\,732}\right)\Bigg)^2$$

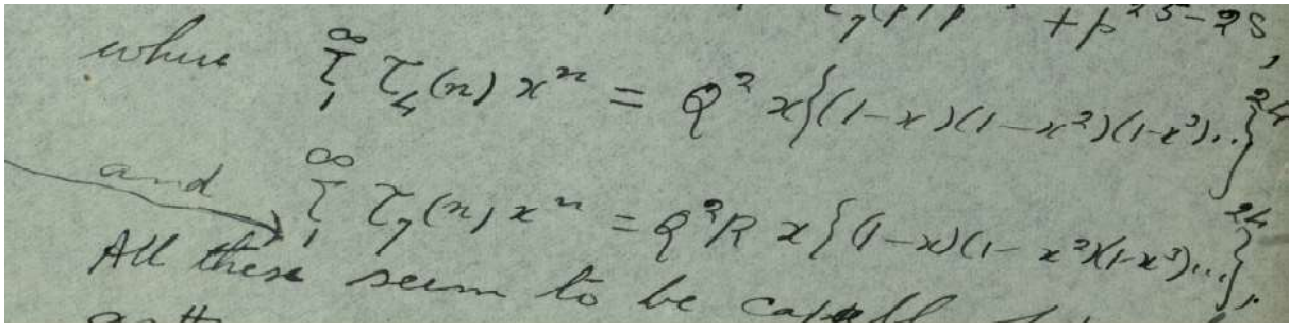
Result:

$1.40351\ldots\times 10^{32}$

1.40351…*10^{32} result very near to the value of Planck temperature

1.416785(16)×10^{32} K

Now, we have that:



For x = 2 , Q = -312.388; R = 9.83114i , we obtain:

(-312.388)^2*2((1-2)(1-2^2)(1-2^3))^24

Input interpretation:

$$(-312.388)^2\times 2\,((1-2)(1-2^2)(1-2^3))^{24}$$

Result:

$1.056043370525471431522666942984940575165852 8 \times 10^{37}$

$1.0560433705\ldots.*10^{37}$

(-312.388^2*9.83114i)*2((1-2)(1-2^2)(1-2^3))^24

Input interpretation:

$(312.388^2\, i \times (-9.83114)) \times 2\,((1-2)(1-2^2)(1-2^3))^{24}$

i is the imaginary unit

Result:

-0

$1.03821\ldots \times 10^{38}\, i$

Polar coordinates:

$r = 1.03821 \times 10^{38}$ (radius), $\theta = -90°$ (angle)

$1.03821*10^{38}$

Multiplying the two results and performing the following calculations, we obtain:

(138^3)/(2(sqrt2+1)) * sqrt[((((-312.388^2*9.83114i)*2((1-2)(1-2^2)(1-2^3))^24)))*((((-312.388)^2*2((1-2)(1-2^2)(1-2^3))^24)))]

where 138^3 is a Ramanujan cube (see Ramanujan's taxicab numbers)

Input interpretation:

$$\frac{138^3}{2(\sqrt{2}+1)} \sqrt{(((312.388^2\, i \times (-9.83114)) \times 2\,((1-2)(1-2^2)(1-2^3))^{24})\,((-312.388)^2 \times 2\,((1-2)(1-2^2)(1-2^3))^{24}))}$$

i is the imaginary unit

Result:

$1.27438\ldots \times 10^{43} -$

$1.27438\ldots \times 10^{43}\, i$

Polar coordinates:

$r = 1.80225 \times 10^{43}$ (radius), $\theta = -45°$ (angle)

$1.80225 * 10^{43}$ result very near to the value of the Planck frequency 1.8549×10^{43} Hz

Furthermore, we have also:

10*ln[((((-312.388^2*9.83114i)*2((1-2)(1-2^2)(1-2^3))^24)))*((((-312.388)^2*2((1-2)(1-2^2)(1-2^3))^24)))]

Input interpretation:

$$10 \log(((312.388^2\, i \times (-9.83114)) \times 2\,((1-2)(1-2^2)(1-2^3))^{24})\\ ((-312.388)^2 \times 2\,((1-2)(1-2^2)(1-2^3))^{24}))$$

$\log(x)$ is the natural logarithm

i is the imaginary unit

Result:

1727.8591... –
15.707963... i

Polar coordinates:

$r = 1727.93$ (radius), $\theta = -0.520861°$ (angle)

1727.93

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)

Alternative representations:

$$10 \log(((-312.388)^2\, 2\,((1-2)(1-2^2)(1-2^3))^{24})\\ (-i\,(312.388^2 \times 9.83114))\,(2\,((1-2)(1-2^2)(1-2^3))^{24})) =\\ 10 \log_e(-39.3246\, i\,(-312.388)^2\,((-21)^{24})^2\,312.388^2)$$

$$10 \log(((-312.388)^2\, 2\,((1-2)(1-2^2)(1-2^3))^{24})\\ (-i\,(312.388^2 \times 9.83114))\,(2\,((1-2)(1-2^2)(1-2^3))^{24})) =\\ 10 \log(a) \log_a(-39.3246\, i\,(-312.388)^2\,((-21)^{24})^2\,312.388^2)$$

$$10 \log(((-312.388)^2\, 2\,((1-2)(1-2^2)(1-2^3))^{24})\\ (-i\,(312.388^2 \times 9.83114))\,(2\,((1-2)(1-2^2)(1-2^3))^{24})) =\\ -10\,\mathrm{Li}_1(1 + 39.3246\, i\,(-312.388)^2\,((-21)^{24})^2\,312.388^2)$$

Series representations:

$$10\log(((-312.388)^2\,2\,((1-2)(1-2^2)(1-2^3))^{24})(-i\,(312.388^2\times 9.83114))(2\,((1-2)(1-2^2)(1-2^3))^{24}))=10\log(-1-1.0964\times 10^{75}\,i)-10\sum_{k=1}^{\infty}\frac{(-1)^k\,(-1-1.0964\times 10^{75}\,i)^{-k}}{k}$$

$$10\log(((-312.388)^2\,2\,((1-2)(1-2^2)(1-2^3))^{24})(-i\,(312.388^2\times 9.83114))(2\,((1-2)(1-2^2)(1-2^3))^{24}))=20\,\pi\,\mathcal{A}\left\lfloor\frac{\arg(-1.0964\times 10^{75}\,i-x)}{2\,\pi}\right\rfloor+10\log(x)-10\sum_{k=1}^{\infty}\frac{(-1)^k\,(-1.0964\times 10^{75}\,i-x)^k\,x^{-k}}{k}\quad\text{for } x<0$$

$$10\log(((-312.388)^2\,2\,((1-2)(1-2^2)(1-2^3))^{24})(-i\,(312.388^2\times 9.83114))(2\,((1-2)(1-2^2)(1-2^3))^{24}))=10\left\lfloor\frac{\arg(-1.0964\times 10^{75}\,i-z_0)}{2\,\pi}\right\rfloor\log\left(\frac{1}{z_0}\right)+10\log(z_0)+10\left\lfloor\frac{\arg(-1.0964\times 10^{75}\,i-z_0)}{2\,\pi}\right\rfloor\log(z_0)-10\sum_{k=1}^{\infty}\frac{(-1)^k\,(-1.0964\times 10^{75}\,i-z_0)^k\,z_0^{-k}}{k}$$

Integral representations:

$$10\log(((-312.388)^2\,2\,((1-2)(1-2^2)(1-2^3))^{24})(-i\,(312.388^2\times 9.83114))(2\,((1-2)(1-2^2)(1-2^3))^{24}))=10\int_1^{-1.0964\times 10^{75}\,i}\frac{1}{t}\,dt$$

$$10\log(((-312.388)^2\,2\,((1-2)(1-2^2)(1-2^3))^{24})(-i\,(312.388^2\times 9.83114))(2\,((1-2)(1-2^2)(1-2^3))^{24}))=\frac{5}{\pi\,\mathcal{A}}\int_{-\mathcal{A}\infty+\gamma}^{\mathcal{A}\infty+\gamma}\frac{(-1-1.0964\times 10^{75}\,i)^{-s}\,\Gamma(-s)^2\,\Gamma(1+s)}{\Gamma(1-s)}\,ds\quad\text{for } -1<\gamma<0$$

((((10*ln[((((-312.388^2*9.83114i)*2((1-2)(1-2^2)(1-2^3))^24)))*((((-312.388)^2*2((1-2)(1-2^2)(1-2^3))^24)))]))))^1/15

Input interpretation:

$$(10\log(((312.388^2\,i\times(-9.83114))\times 2\,((1-2)(1-2^2)(1-2^3))^{24})((-312.388)^2\times 2\,((1-2)(1-2^2)(1-2^3))^{24})))\,\hat{}\,(1/15)$$

$\log(x)$ is the natural logarithm

i is the imaginary unit

Result:

1.64374712... −
0.000996192773... i

Polar coordinates:

$r = 1.64375$ (radius), $\theta = -0.0347241°$ (angle)

$1.64375\ldots \approx \zeta(2) = \frac{\pi^2}{6} = 1.644934\ldots$

From:

