On the possible mathematical connections between some Rogers-Ramanujan continued fractions, Ramanujan equations concerning p(n) and τ(n), various parameters concerning Particle Physics, ϕ and ζ(2). IV

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

Abstract

In this paper (part IV), we describe and analyze further new mathematical connections between some Rogers-Ramanujan continued fractions, Ramanujan equations concerning p(n) and τ(n), 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**



Leonard James Rogers

(From Wikipedia)



Srinivasa Ramanujan

(From Wikipedia)

FOR THE READER

We want to highlight that the development of the various equations was carried out according an our possible logical and original interpretation

For more information on the data entered for the development of the various equations, see the "Observations" section.

On recreational mathematics

"Penrose tiles are a marvelous example of how a discovery made solely for the fun of it can turn out to have an unexpected practical use. A few years later a 3-D form of Penrose tiling became the basis for constructing a previously unknown type of molecular structure called a quasicrystal. Since then, physicists have written hundreds of research papers on quasicrystals and their unique thermal and vibrational properties. Although Penrose's idea started as a strictly recreational pursuit, it paved the way for an entirely new branch of solid-state physics." (https://blogs.scientificamerican.com/observations/a-quarter-century-of-recreational-m-2010-05-26/)

From:

https://web.archive.org/web/20020207051215/http://anduin.eldar.org/~problemi/singmast/ecmutil.html

THE UNREASONABLE UTILITY OF RECREATIONAL MATHEMATICS
by Prof. David Singmaster

WHY IS RECREATIONAL MATHEMATICS SO USEFUL?

"As I said earlier, I have only a tentative answer to this, but it also partly answers Wigner's question. Mathematics has been described as a search for pattern - and that certainly describes much of what we do and also much of what most scientists do. But how do we find patterns? The real world is messy and patterns are difficult to see. As we begin to see a pattern, we tend to remove all the inessential details and get to an ideal or model situation. These models may be so removed from reality that they become fanciful or even recreational. E.g. physicists deal with frictionless perfectly elastic particles, weightless strings, ideal gases, etc. Then such models get modified and adapted into a large variety of models. Now one of the ways in which a science progresses is by seeing analogies between reality and simpler situations. E.g. the idea of the circulation of the blood could not be developed until the idea of a pump was known and somewhat understood. The behaviour of a real system cannot be developed until one can see simpler models within it. But what are these simpler models? They are generally among the large variety of models which have been created in the past, often recreational or fanciful. Perhaps the clearest example is graph theory, where Euler made a simple model of the reality that he was studying, then later workers found that model useful in other situations. Thus recreational mathematics helps as a major source of mathematical models, which are the raw material for mathematical research"

We, in our papers, through the use of "recreational number theory", obtain possible new matematical connections between various sectors of Ramanujan's mathematics and various physical parameters concerning several topics of physics and cosmology.

From:

Separable Integer Partition Classes - *George E. Andrews* - CANT 2020: ZOOM CONFERENCE - CUNY Graduate Center (Via Zoom) - June 1-5, 2020

We have that:

Identity (81) in Slater's compendium of Rogers-Ramanujan type identities reveals now

$$\sum_{n\geq 0} B_{-1}(n)q^n$$
$$= \prod_{n=1}^{\infty} \frac{(1+q^{7n})}{(1-q^{14n-11})(1-q^{14n-3})}$$
$$\times \prod_{\substack{n=1 \\ n=+2,+3,+4 \pmod{14}}}^{\infty} \frac{1}{1-q^n},$$

For $q = e^{-2\pi i\tau} = e^{-2\pi} = 1/535.49165\ldots.$ for $i\tau > 0$; $\tau = i^3$ $i\tau = 1$

We take only the following part of the above expression:

$$\prod_{n=1}^{\infty} \frac{(1+q^{7n})}{(1-q^{14n-11})(1-q^{14n-3})}$$

Product (((1+(1/535.49165)^(7n))))/((((1-(1/535.49165)^(14n-11))(1-(1/535.49165)^(14n-3))))), n=1..infinity

Input interpretation:

$$\prod_{n=1}^{\infty} \frac{1+\left(\frac{1}{535.49165}\right)^{7n}}{\left(1-\left(\frac{1}{535.49165}\right)^{14n-11}\right)\left(1-\left(\frac{1}{535.49165}\right)^{14n-3}\right)}$$

Approximated product:

$$\prod_{n=1}^{10} \frac{1+0.00186744^{7n}}{\left(1-0.00186744^{-11+14n}\right)\left(1-0.00186744^{-3+14n}\right)} \approx 1.$$

Now, we take the second part of the expression, i.e.