Topics in Analytic Number Theory - Authors: *Rademacher, Hans* - © 1973

We have the following equation:

$$|R_N| < \frac{\sqrt{2}}{\pi} \sum_{N+1}^{\infty} k^{5/4} \left| \frac{d}{dn} \frac{\sinh \frac{C}{k} \lambda_n}{\lambda_n} \right|$$

$$= \frac{\sqrt{2}}{\pi} \sum_{N+1}^{\infty} k^{5/4} \frac{d}{dn} \sum_{\nu=0}^{\infty} \frac{\left(\frac{C}{k}\right)^{2\nu+1} \left(n - \frac{1}{24}\right)^{\nu}}{(2\nu+1)!}$$

$$= \frac{\sqrt{2}}{\pi} \frac{N^{9/4}}{\lambda_n^3} \left\{ \frac{10}{99} \left(\frac{C\lambda_n}{N}\right)^3 + \frac{8}{11} \left(\sinh \frac{C\lambda_n}{N} - \frac{C\lambda_n}{N}\right) \right\}.$$

(pag.274-276)

$$C = \pi \sqrt{2/3}$$

$$\lambda_n = \sqrt{n - \frac{1}{24}}, \qquad K = \frac{\pi}{k} \sqrt{\frac{2}{3}}$$

$$k \leq N$$

Let us take in particular

$$N = \left[2\sqrt{n}/3\right] \tag{121.5}$$

and consider only $n \geqq 24^2 = 576$, since $p(n)$ is tabulated for $n \leqq 600$ (MacMahon [38], Gupta [15]). We have under these conditions

$$\frac{3}{2} \leqq \frac{\sqrt{n}}{N} \leqq \frac{8}{5}, \quad \frac{\sqrt{n-1}}{N} \geqq \frac{15}{48}\sqrt{23}, \quad \frac{N+1}{\sqrt{n-1}} \leqq \frac{17}{5\sqrt{23}}.$$

From:

$$|R_N| < \frac{\sqrt{2}}{\pi} \sum_{N+1}^{\infty} k^{5/4} \left| \frac{d}{dn} \frac{\sinh \frac{C}{k}\lambda_n}{\lambda_n} \right|$$

$$= \frac{\sqrt{2}}{\pi} \sum_{N+1}^{\infty} k^{5/4} \frac{d}{dn} \sum_{\nu=0}^{\infty} \frac{\left(\frac{C}{k}\right)^{2\nu+1} \left(n - \frac{1}{24}\right)^{\nu}}{(2\nu+1)!}$$

$$= \frac{\sqrt{2}}{\pi} \frac{N^{9/4}}{\lambda_n^3} \left\{ \frac{10}{99} \left(\frac{C\lambda_n}{N}\right)^3 + \frac{8}{11} \left(\sinh \frac{C\lambda_n}{N} - \frac{C\lambda_n}{N}\right) \right\}.$$

For:

$$C = \pi\sqrt{2/3}$$

$$\lambda_n = \sqrt{n - \frac{1}{24}}$$

$$\left\{ N = \left[2\sqrt{n}/3\right] \right\} = 16 \qquad \left(n \geqq 24^2 = 576 \quad N + 1 = 17 \right)$$

We know that (sequence OEIS A000041):

p(576)= 134003339931725153597473

from the above equation

$$\frac{\sqrt{2}}{\pi}\frac{N^{9/4}}{\lambda_n^3}\left\{\frac{10}{99}\left(\frac{C\lambda_n}{N}\right)^3+\frac{8}{11}\left(\sinh\frac{C\lambda_n}{N}-\frac{C\lambda_n}{N}\right)\right\}$$

we obtain:

sqrt2/Pi * 16^(9/4) / (sqrt(576-1/24))^3*[((10/99((((Pi*sqrt(2/3)*(sqrt(576-1/24))/16))))^3+8/11((((((sinh(((Pi*sqrt(2/3))(sqrt(576-1/24))/16)))-((Pi*sqrt(2/3))sqrt(576-1/24))/16)))))))]

Input:

$$\frac{\sqrt{2}}{\pi}\times\frac{16^{9/4}}{\sqrt{576-\frac{1}{24}}^3}\left(\frac{10}{99}\left(\pi\sqrt{\frac{2}{3}}\left(\frac{1}{16}\sqrt{576-\frac{1}{24}}\right)\right)^3+\frac{8}{11}\left(\sinh\left(\left(\pi\sqrt{\frac{2}{3}}\right)\left(\frac{1}{16}\sqrt{576-\frac{1}{24}}\right)\right)-\frac{1}{16}\left(\left(\pi\sqrt{\frac{2}{3}}\right)\sqrt{576-\frac{1}{24}}\right)\right)\right)$$

$\sinh(x)$ is the hyperbolic sine function

Exact result:

$$\frac{49\,152\sqrt{\frac{3}{13\,823}}\left(\frac{69\,115\sqrt{13\,823}\,\pi^3}{43\,794\,432}+\frac{8}{11}\left(\sinh\left(\frac{\sqrt{13\,823}\,\pi}{96}\right)-\frac{\sqrt{13\,823}\,\pi}{96}\right)\right)}{13\,823\,\pi}$$

Decimal approximation:

0.333371256971778445271446116998556334523759081116569981866...

0.3333712569717784……..

Alternate forms:

$$\frac{\frac{13\,823\,\pi\left(69\,115\,\pi^2-331\,776\right)}{\sqrt{3}}+10\,616\,832\sqrt{41\,469}\,\sinh\left(\frac{\sqrt{13\,823}\,\pi}{96}\right)}{56\,749\,372\,713\,\pi}$$

$$\frac{-331\,776\sqrt{13\,823}\,\pi+69\,115\sqrt{13\,823}\,\pi^3+31\,850\,496\sinh\left(\frac{\sqrt{13\,823}\,\pi}{96}\right)}{4\,105\,431\sqrt{41\,469}\,\pi}$$

$$\frac{-331\,776\sqrt{41\,469}\,\pi+69\,115\sqrt{41\,469}\,\pi^3+31\,850\,496\sqrt{3}\,\sinh\left(\frac{\sqrt{13\,823}\,\pi}{96}\right)}{12\,316\,293\sqrt{13\,823}\,\pi}$$

Alternative representations:

$$\frac{1}{\sqrt{576-\frac{1}{24}}^{3}\pi}\left(16^{9/4}\left(\frac{10}{99}\left(\frac{1}{16}\pi\sqrt{\frac{2}{3}}\sqrt{576-\frac{1}{24}}\right)^{3}+\frac{8}{11}\left(\sinh\left(\frac{1}{16}\left(\pi\sqrt{\frac{2}{3}}\right)\sqrt{576-\frac{1}{24}}\right)-\frac{1}{16}\left(\pi\sqrt{\frac{2}{3}}\right)\sqrt{576-\frac{1}{24}}\right)\right)\sqrt{2}=\frac{1}{\pi\sqrt{576-\frac{1}{24}}^{3}}16^{9/4}\sqrt{2}\left(\frac{10}{99}\left(\frac{1}{16}\pi\sqrt{\frac{2}{3}}\sqrt{576-\frac{1}{24}}\right)^{3}+\frac{8}{11}\left(\frac{1}{2}\left(-e^{-1/16\pi\sqrt{2/3}\sqrt{576-1/24}}+e^{1/16\pi\sqrt{2/3}\sqrt{576-1/24}}\right)-\frac{1}{16}\pi\sqrt{\frac{2}{3}}\sqrt{576-\frac{1}{24}}\right)\right)$$

$$\frac{1}{\sqrt{576-\frac{1}{24}}^{3}\pi}\left(16^{9/4}\left(\frac{10}{99}\left(\frac{1}{16}\pi\sqrt{\frac{2}{3}}\sqrt{576-\frac{1}{24}}\right)^{3}+\frac{8}{11}\left(\sinh\left(\frac{1}{16}\left(\pi\sqrt{\frac{2}{3}}\right)\sqrt{576-\frac{1}{24}}\right)-\frac{1}{16}\left(\pi\sqrt{\frac{2}{3}}\right)\sqrt{576-\frac{1}{24}}\right)\right)\sqrt{2}=\frac{1}{\pi\sqrt{576-\frac{1}{24}}^{3}}16^{9/4}\sqrt{2}\left(\frac{10}{99}\left(\frac{1}{16}\pi\sqrt{\frac{2}{3}}\sqrt{576-\frac{1}{24}}\right)^{3}+\frac{8}{11}\left(i\cosh\left(\frac{i\pi}{2}-\frac{1}{16}\pi\sqrt{\frac{2}{3}}\sqrt{576-\frac{1}{24}}\right)-\frac{1}{16}\pi\sqrt{\frac{2}{3}}\sqrt{576-\frac{1}{24}}\right)\right)$$

$$\frac{1}{\sqrt{576-\frac{1}{24}}^{3}\pi}\left(16^{9/4}\left(\frac{10}{99}\left(\frac{1}{16}\pi\sqrt{\frac{2}{3}}\sqrt{576-\frac{1}{24}}\right)^{3}+\frac{8}{11}\left(\sinh\left(\frac{1}{16}\left(\pi\sqrt{\frac{2}{3}}\right)\sqrt{576-\frac{1}{24}}\right)-\frac{1}{16}\left(\pi\sqrt{\frac{2}{3}}\right)\sqrt{576-\frac{1}{24}}\right)\right)\sqrt{2}=\frac{1}{\pi\sqrt{576-\frac{1}{24}}^{3}}16^{9/4}\sqrt{2}\left(\frac{10}{99}\left(\frac{1}{16}\pi\sqrt{\frac{2}{3}}\sqrt{576-\frac{1}{24}}\right)^{3}+\frac{8}{11}\left(-i\cosh\left(\frac{i\pi}{2}+\frac{1}{16}\pi\sqrt{\frac{2}{3}}\sqrt{576-\frac{1}{24}}\right)-\frac{1}{16}\pi\sqrt{\frac{2}{3}}\sqrt{576-\frac{1}{24}}\right)\right)$$

$\cosh(x)$ is the hyperbolic cosine function

i is the imaginary unit

Series representations:

$$\frac{1}{\sqrt{576-\frac{1}{24}}^{3}\pi}\left(16^{9/4}\left(\frac{10}{99}\left(\frac{1}{16}\pi\sqrt{\frac{2}{3}}\sqrt{576-\frac{1}{24}}\right)^{3}+\frac{8}{11}\left(\sinh\left(\frac{1}{16}\left(\pi\sqrt{\frac{2}{3}}\right)\sqrt{576-\frac{1}{24}}\right)-\frac{1}{16}\left(\pi\sqrt{\frac{2}{3}}\right)\sqrt{576-\frac{1}{24}}\right)\right)\sqrt{2}\right)=$$

$$-\frac{4096\sqrt{3}}{152053}+\frac{5\pi^2}{297\sqrt{3}}+\frac{393216\sqrt{\frac{3}{13823}}\sum_{k=0}^{\infty}\frac{96^{-1-2k}\times 13823^{1/2+k}\pi^{1+2k}}{(1+2k)!}}{152053\pi}$$

$$\frac{1}{\sqrt{576-\frac{1}{24}}^{3}\pi}\left(16^{9/4}\left(\frac{10}{99}\left(\frac{1}{16}\pi\sqrt{\frac{2}{3}}\sqrt{576-\frac{1}{24}}\right)^{3}+\frac{8}{11}\left(\sinh\left(\frac{1}{16}\left(\pi\sqrt{\frac{2}{3}}\right)\sqrt{576-\frac{1}{24}}\right)-\frac{1}{16}\left(\pi\sqrt{\frac{2}{3}}\right)\sqrt{576-\frac{1}{24}}\right)\right)\sqrt{2}\right)=$$

$$-\frac{4096\sqrt{3}}{152053}+\frac{5\pi^2}{297\sqrt{3}}+\frac{786432\sqrt{\frac{3}{13823}}\sum_{k=0}^{\infty}I_{1+2k}\left(\frac{\sqrt{13823}\,\pi}{96}\right)}{152053\pi}$$

$$\frac{1}{\sqrt{576-\frac{1}{24}}^{3}\pi}\left(16^{9/4}\left(\frac{10}{99}\left(\frac{1}{16}\pi\sqrt{\frac{2}{3}}\sqrt{576-\frac{1}{24}}\right)^{3}+\frac{8}{11}\left(\sinh\left(\frac{1}{16}\left(\pi\sqrt{\frac{2}{3}}\right)\sqrt{576-\frac{1}{24}}\right)-\frac{1}{16}\left(\pi\sqrt{\frac{2}{3}}\right)\sqrt{576-\frac{1}{24}}\right)\right)\sqrt{2}\right)=$$

$$-\frac{4096\sqrt{3}}{152053}+\frac{5\pi^2}{297\sqrt{3}}+\frac{786432\sqrt{\frac{3}{13823}}\sum_{k=0}^{\infty}I_{1+2k}\left(\frac{1}{96}\right)T_{1+2k}\left(\sqrt{13823}\,\pi\right)}{152053\pi}$$

$n!$ is the factorial function

$I_n(z)$ is the modified Bessel function of the first kind

$T_n(x)$ is the Chebyshev polynomial of the first kind

Integral representations:

$$\frac{1}{\sqrt{576-\frac{1}{24}}^{3}\pi}\left(16^{9/4}\left(\frac{10}{99}\left(\frac{1}{16}\pi\sqrt{\frac{2}{3}}\sqrt{576-\frac{1}{24}}\right)^{3}+\frac{8}{11}\left(\sinh\left(\frac{1}{16}\left(\pi\sqrt{\frac{2}{3}}\right)\sqrt{576-\frac{1}{24}}\right)-\frac{1}{16}\left(\pi\sqrt{\frac{2}{3}}\right)\sqrt{576-\frac{1}{24}}\right)\right)\sqrt{2}\right)=$$

$$-\frac{4096\sqrt{3}}{152053}+\frac{5\pi^2}{297\sqrt{3}}+\frac{4096\sqrt{3}}{152053}\int_0^1\cosh\left(\frac{1}{96}\sqrt{13823}\,\pi t\right)dt$$

$$\frac{1}{\sqrt{576-\frac{1}{24}}^{3}\,\pi}\left(16^{9/4}\left(\frac{10}{99}\left(\frac{1}{16}\,\pi\sqrt{\frac{2}{3}}\,\sqrt{576-\frac{1}{24}}\right)^{3}+\frac{8}{11}\left(\sinh\left(\frac{1}{16}\left(\pi\sqrt{\frac{2}{3}}\right)\sqrt{576-\frac{1}{24}}\right)-\frac{1}{16}\left(\pi\sqrt{\frac{2}{3}}\right)\sqrt{576-\frac{1}{24}}\right)\right)\right)\sqrt{2}\;=$$

$$-\frac{4096\sqrt{3}}{152053}+\frac{5\pi^2}{297\sqrt{3}}-\frac{1024\,i\sqrt{\frac{3}{\pi}}}{152053}\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{e^{(13823\,\pi^2)/(36864\,s)+s}}{s^{3/2}}\,ds\quad\text{for}\ \gamma>0$$

From

and we see that the error term in (121.4) under these conditions is in absolute value less than

$$N^{-3/4}\cdot 3.3106 < 1/2 \quad \text{for } n \geqq 576\,, \tag{121.6}$$

We obtain:

16^(-3/4)*x =
(0.33337125697177844527144611699855633452375908111656998186 6)

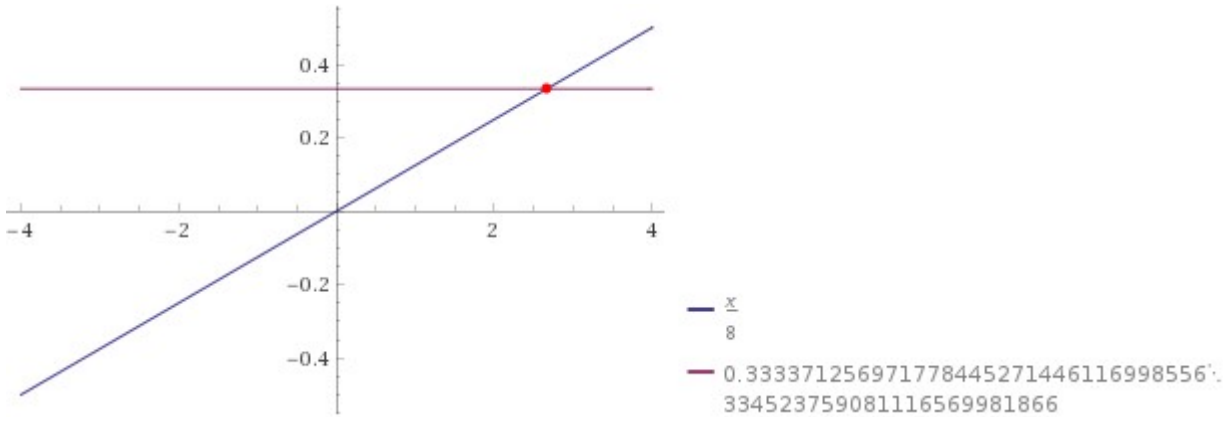
Input interpretation:

$16^{-3/4}\,x = 0.33337125697177844527144611699855633452375908111656998186 6$

Result:

$\frac{x}{8} = 0.33337125697177844527144611699855633452375908111656998186 6$

Plot:



Alternate form:

$$\frac{x}{8} - 0.333371256971778445271446116998556334523759081116569981866 = 0$$

Solution:

$$x \approx 2.666970055774227562171568935988450676190072648932559854 93$$

2.66697005577…..

and 0.3333712569717… < 1/2

Thence:

(pag. 278)

$$p(n) = \frac{1}{2\pi\sqrt{2}} \frac{d}{dn} \frac{\exp C\lambda_n}{\lambda_n} + O\left(\frac{\exp \frac{C}{2}\lambda_n}{n}\right)$$

we obtain:

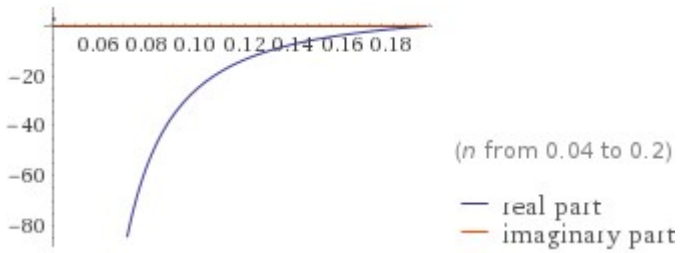
exp((((Pi*sqrt(2/3)*(sqrt(576-1/24))*1/((sqrt(576-1/24))

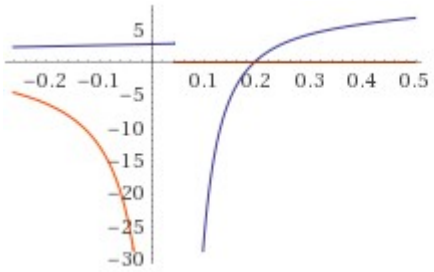
partial derivative [exp((((Pi*sqrt(2/3)*(sqrt(n-1/24))))))*1/((sqrt(n-1/24)))]

Derivative:

$$\frac{d}{dn}\left(\frac{\exp\left(\pi\sqrt{\frac{2}{3}}\sqrt{n-\frac{1}{24}}\right)}{\sqrt{n-\frac{1}{24}}}\right) = \frac{\pi e^{\sqrt{2/3}\,\pi\sqrt{n-1/24}}}{\sqrt{6}\left(n-\frac{1}{24}\right)} - \frac{e^{\sqrt{2/3}\,\pi\sqrt{n-1/24}}}{2\left(n-\frac{1}{24}\right)^{3/2}}$$

Plots:





Alternate forms:

$$\frac{4\sqrt{6}\ e^{1/6\pi\sqrt{24n-1}}\left(\pi(24n-1)^{3/2}-144n+6\right)}{(24n-1)^{5/2}}$$

$$e^{1/6\pi\sqrt{24n-1}}\left(\frac{4\sqrt{6}\ \pi}{24n-1}-\frac{24\sqrt{6}}{(24n-1)^{3/2}}\right)$$

$$\frac{4\sqrt{6}\ \pi e^{1/6\pi\sqrt{24n-1}}}{24n-1}-\frac{24\sqrt{6}\ e^{1/6\pi\sqrt{24n-1}}}{(24n-1)^{3/2}}$$

Root:

$$n=\frac{1}{24}+\frac{3}{2\pi^2}$$

Series expansion at n = 0:

$$\begin{cases} 4(-1)^{5/6}\sqrt{6}\ (\pi+-6i)-8\left(\sqrt[3]{-1}\ \sqrt{6}\ \left(-108-18i\pi+\pi^2\right)\right)n+ & \mathrm{Im}(n)<0 \\ \quad 8\sqrt[3]{-1}\ \sqrt{6}\ \left(3240+540i\pi-36\pi^2-i\pi^3\right)n^2+8\sqrt{\frac{2}{3}}\ \left(1+i\sqrt{3}\right) \\ \quad \left(136\,080+22\,680i\pi-1620\pi^2-60i\pi^3+\pi^4\right)n^3+8(-1)^{5/6}\sqrt{\frac{2}{3}} \\ \quad \left(-7\,348\,320i+1\,224\,720\pi+90\,720i\pi^2-3780\pi^3-90i\pi^4+\pi^5\right)n^4+ \\ \quad \frac{16}{5}(-1)^{5/6}\sqrt{\frac{2}{3}}\ \left(-484\,989\,120i+80\,831\,520\pi+6\,123\,600i\pi^2-\right. \\ \qquad \left.272\,160\pi^3-7560i\pi^4+126\pi^5+i\pi^6\right)n^5+O\left(n^6\right) \\ -4\left(\sqrt[6]{-1}\ \sqrt{6}\ (\pi+6i)\right)+8(-1)^{2/3}\sqrt{6}\ \left(-108+18i\pi+\pi^2\right)n+ & \text{(otherwise)} \\ \quad 8\sqrt[6]{-1}\ \sqrt{6}\ \left(-3240i-540\pi+36i\pi^2+\pi^3\right)n^2+16\sqrt[6]{-1}\ \sqrt{\frac{2}{3}} \\ \quad \left(-136\,080i-22\,680\pi+1620i\pi^2+60\pi^3-i\pi^4\right)n^3-8\left(\sqrt[6]{-1}\ \sqrt{\frac{2}{3}}\right. \\ \qquad \left.\left(7\,348\,320i+1\,224\,720\pi-90\,720i\pi^2-3780\pi^3+90i\pi^4+\pi^5\right)\right) \\ \quad n^4+\frac{16}{5}(-1)^{2/3}\sqrt{\frac{2}{3}}\ \left(-484\,989\,120+80\,831\,520i\pi+\right. \\ \qquad \left.6\,123\,600\pi^2-272\,160i\pi^3-7560\pi^4+126i\pi^5+\pi^6\right)n^5+O\left(n^6\right) \end{cases}$$

Im(z) is the imaginary part of z

Big-O notation »

Series expansion at n = ∞:

$$e^{\sqrt{2/3}\,\pi\sqrt{n}}\left(\frac{\pi}{\sqrt{6}\,n}-\frac{1}{2}\left(\frac{1}{n}\right)^{3/2}+\frac{\pi\left(\sqrt{6}-\sqrt{n}\,\pi\right)}{144\,n^2}+\frac{1}{288}\left(\sqrt{6}\,\sqrt{n}\,\pi-9\right)\left(\frac{1}{n}\right)^{5/2}+\frac{\pi\left(\sqrt{6}\,\pi^2\,n-15\,\pi\sqrt{n}+12\sqrt{6}\right)}{41\,472\,n^3}+\frac{\left(-2\,\pi^2\,n+7\sqrt{6}\,\pi\sqrt{n}-45\right)\left(\frac{1}{n}\right)^{7/2}}{27\,648}+\frac{\pi\left(-2\,\pi^3\,n^{3/2}+9\sqrt{6}\,\pi^2\,n-99\,\pi\sqrt{n}+72\sqrt{6}\right)}{5\,971\,968\,n^4}+\frac{\left(2\sqrt{6}\,\pi^3\,n^{3/2}-72\,\pi^2\,n+171\sqrt{6}\,\pi\sqrt{n}-945\right)\left(\frac{1}{n}\right)^{9/2}}{11\,943\,936}+\frac{\pi\left(2\sqrt{6}\,\pi^4\,n^2-84\,\pi^3\,n^{3/2}+261\sqrt{6}\,\pi^2\,n-2511\,\pi\sqrt{n}+1728\sqrt{6}\right)}{3\,439\,853\,568\,n^5}+\frac{\left(-4\,\pi^4\,n^2+36\sqrt{6}\,\pi^3\,n^{3/2}-846\,\pi^2\,n+1683\sqrt{6}\,\pi\sqrt{n}-8505\right)\left(\frac{1}{n}\right)^{11/2}}{2\,293\,235\,712}+O\left(\left(\frac{1}{n}\right)^6\right)\right)$$

Big-O notation »

Indefinite integral:

$$\int\frac{4\sqrt{6}\;e^{1/6\sqrt{-1+24\,n}\,\pi}\left(-6+\sqrt{-1+24\,n}\,\pi\right)}{(-1+24\,n)^{3/2}}\,dn=\frac{2\,e^{1/6\pi\sqrt{24\,n-1}}}{\sqrt{4\,n-\frac{1}{6}}}+\text{constant}$$

From

$$\frac{4\sqrt{6}\;e^{1/6\pi\sqrt{24\,n-1}}\left(\pi\,(24\,n-1)^{3/2}-144\,n+6\right)}{(24\,n-1)^{5/2}}$$

For n = 576, we obtain:

(4 sqrt(6) e^(1/6 π sqrt(24 *576 - 1)) (π (24 *576 - 1)^(3/2) - 144 *576 + 6))/(24 *576 - 1)^(5/2)

Input:

$$\frac{4\sqrt{6}\;e^{1/6\pi\sqrt{24\times576-1}}\left(\pi\,(24\times576-1)^{3/2}-144\times576+6\right)}{(24\times576-1)^{5/2}}$$

Exact result:

$$\frac{4\sqrt{\frac{6}{13823}}\; e^{\left(\sqrt{13823}\;\pi\right)/6}\left(13823\sqrt{13823}\;\pi-82938\right)}{191075329}$$

Decimal approximation:

$1.190722305277759232079579196111257631740515398545070\ldots\times 10^{24}$

$1.19072230527\ldots.*10^{24}$

Alternate forms:

$$\frac{4\sqrt{\frac{6}{13823}}\; e^{\left(\sqrt{13823}\;\pi\right)/6}\left(\sqrt{13823}\;\pi-6\right)}{13823}$$

$$e^{\left(\sqrt{13823}\;\pi\right)/6}\left(\frac{4\sqrt{6}\;\pi}{13823}-\frac{24\sqrt{\frac{6}{13823}}}{13823}\right)$$

$$\frac{4\sqrt{6}\; e^{\left(\sqrt{13823}\;\pi\right)/6}\,\pi}{13823}-\frac{24\sqrt{\frac{6}{13823}}\; e^{\left(\sqrt{13823}\;\pi\right)/6}}{13823}$$

Series representations:

$$\frac{4\left(\sqrt{6}\; e^{1/6\,\pi\sqrt{24\times 576-1}}\left(\pi\,(24\times 576-1)^{3/2}-144\times 576+6\right)\right)}{(24\times 576-1)^{5/2}}=$$

$$-\frac{4\, e^{1/6\,\pi\sqrt{13822}\;\sum_{k=0}^{\infty}13822^{-k}\binom{1/2}{k}}\left(6\sqrt{13823}-13823\,\pi\right)\sqrt{5}\;\sum_{k=0}^{\infty}5^{-k}\binom{\frac{1}{2}}{k}}{191075329}$$

$$\frac{4\left(\sqrt{6}\; e^{1/6\,\pi\sqrt{24\times 576-1}}\left(\pi\,(24\times 576-1)^{3/2}-144\times 576+6\right)\right)}{(24\times 576-1)^{5/2}}=$$

$$-\frac{1}{191075329}\,4\exp\left(\frac{1}{6}\,\pi\sqrt{13822}\;\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{13822}\right)^{k}\left(-\frac{1}{2}\right)_{k}}{k!}\right)$$

$$\left(6\sqrt{13823}-13823\,\pi\right)\sqrt{5}\;\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{5}\right)^{k}\left(-\frac{1}{2}\right)_{k}}{k!}$$

$$\frac{4\left(\sqrt{6}\ e^{1/6\,\pi\sqrt{24\times 576-1}}\left(\pi\,(24\times 576-1)^{3/2}-144\times 576+6\right)\right)}{(24\times 576-1)^{5/2}}=$$

$$-\frac{1}{191\,075\,329}\,4\exp\left(\frac{1}{6}\,\pi\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(13\,823-z_0)^k\,z_0^{-k}}{k!}\right)$$

$$\left(6\sqrt{13\,823}-13\,823\,\pi\right)\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(6-z_0)^k\,z_0^{-k}}{k!}$$

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

In conclusion, we obtain:

1/(2Pi*sqrt2)*(1.190722305277759232079579196111257631740515398545070 0 × 10^24) + 0.333371256971778445271446116998556334523759081116569981866

Input interpretation:

$$\frac{1}{2\,\pi\sqrt{2}}\times 1.190722305277759232079579196111257631740515398545070 0\times 10^{24}+0.333371256971778445271446116998556334523759081116569981866$$

Result:

$1.340033399317211562343466492909449090138660107926855 9\ldots\times 10^{23}$

$1340033399317211562343466492909449090138660107926855 9\ldots\times 10^{23}$

1340033399317211562343466.64929 = $1.3400333993*10^{23}$

And

p(576)= 1340033399317251535974 73 = $1.3400333993172515359747 3\times 10^{23}$

From:

Let us call $p_d(N)$ the number of partitions of N when we have a d-fold degeneracy. This means, for example, that the partition $\{3,2,1\}$ of 6 now gives rise to many partitions written like $\{3_{p_1}, 2_{p_2}, 1_{p_3}\}$, where we include subscripts p_i that can take all possible values from one to d. A partition with different subscripts is considered a different partition. We now see that, for a given energy, with associated number N, the number of states is $p_d(N)$. Therefore $S_d = k \ln p_d(N)$, and comparing with (16.2.39) we conclude that for large N

$$\ln p_d(N) \simeq 2\pi\sqrt{\frac{Nd}{6}}\,. \tag{16.2.40}$$

The more accurate version of this result can be shown to be

$$p_d(N) \simeq \frac{1}{\sqrt{2}}\left(\frac{d}{24}\right)^{(d+1)/4} N^{-(d+3)/4} \exp\left(2\pi\sqrt{\frac{Nd}{6}}\right). \tag{16.2.41}$$

You can see that for $d = 1$ this reduces to $p(N)$, as given in (16.2.31). For $d = 24$, the number of transverse light-cone directions in the bosonic string, the expression simplifies a little:

$$\boxed{p_{24}(N) \simeq \frac{1}{\sqrt{2}} N^{-27/4} \exp\left(4\pi\sqrt{N}\right).} \tag{16.2.42}$$

From the eq.(16.2.42), for n = 576, we obtain:

1/(sqrt2) * 576^(-27/4) * exp(4Pi*sqrt576)

Input:

$$\frac{1}{\sqrt{2}} \times 576^{-27/4} \exp\left(4\pi\sqrt{576}\right)$$

Exact result:

$$\frac{e^{96\pi}}{3\,505\,953\,353\,861\,431\,296\sqrt{3}}$$

Decimal approximation:

$1.57312490939170338528307880844418590493369004949368 72\ldots \times 10^{112}$

$1.5731249093917\ldots.*10^{112}$

Property:

$\frac{e^{96\pi}}{3505\,953\,353\,861\,431\,296\sqrt{3}}$ is a transcendental number

Series representations:

$$\frac{576^{-27/4}\exp\left(4\pi\sqrt{576}\right)}{\sqrt{2}} = \frac{\exp\left(4\pi\sqrt{z_0}\ \sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k (576-z_0)^k z_0^{-k}}{k!}\right)}{1\,752\,976\,676\,930\,715\,648\sqrt{6}\ \sqrt{z_0}\ \sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k (2-z_0)^k z_0^{-k}}{k!}}$$

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

$$\frac{576^{-27/4}\exp\left(4\pi\sqrt{576}\right)}{\sqrt{2}} = \frac{\exp\left(4\pi\exp\left(i\pi\left\lfloor\frac{\arg(576-x)}{2\pi}\right\rfloor\right)\sqrt{x}\ \sum_{k=0}^{\infty}\frac{(-1)^k (576-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)}{1\,752\,976\,676\,930\,715\,648\sqrt{6}\ \exp\left(i\pi\left\lfloor\frac{\arg(2-x)}{2\pi}\right\rfloor\right)\sqrt{x}\ \sum_{k=0}^{\infty}\frac{(-1)^k (2-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}}$$

for $(x \in \mathbb{R} \text{ and } x < 0)$

$$\frac{576^{-27/4}\exp\left(4\pi\sqrt{576}\right)}{\sqrt{2}} = \left(\exp\left(4\pi\left(\frac{1}{z_0}\right)^{1/2\lfloor\arg(576-z_0)/(2\pi)\rfloor} z_0^{1/2(1+\lfloor\arg(576-z_0)/(2\pi)\rfloor)}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k (576-z_0)^k z_0^{-k}}{k!}\right)\left(\frac{1}{z_0}\right)^{-1/2\lfloor\arg(2-z_0)/(2\pi)\rfloor} z_0^{-1/2-1/2\lfloor\arg(2-z_0)/(2\pi)\rfloor}\right)\Big/\left(1\,752\,976\,676\,930\,715\,648\sqrt{6}\ \sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k (2-z_0)^k z_0^{-k}}{k!}\right)$$

The ratio between the two results is:

(((1/(sqrt2) * 576^(-27/4) * exp(4Pi*sqrt576))))/134003339931725153597473

Input:

$$\frac{\frac{1}{\sqrt{2}}\times 576^{-27/4}\exp\left(4\pi\sqrt{576}\right)}{134\,003\,339\,931\,725\,153\,597\,473}$$

Exact result:

$$\frac{e^{96\pi}}{469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008\sqrt{3}}$$

Decimal approximation:

$1.173944552571012204174739391281749462611226817736048 7\ldots \times 10^{89}$

$1.173944552571\ldots.*10^{89}$

Property:

$$\frac{e^{96\pi}}{469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008\sqrt{3}}$$

is a transcendental number

Series representations:

$$\frac{576^{-27/4}\exp\left(4\pi\sqrt{576}\right)}{134\,003\,339\,931\,725\,153\,597\,473\sqrt{2}} = \exp\left(4\pi\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(576-z_0)^k z_0^{-k}}{k!}\right)\Bigg/$$
$$\left(234\,904\,729\,531\,132\,632\,057\,607\,513\,628\,119\,614\,357\,504\sqrt{6}\sqrt{z_0}\right.$$
$$\left.\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k z_0^{-k}}{k!}\right) \text{ for } (\text{not } (z_0 \in \mathbb{R} \text{ and } -\infty < z_0 \le 0))$$

$$\frac{576^{-27/4}\exp\left(4\pi\sqrt{576}\right)}{134\,003\,339\,931\,725\,153\,597\,473\sqrt{2}} =$$
$$\exp\left(4\pi\exp\left(i\pi\left\lfloor\frac{\arg(576-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(576-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)\Bigg/$$
$$\left(234\,904\,729\,531\,132\,632\,057\,607\,513\,628\,119\,614\,357\,504\sqrt{6}\right.$$
$$\left.\exp\left(i\pi\left\lfloor\frac{\arg(2-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(2-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right) \text{ for } (x \in \mathbb{R} \text{ and } x < 0)$$

$$\frac{576^{-27/4}\,\exp\left(4\pi\sqrt{576}\right)}{134\,003\,339\,931\,725\,153\,597\,473\sqrt{2}} =$$
$$\left(\exp\left(4\pi\left(\frac{1}{z_0}\right)^{1/2\,[\arg(576-z_0)/(2\pi)]}\,z_0^{1/2\,(1+[\arg(576-z_0)/(2\pi)])}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\,(576-z_0)^k\,z_0^{-k}}{k!}\right)\left(\frac{1}{z_0}\right)^{-1/2\,[\arg(2-z_0)/(2\pi)]}\,z_0^{-1/2-1/2\,[\arg(2-z_0)/(2\pi)]}\right)\Big/$$
$$\left(234\,904\,729\,531\,132\,632\,057\,607\,513\,628\,119\,614\,357\,504\,\sqrt{6}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\,(2-z_0)^k\,z_0^{-k}}{k!}\right)$$

From which:

((2(pi - sqrt(3))/2))^2 / ((3+golden ratio^2)) * sqrt[(((1/(sqrt2) * 576^(-27/4) * exp(4Pi*sqrt576))))/134003339931725153597473]

Input:

$$\frac{\left(2\left(\frac{1}{2}\left(\pi-\sqrt{3}\right)\right)\right)^2}{3+\phi^2}\sqrt{\frac{\frac{1}{\sqrt{2}}\times 576^{-27/4}\,\exp\left(4\pi\sqrt{576}\right)}{134\,003\,339\,931\,725\,153\,597\,473}}$$

ϕ is the golden ratio

Exact result:

$$\frac{e^{48\pi}\left(\pi-\sqrt{3}\right)^2}{35\,927\,359\,488\times 3^{3/4}\sqrt{121\,324\,889\,028\,270\,849\,794}\,\left(\phi^2+3\right)}$$

Decimal approximation:

$1.21170075171232394245607889823430394652355973209771 07\ldots\times 10^{44}$

$1.2117007517\ldots*10^{44}$ result very near to the value of Planck force 1.2103×10^{44} N

Alternate forms:

$$\frac{e^{48\pi}\left(\sqrt{3}-\pi\right)^2}{17\,963\,679\,744\times 3^{3/4}\sqrt{121\,324\,889\,028\,270\,849\,794}\,\left(9+\sqrt{5}\right)}$$

$$\frac{\sqrt[4]{1127-387\sqrt{5}}\;e^{48\pi}\left(\pi-\sqrt{3}\right)^2}{682\,619\,830\,272\times 6^{3/4}\sqrt{60\,662\,444\,514\,135\,424\,897}}$$

$$\frac{e^{48\pi}\left(\pi-\sqrt{3}\right)^2}{35\,927\,359\,488\times 3^{3/4}\sqrt{121\,324\,889\,028\,270\,849\,794}\left(3+\frac{1}{4}\left(1+\sqrt{5}\right)^2\right)}$$

Series representations:

$$\frac{\sqrt{\frac{576^{-27/4}\exp\left(4\pi\sqrt{576}\right)}{\sqrt{2}\;134003\,339931\,725\,153\,597473}}\left(\frac{2}{2}\left(\pi-\sqrt{3}\right)\right)^2}{3+\phi^2}=$$

$$\frac{1}{3+\phi^2}\sqrt{-1+\frac{\exp\left(4\pi\sqrt{576}\right)}{234\,904\,729\,531\,132\,632\,057\,607\,513\,628\,119\,614\,357\,504\sqrt{6}\;\sqrt{2}}}$$

$$\left(\pi-\sqrt{2}\sum_{k=0}^{\infty}2^{-k}\binom{\frac{1}{2}}{k}\right)^2\sum_{k=0}^{\infty}\binom{\frac{1}{2}}{k}\left(-1+\frac{\exp\left(4\pi\sqrt{576}\right)}{234\,904\,729\,531\,132\,632\,057\,607\,513\,628\,119\,614\,357\,504\sqrt{6}\;\sqrt{2}}\right)^{-k}$$

$$\frac{\sqrt{\frac{576^{-27/4}\exp\left(4\pi\sqrt{576}\right)}{\sqrt{2}\;134003\,339931\,725\,153\,597473}}\left(\frac{2}{2}\left(\pi-\sqrt{3}\right)\right)^2}{3+\phi^2}=$$

$$\frac{1}{3+\phi^2}\sqrt{-1+\frac{\exp\left(4\pi\sqrt{576}\right)}{234\,904\,729\,531\,132\,632\,057\,607\,513\,628\,119\,614\,357\,504\sqrt{6}\;\sqrt{2}}}$$

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

$$\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(-1+\frac{\exp\left(4\pi\sqrt{576}\right)}{234\,904\,729\,531\,132\,632\,057\,607\,513\,628\,119\,614\,357\,504\sqrt{6}\;\sqrt{2}}\right)^{-k}}{k!}$$

$$\frac{\sqrt{\frac{576^{-27/4}\exp\left(4\pi\sqrt{576}\right)}{\sqrt{2}\ 134003339931725153597473}\left(\frac{2}{2}(\pi-\sqrt{3})\right)^2}}{3+\phi^2} =$$

$$\frac{1}{3+\phi^2}\sqrt{z_0}\left(\pi-\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(3-z_0)^k z_0^{-k}}{k!}\right)^2$$

$$\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(\frac{\exp\left(4\pi\sqrt{576}\right)}{234904729531132632057607513628119614357504\sqrt{6}\ \sqrt{2}}-z_0\right)^k z_0^{-k}}{k!}$$

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

We have also:

ln((((((1/(sqrt2) * 576^(-27/4) * exp(4Pi*sqrt576))))/134003339931725153597473)))-76-4

where 76 and 4 are Lucas numbers

Input:

$$\log\left(\frac{\frac{1}{\sqrt{2}}\times 576^{-27/4}\exp\left(4\pi\sqrt{576}\right)}{134003339931725153597473}\right)-76-4$$

$\log(x)$ is the natural logarithm

Exact result:

$$\log\left(\frac{e^{96\pi}}{469809459062265264115215027256239228715008\sqrt{3}}\right)-80$$

Decimal approximation:

125.090442767264040341605322603777300852926696852184756994 4...

125.09044276…. result very near to the Higgs boson mass 125.18 GeV

Alternate forms:

$$-80+96\pi+\log\left(\frac{1}{469809459062265264115215027256239228715008\sqrt{3}}\right)$$

$$-80+96\pi-\frac{\log(3)}{2}-\log(469809459062265264115215027256239228715008)$$

$$-80 + 96\,\pi - 41\,\log(2) - \frac{27\,\log(3)}{2} - 2\,\log(47) - \log(60\,662\,444\,514\,135\,424\,897)$$

Alternative representations:

$$\log\left(\frac{576^{-27/4}\,\exp\left(4\,\pi\,\sqrt{576}\right)}{134\,003\,339\,931\,725\,153\,597\,473\,\sqrt{2}}\right) - 76 - 4 =$$
$$-80 + \log_e\left(\frac{\exp\left(4\,\pi\,\sqrt{576}\right)576^{-27/4}}{134\,003\,339\,931\,725\,153\,597\,473\,\sqrt{2}}\right)$$

$$\log\left(\frac{576^{-27/4}\,\exp\left(4\,\pi\,\sqrt{576}\right)}{134\,003\,339\,931\,725\,153\,597\,473\,\sqrt{2}}\right) - 76 - 4 =$$
$$-80 + \log(a)\,\log_a\left(\frac{\exp\left(4\,\pi\,\sqrt{576}\right)576^{-27/4}}{134\,003\,339\,931\,725\,153\,597\,473\,\sqrt{2}}\right)$$

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

Series representations:

$$\log\left(\frac{576^{-27/4}\,\exp\left(4\,\pi\,\sqrt{576}\right)}{134\,003\,339\,931\,725\,153\,597\,473\,\sqrt{2}}\right) - 76 - 4 =$$
$$-80 + \log\left(-1 + \frac{e^{96\,\pi}}{469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008\,\sqrt{3}}\right) -$$
$$\sum_{k=1}^{\infty} \frac{\left(-\frac{1}{-1+\frac{e^{96\,\pi}}{469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008\,\sqrt{3}}}\right)^k}{k}$$

$$\log\left(\frac{576^{-27/4}\exp\left(4\pi\sqrt{576}\right)}{134\,003\,339\,931\,725\,153\,597\,473\sqrt{2}}\right)-76-4=$$
$$-80+2i\pi\left\lfloor\frac{\arg\left(\frac{e^{96\pi}}{469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008\sqrt{3}}-x\right)}{2\pi}\right\rfloor+\log(x)-$$
$$\sum_{k=1}^{\infty}\frac{(-1)^k\left(\frac{e^{96\pi}}{469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008\sqrt{3}}-x\right)^k x^{-k}}{k}\quad\text{for } x<0$$

$$\log\left(\frac{576^{-27/4}\exp\left(4\pi\sqrt{576}\right)}{134\,003\,339\,931\,725\,153\,597\,473\sqrt{2}}\right)-76-4=$$
$$-80+2i\pi\left\lfloor\frac{\pi-\arg\left(\frac{1}{z_0}\right)-\arg(z_0)}{2\pi}\right\rfloor+\log(z_0)-$$
$$\sum_{k=1}^{\infty}\frac{(-1)^k\left(\frac{e^{96\pi}}{469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008\sqrt{3}}-z_0\right)^k z_0^{-k}}{k}$$

Integral representations:

$$\log\left(\frac{576^{-27/4}\exp\left(4\pi\sqrt{576}\right)}{134\,003\,339\,931\,725\,153\,597\,473\sqrt{2}}\right)-76-4=$$
$$-80+\int_1^{\frac{e^{96\pi}}{469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008\sqrt{3}}}\frac{1}{t}\,dt$$

$$\log\left(\frac{576^{-27/4}\exp\left(4\pi\sqrt{576}\right)}{134\,003\,339\,931\,725\,153\,597\,473\sqrt{2}}\right)-76-4=-80-\frac{i}{2\pi}$$
$$\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{\left(-1+\frac{e^{96\pi}}{469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008\sqrt{3}}\right)^{-s}\Gamma(-s)^2\,\Gamma(1+s)}{\Gamma(1-s)}$$
$$ds\quad\text{for } -1<\gamma<0$$

$\Gamma(x)$ is the gamma function

ln((((((1/(sqrt2) * 576^(-27/4) * exp(4Pi*sqrt576))))/1340033399317251535974 73)))-47-7-11-1/2

where 47, 7 and 11 are Lucas numbers

Input:

$$\log\left(\frac{\frac{1}{\sqrt{2}}\times 576^{-27/4}\exp\left(4\pi\sqrt{576}\right)}{134\,003\,339\,931\,725\,153\,597\,473}\right)-47-7-11-\frac{1}{2}$$

$\log(x)$ is the natural logarithm

Exact result:

$$\log\left(\frac{e^{96\pi}}{469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008\sqrt{3}}\right)-\frac{131}{2}$$

Decimal approximation:

139.590442767264040341605322603777300852926696852184756994 4...

139.59044276…. result practically equal to the rest mass of Pion meson 139.57 MeV

Alternate forms:

$$-\frac{131}{2}+96\pi+\log\left(\frac{1}{469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008\sqrt{3}}\right)$$

$$-\frac{131}{2}+96\pi-\frac{\log(3)}{2}-\log(469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008)$$

$$\frac{1}{2}\left(2\log\left(\frac{e^{96\pi}}{469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008\sqrt{3}}\right)-131\right)$$

Alternative representations:

$$\log\left(\frac{576^{-27/4}\exp\left(4\pi\sqrt{576}\right)}{134\,003\,339\,931\,725\,153\,597\,473\sqrt{2}}\right)-47-7-11-\frac{1}{2}=$$

$$-\frac{131}{2}+\log_e\left(\frac{\exp\left(4\pi\sqrt{576}\right)576^{-27/4}}{134\,003\,339\,931\,725\,153\,597\,473\sqrt{2}}\right)$$

$$\log\left(\frac{576^{-27/4}\exp\left(4\pi\sqrt{576}\right)}{134\,003\,339\,931\,725\,153\,597\,473\sqrt{2}}\right)-47-7-11-\frac{1}{2}=$$
$$-\frac{131}{2}+\log(a)\log_a\left(\frac{\exp\left(4\pi\sqrt{576}\right)576^{-27/4}}{134\,003\,339\,931\,725\,153\,597\,473\sqrt{2}}\right)$$

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

Series representations:

$$\log\left(\frac{576^{-27/4}\exp\left(4\pi\sqrt{576}\right)}{134\,003\,339\,931\,725\,153\,597\,473\sqrt{2}}\right)-47-7-11-\frac{1}{2}=$$
$$-\frac{131}{2}+\log\left(-1+\frac{e^{96\pi}}{469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008\sqrt{3}}\right)-\sum_{k=1}^{\infty}\frac{\left(-\frac{1}{-1+\frac{e^{96\pi}}{469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008\sqrt{3}}}\right)^k}{k}$$

$$\log\left(\frac{576^{-27/4}\exp\left(4\pi\sqrt{576}\right)}{134\,003\,339\,931\,725\,153\,597\,473\sqrt{2}}\right)-47-7-11-\frac{1}{2}=$$
$$-\frac{131}{2}+2i\pi\left\lfloor\frac{\arg\left(\frac{e^{96\pi}}{469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008\sqrt{3}}-x\right)}{2\pi}\right\rfloor+\log(x)-\sum_{k=1}^{\infty}\frac{(-1)^k\left(\frac{e^{96\pi}}{469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008\sqrt{3}}-x\right)^k x^{-k}}{k}\quad\text{for } x<0$$

$$\log\left(\frac{576^{-27/4}\exp\left(4\pi\sqrt{576}\right)}{134\,003\,339\,931\,725\,153\,597\,473\sqrt{2}}\right)-47-7-11-\frac{1}{2}=$$
$$-\frac{131}{2}+2i\pi\left\lfloor\frac{\pi-\arg\left(\frac{1}{z_0}\right)-\arg(z_0)}{2\pi}\right\rfloor+\log(z_0)-\sum_{k=1}^{\infty}\frac{(-1)^k\left(\frac{e^{96\pi}}{469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008\sqrt{3}}-z_0\right)^k z_0^{-k}}{k}$$

$\arg(z)$ is the complex argument

Integral representations:

$$\log\left(\frac{576^{-27/4}\exp\left(4\pi\sqrt{576}\right)}{134\,003\,339\,931\,725\,153\,597\,473\sqrt{2}}\right)-47-7-11-\frac{1}{2}=$$
$$-\frac{131}{2}+\int_1^{\frac{e^{96\pi}}{469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008\sqrt{3}}}\frac{1}{t}\,dt$$

$$\log\left(\frac{576^{-27/4}\exp\left(4\pi\sqrt{576}\right)}{134\,003\,339\,931\,725\,153\,597\,473\sqrt{2}}\right)-47-7-11-\frac{1}{2}=-\frac{131}{2}-\frac{i}{2\pi}$$
$$\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{\left(-1+\frac{e^{96\pi}}{469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008\sqrt{3}}\right)^{-s}\Gamma(-s)^2\,\Gamma(1+s)}{\Gamma(1-s)}$$
$$ds\quad \text{for } -1<\gamma<0$$

$\Gamma(x)$ is the gamma function

27*1/2*(((ln((((((1/(sqrt2) * 576^(-27/4) * exp(4Pi*sqrt576))))/134003339931725153597473)))-76-1)))

Input:

$$27\times\frac{1}{2}\left(\log\left(\frac{\frac{1}{\sqrt{2}}\times 576^{-27/4}\exp\left(4\pi\sqrt{576}\right)}{134\,003\,339\,931\,725\,153\,597\,473}\right)-76-1\right)$$

$\log(x)$ is the natural logarithm

Exact result:

$$\frac{27}{2}\left(\log\left(\frac{e^{96\pi}}{469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008\sqrt{3}}\right)-77\right)$$

Decimal approximation:

1729.220977358064544611671855150993561514510407504494219424...

1729.220977….

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)

Alternate forms:

$$\frac{27}{2}\left(-77+96\,\pi-\frac{\log(3)}{2}-\log(\right.$$
$$\left.469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008)\right)$$

$$\frac{27}{4}\,(192\,\pi-\log(3)-2\,(77+\log($$
$$469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008)))$$

$$\frac{27}{2}\log\left(\frac{e^{96\,\pi}}{469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008\,\sqrt{3}}\right)-\frac{2079}{2}$$

Alternative representations:

$$\frac{27}{2}\left(\log\left(\frac{576^{-27/4}\,\exp\left(4\,\pi\,\sqrt{576}\right)}{\sqrt{2}\;134\,003\,339\,931\,725\,153\,597\,473}\right)-76-1\right)=$$
$$\frac{27}{2}\left(-77+\log_e\left(\frac{\exp\left(4\,\pi\,\sqrt{576}\right)576^{-27/4}}{134\,003\,339\,931\,725\,153\,597\,473\,\sqrt{2}}\right)\right)$$

$$\frac{27}{2}\left(\log\left(\frac{576^{-27/4}\,\exp\left(4\,\pi\,\sqrt{576}\right)}{\sqrt{2}\;134\,003\,339\,931\,725\,153\,597\,473}\right)-76-1\right)=$$
$$\frac{27}{2}\left(-77+\log(a)\log_a\left(\frac{\exp\left(4\,\pi\,\sqrt{576}\right)576^{-27/4}}{134\,003\,339\,931\,725\,153\,597\,473\,\sqrt{2}}\right)\right)$$

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

Series representations:

$$\frac{27}{2}\left(\log\left(\frac{576^{-27/4}\exp\left(4\pi\sqrt{576}\right)}{\sqrt{2}\ 134\,003\,339\,931\,725\,153\,597\,473}\right)-76-1\right)=-\frac{2079}{2}+\frac{27}{2}\log\left(-1+\frac{e^{96\pi}}{469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008\sqrt{3}}\right)-\frac{27}{2}\sum_{k=1}^{\infty}\frac{\left(-\frac{1}{-1+\frac{e^{96\pi}}{469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008\sqrt{3}}}\right)^k}{k}$$

$$\frac{27}{2}\left(\log\left(\frac{576^{-27/4}\exp\left(4\pi\sqrt{576}\right)}{\sqrt{2}\ 134\,003\,339\,931\,725\,153\,597\,473}\right)-76-1\right)=-\frac{2079}{2}+27\,i\,\pi\left\lfloor\frac{\arg\left(\frac{e^{96\pi}}{469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008\sqrt{3}}-x\right)}{2\pi}\right\rfloor+\frac{27\log(x)}{2}-\frac{27}{2}\sum_{k=1}^{\infty}\frac{(-1)^k\left(\frac{e^{96\pi}}{469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008\sqrt{3}}-x\right)^k x^{-k}}{k}\quad\text{for } x<0$$

$$\frac{27}{2}\left(\log\left(\frac{576^{-27/4}\exp\left(4\pi\sqrt{576}\right)}{\sqrt{2}\ 134\,003\,339\,931\,725\,153\,597\,473}\right)-76-1\right)=-\frac{2079}{2}+27\,i\,\pi\left\lfloor\frac{\pi-\arg\left(\frac{1}{z_0}\right)-\arg(z_0)}{2\pi}\right\rfloor+\frac{27\log(z_0)}{2}-\frac{27}{2}\sum_{k=1}^{\infty}\frac{(-1)^k\left(\frac{e^{96\pi}}{469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008\sqrt{3}}-z_0\right)^k z_0^{-k}}{k}$$

Integral representations:

$$\frac{27}{2}\left(\log\left(\frac{576^{-27/4}\exp\left(4\pi\sqrt{576}\right)}{\sqrt{2}\ 134\,003\,339\,931\,725\,153\,597\,473}\right)-76-1\right)=-\frac{2079}{2}+\frac{27}{2}\int_1^{\frac{e^{96\pi}}{469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008\sqrt{3}}}\frac{1}{t}\,dt$$

$$\frac{27}{2}\left(\log\left(\frac{576^{-27/4}\exp\left(4\pi\sqrt{576}\right)}{\sqrt{2}\ 134\,003\,339\,931\,725\,153\,597\,473}\right)-76-1\right)=-\frac{2079}{2}-\frac{27\,i}{4\pi}$$
$$\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{\left(-1+\frac{e^{96\pi}}{469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008\sqrt{3}}\right)^{-s}\Gamma(-s)^2\,\Gamma(1+s)}{\Gamma(1-s)}\,ds \quad \text{for } -1<\gamma<0$$

$\Gamma(x)$ is the gamma function

(((27*1/2*(((ln((((((1/(sqrt2) * 576^(-27/4) * exp(4Pi*sqrt576))))/134003339931725153597473)))-76-1))))))^1/15

Input:

$$\sqrt[15]{27\times\frac{1}{2}\left(\log\left(\frac{\frac{1}{\sqrt{2}}\times 576^{-27/4}\exp\left(4\pi\sqrt{576}\right)}{134\,003\,339\,931\,725\,153\,597\,473}\right)-76-1\right)}$$

$\log(x)$ is the natural logarithm

Exact result:

$$\sqrt[5]{3}\ \sqrt[15]{\frac{1}{2}\left(\log\left(\frac{e^{96\pi}}{469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008\sqrt{3}}\right)-77\right)}$$

Decimal approximation:

1.643829233926406835614387765398130406405716563214724441544...

$1.6438292339\ldots\approx\zeta(2)=\frac{\pi^2}{6}=1.644934\ldots$

Alternate forms:

$$\sqrt[5]{3}\left(\frac{1}{2}\left(-77+96\pi-\frac{\log(3)}{2}-\log(469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008)\right)\right)\text{^ }(1/15)$$

$$\sqrt[5]{3}\ \sqrt[15]{-\frac{77}{2}+48\pi+\log\left(\frac{1}{35\,927\,359\,488\times 3^{3/4}\sqrt{121\,324\,889\,028\,270\,849\,794}}\right)}$$

$$\sqrt[5]{3}\ \sqrt[15]{-\frac{77}{2}+48\pi-\log\left(35\,927\,359\,488\times 3^{3/4}\sqrt{121\,324\,889\,028\,270\,849\,794}\right)}$$

All 15th roots of 27/2 (log(e^(96 π)/(469809459062265264115215027256239228715008 sqrt(3))) - 77):

$$\sqrt[5]{3}\ e^{0}$$

$$\sqrt[15]{\frac{1}{2}\left(\log\left(\frac{e^{96\pi}}{469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008\sqrt{3}}\right)-77\right)}$$

$$\approx 1.6438 \quad \text{(real, principal root)}$$

$$\sqrt[5]{3}\ e^{(2i\pi)/15}\ \sqrt[15]{\frac{1}{2}\left(\log\left(\frac{e^{96\pi}}{469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008\sqrt{3}}\right)-77\right)}$$

$$\approx 1.5017+0.6686\,i$$

$$\sqrt[5]{3}\ e^{(4i\pi)/15}\ \sqrt[15]{\frac{1}{2}\left(\log\left(\frac{e^{96\pi}}{469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008\sqrt{3}}\right)-77\right)}$$

$$\approx 1.0999+1.2216\,i$$

$$\sqrt[5]{3}\ e^{(2i\pi)/5}\ \sqrt[15]{\frac{1}{2}\left(\log\left(\frac{e^{96\pi}}{469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008\sqrt{3}}\right)-77\right)}$$

$$\approx 0.5080+1.5634\,i$$

$$\sqrt[5]{3}\ e^{(8i\pi)/15}\ \sqrt[15]{\frac{1}{2}\left(\log\left(\frac{e^{96\pi}}{469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008\sqrt{3}}\right)-77\right)}$$

$$\approx -0.17183+1.6348\,i$$

Alternative representations:

$$\sqrt[15]{\frac{27}{2}\left(\log\left(\frac{576^{-27/4}\exp\left(4\pi\sqrt{576}\right)}{\sqrt{2}\ 134\,003\,339\,931\,725\,153\,597\,473}\right)-76-1\right)}=\sqrt[15]{\frac{27}{2}\left(-77+\log_e\left(\frac{\exp\left(4\pi\sqrt{576}\right)576^{-27/4}}{134\,003\,339\,931\,725\,153\,597\,473\sqrt{2}}\right)\right)}$$

$$\sqrt[15]{\frac{27}{2}\left(\log\left(\frac{576^{-27/4}\exp\left(4\pi\sqrt{576}\right)}{\sqrt{2}\ 134\,003\,339\,931\,725\,153\,597\,473}\right)-76-1\right)}=\sqrt[15]{\frac{27}{2}\left(-77+\log(a)\log_a\left(\frac{\exp\left(4\pi\sqrt{576}\right)576^{-27/4}}{134\,003\,339\,931\,725\,153\,597\,473\sqrt{2}}\right)\right)}$$

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

Series representations:

$$\sqrt[15]{\frac{27}{2}\left(\log\left(\frac{576^{-27/4}\exp(4\pi\sqrt{576})}{\sqrt{2}\ 134\,003\,339\,931\,725\,153\,597\,473}\right)-76-1\right)}=\frac{1}{\sqrt[15]{2}}\sqrt[5]{3}\left(-77+\log\left(-1+\frac{e^{96\pi}}{469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008\sqrt{3}}\right)-\sum_{k=1}^{\infty}\frac{\left(-\frac{1}{-1+\frac{e^{96\pi}}{469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008\sqrt{3}}}\right)^k}{k}\right)\text{^}(1/15)$$

$$\sqrt[15]{\frac{27}{2}\left(\log\left(\frac{576^{-27/4}\exp\left(4\pi\sqrt{576}\right)}{\sqrt{2}\ 134\,003\,339\,931\,725\,153\,597\,473}\right)-76-1\right)}=\frac{1}{\sqrt[15]{2}}\sqrt[5]{3}$$
$$\left(-77+2i\pi\left\lfloor\frac{\arg\left(\frac{e^{96\pi}}{469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008\sqrt{3}}-x\right)}{2\pi}\right\rfloor+\log(x)-\right.$$
$$\left.\sum_{k=1}^{\infty}\frac{(-1)^k\left(\frac{e^{96\pi}}{469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008\sqrt{3}}-x\right)^k x^{-k}}{k}\right)\wedge(1/$$
$$15)\quad \text{for } x<0$$

$$\sqrt[15]{\frac{27}{2}\left(\log\left(\frac{576^{-27/4}\exp\left(4\pi\sqrt{576}\right)}{\sqrt{2}\ 134\,003\,339\,931\,725\,153\,597\,473}\right)-76-1\right)}=$$
$$\frac{1}{\sqrt[15]{2}}\sqrt[5]{3}\left(-77+2i\pi\left\lfloor\frac{\pi-\arg\left(\frac{1}{z_0}\right)-\arg(z_0)}{2\pi}\right\rfloor+\log(z_0)-\right.$$
$$\left.\sum_{k=1}^{\infty}\frac{(-1)^k\left(\frac{e^{96\pi}}{469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008\sqrt{3}}-z_0\right)^k z_0^{-k}}{k}\right)\wedge(1/$$
$$15)$$

Integral representations:

$$\sqrt[15]{\frac{27}{2}\left(\log\left(\frac{576^{-27/4}\exp\left(4\pi\sqrt{576}\right)}{\sqrt{2}\ 134\,003\,339\,931\,725\,153\,597\,473}\right)-76-1\right)}=$$
$$\frac{\sqrt[5]{3}\sqrt[15]{-77+\int_1^{\frac{e^{96\pi}}{469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\,008\sqrt{3}}}\frac{1}{t}\,dt}}{\sqrt[15]{2}}$$

$$\sqrt[15]{\frac{27}{2}\left(\log\left(\frac{576^{-27/4}\exp\left(4\pi\sqrt{576}\right)}{\sqrt{2}\ 134\,003\,339\,931\,725\,153\,597\,473}\right)-76-1\right)}=$$

$$\frac{1}{2^{2/15}}\sqrt[5]{3}\left(-154-\frac{i}{\pi}\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{1}{\Gamma(1-s)}\left(-1+e^{96\pi}\Big/\left(469\,809\,459\,062\,265\,264\,115\,215\,027\,256\,239\,228\,715\cdots 008\sqrt{3}\right)\right)^{-s}\Gamma(-s)^2\,\Gamma(1+s)\,ds\right)\text{^}(1/15)\quad \text{for } -1<\gamma<0$$

$\Gamma(x)$ is the gamma function

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.

References

Duality and Mock Modularity
Atish Dabholkar, Pavel Putrov, Edward Witten - arXiv:2004.14387v1 [hep-th] 29 Apr 2020

SIAM REVIEW
Vol. 16, No. 4, October 1974

APPLICATIONS OF BASIC HYPERGEOMETRIC FUNCTIONS*

GEORGE E. ANDREWS†

Mock modularity and a secondary elliptic genus
Davide Gaiotto and Theo Johnson-Freyd - arXiv:1904.05788v1 [hep-th] 11 Apr 2019

https://mss-cat.trin.cam.ac.uk/manuscripts/uv/view.php?n=Add.Ms.a.94.13#?c=0&m=0&s=0&cv=26&xywh=-269%2C1068%2C4667%2C2707

Topics in Analytic Number Theory - Authors: *Rademacher, Hans* - © 1973