$$\times \prod_{\substack{n=1 \\ n\equiv\pm2,\pm3,\pm4 \pmod{14}}}^{\infty} \frac{1}{1-q^n},$$

product ((1/(1-(1/535.49165)^n))), n=1..infinity

Input interpretation:

$$\prod_{n=1}^{\infty} \frac{1}{1-\left(\frac{1}{535.49165}\right)^n}$$

Infinite product:

$$\prod_{n=1}^{\infty} \frac{1}{1-0.00186744^n} = 1.001874437034035$$

1.001874437034035

Thence:

$$\prod_{n=1}^{\infty} \frac{(1+q^{7n})}{(1-q^{14n-11})(1-q^{14n-3})} \times \prod_{\substack{n=1 \\ n\equiv\pm2,\pm3,\pm4 \pmod{14}}}^{\infty} \frac{1}{1-q^n},$$

= 1.001874437034035 result very near to the following Rogers-Ramanujan continued fraction:

$$\frac{e^{-\frac{2\pi}{5}}}{\sqrt{\varphi\sqrt{5}}-\varphi} = 1+\frac{e^{-2\pi}}{1+\frac{e^{-4\pi}}{1+\frac{e^{-6\pi}}{1+\frac{e^{-8\pi}}{1+\ldots}}}} \approx 1.0018674362$$

Furthermore:

[1/(((product ((1/(1-(1/535.49165)^n))), n=1..infinity)))]

Input interpretation:

$$\frac{1}{\prod_{n=1}^{\infty} \frac{1}{1-\left(\frac{1}{535.49165}\right)^n}}$$

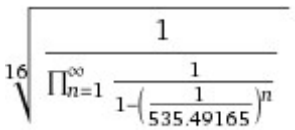
Result:

0.998129069906620

0.998129069906620

[1/(((product ((1/(1-(1/535.49165)^n))), n=1..infinity)))]^1/16

Input interpretation:



Result:

0.99988296419490278

0.9998829641949027 8

result very near to the value of the following Rogers-Ramanujan continued fraction:

$$\frac{e^{-\frac{\pi}{\sqrt{5}}}}{\frac{\sqrt{5}}{1+\sqrt[5]{\sqrt{\varphi^5\sqrt[4]{5^3}}-1}}-\varphi+1}=1-\frac{e^{-\pi\sqrt{5}}}{1+\frac{e^{-2\pi\sqrt{5}}}{1+\frac{e^{-3\pi\sqrt{5}}}{1+\frac{e^{-4\pi\sqrt{5}}}{1+\ldots}}}}\approx 0.9991104684$$

and to the Omega mesons ($\omega/\omega_3 \mid 5+3 \mid m_{u/d}=255-390 \mid 0.988-1.18$) Regge slope value (0.988) connected to the dilaton scalar field $\mathbf{0.989117352243 = \phi}$

A_1^{**} above the two low-lying pseudo-scalars. (bound states of gluons, or 'glueballs').

A_1^{**}	0.943(39) [2.5]	0.988(38)	0.152(53)
A_4	1.03(10) [2.5]	0.999(32)	0.035(21)

(**Glueball Regge trajectories -** *Harvey Byron Meyer*, Lincoln College -Thesis submitted for the degree of Doctor of Philosophy at the University of Oxford Trinity Term, 2004)

If we perform the following calculation, putting n = 2 and $q = e^{-2\pi i\tau} = e^{-2\pi} = 1/535.49165\ldots$, we obtain:

(((1+(1/535.49165)^(7*2))))/((((1-(1/535.49165)^(14*2-11))(1-(1/535.49165)^(14*2-3))))) * 1/(1-(1/535.49165)^2)

Input interpretation:

$$\frac{1+\left(\frac{1}{535.49165}\right)^{7\times 2}}{\left(1-\left(\frac{1}{535.49165}\right)^{14\times 2-11}\right)\left(1-\left(\frac{1}{535.49165}\right)^{14\times 2-3}\right)}\times\frac{1}{1-\left(\frac{1}{535.49165}\right)^{2}}$$

Result:

1.000003487354589767709407019970408666576774121215547368303...

1.0000034873545…

Now, if we perform the calculations putting $q = e^{2\pi i\tau} = e^{2\pi} = 535.49165\ldots$ we obtain these other results:

(((1+(535.49165)^(7*2))))/((((1-(535.49165)^(14*2-11))(1-(535.49165)^(14*2-3))))) * 1/(1-(535.49165)^2)

Input interpretation:

$$\frac{1+535.49165^{7\times 2}}{\left(1-535.49165^{14\times 2-11}\right)\left(1-535.49165^{14\times 2-3}\right)}\times\frac{1}{1-535.49165^{2}}$$

Result:

$-1.372209489774826089978951316224757354612956562406989\ldots\times 10^{-82}$

$-1.372209489\ldots*10^{-82}$

Performing the square root and changing the sign, we obtain:

sqrt(((((-(1+(535.49165)^(7*2))))/((((1-(535.49165)^(14*2-11))(1-(535.49165)^(14*2-3))))) * 1/(1-(535.49165)^2))))

Input interpretation:

$$\sqrt{-\frac{1+535.49165^{7\times 2}}{\left(1-535.49165^{14\times 2-11}\right)\left(1-535.49165^{14\times 2-3}\right)}\times\frac{1}{1-535.49165^{2}}}$$

Result:

$1.171413... \times 10^{-41}$

$1.171413…*10^{-41}$

From which:

(199+18)*1/sqrt(((((-(1+(535.49165)^(7*2))))/((((1-(535.49165)^(14*2-11))(1-(535.49165)^(14*2-3))))) * 1/(1-(535.49165)^2))))

Input interpretation:

$$(199 + 18) \times \frac{1}{\sqrt{-\frac{1+535.49165^{7\times 2}}{(1-535.49165^{14\times 2-11})(1-535.49165^{14\times 2-3})} \times \frac{1}{1-535.49165^2}}}$$

Result:

$1.852463... \times 10^{43}$

$1.852463…*10^{43}$ result very near to the value of Planck frequency

1.8549×10^{43} Hz

We obtain also:

(7+2)*colog((((-(1+(535.49165)^(7*2))))/((((1-(535.49165)^(14*2-11))(1-(535.49165)^(14*2-3))))) * 1/(1-(535.49165)^2)))+29+3+1/2

Input interpretation:

$$(7 + 2)\left(-\log\left(-\frac{1 + 535.49165^{7\times 2}}{(1 - 535.49165^{14\times 2-11})(1 - 535.49165^{14\times 2-3})} \times \frac{1}{1 - 535.49165^2}\right)\right) + 29 + 3 + \frac{1}{2}$$

$\log(x)$ is the natural logarithm

Result:

1728.96000...

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)

Alternative representations:

$$(7+2)(-1)\log\left(-\frac{1+535.492^{7\times 2}}{((1-535.492^{14\times 2-11})(1-535.492^{14\times 2-3}))(1-535.492^2)}\right)+29+3+\frac{1}{2}=\frac{65}{2}-9\log_e\left(\frac{-1-535.492^{14}}{(1-535.492^2)((1-535.492^{17})(1-535.492^{25}))}\right)$$

$$(7+2)(-1)\log\left(-\frac{1+535.492^{7\times 2}}{((1-535.492^{14\times 2-11})(1-535.492^{14\times 2-3}))(1-535.492^2)}\right)+29+3+\frac{1}{2}=\frac{65}{2}-9\log(a)\log_a\left(\frac{-1-535.492^{14}}{(1-535.492^2)((1-535.492^{17})(1-535.492^{25}))}\right)$$

$$(7+2)(-1)\log\left(-\frac{1+535.492^{7\times 2}}{((1-535.492^{14\times 2-11})(1-535.492^{14\times 2-3}))(1-535.492^2)}\right)+29+3+\frac{1}{2}=\left(\frac{65}{2}+9\,\mathrm{Li}_1\left(1-\frac{-1-535.492^{14}}{(1-535.492^2)((1-535.492^{17})(1-535.492^{25}))}\right)=\frac{65}{2}+9\,\mathrm{Li}_1(1)\right)$$

Series representations:

$$(7+2)(-1)\log\left(-\frac{1+535.492^{7\times 2}}{((1-535.492^{14\times 2-11})(1-535.492^{14\times 2-3}))(1-535.492^2)}\right)+29+3+\frac{1}{2}=\frac{65}{2}-18\,i\pi\left\lfloor\frac{\arg(1.37221\times 10^{-82}-x)}{2\pi}\right\rfloor-9\log(x)+9\sum_{k=1}^{\infty}\frac{(-1)^k\,(1.37221\times 10^{-82}-x)^k\,x^{-k}}{k}\quad\text{for } x<0$$

$$(7+2)(-1)\log\left(-\frac{1+535.492^{7\times 2}}{((1-535.492^{14\times 2-11})(1-535.492^{14\times 2-3}))(1-535.492^2)}\right)+$$
$$29+3+\frac{1}{2}=\frac{65}{2}-9\left\lfloor\frac{\arg(1.37221\times 10^{-82}-z_0)}{2\pi}\right\rfloor\log\left(\frac{1}{z_0}\right)-9\log(z_0)-$$
$$9\left\lfloor\frac{\arg(1.37221\times 10^{-82}-z_0)}{2\pi}\right\rfloor\log(z_0)+9\sum_{k=1}^{\infty}\frac{(-1)^k(1.37221\times 10^{-82}-z_0)^k z_0^{-k}}{k}$$

$$(7+2)(-1)\log\left(-\frac{1+535.492^{7\times 2}}{((1-535.492^{14\times 2-11})(1-535.492^{14\times 2-3}))(1-535.492^2)}\right)+$$
$$29+3+\frac{1}{2}=\frac{65}{2}-18\,i\pi\left\lfloor-\frac{-\pi+\arg\left(\frac{1.37221\times 10^{-82}}{z_0}\right)+\arg(z_0)}{2\pi}\right\rfloor-$$
$$9\log(z_0)+9\sum_{k=1}^{\infty}\frac{(-1)^k(1.37221\times 10^{-82}-z_0)^k z_0^{-k}}{k}$$

Integral representation:

$$(7+2)(-1)\log\left(-\frac{1+535.492^{7\times 2}}{((1-535.492^{14\times 2-11})(1-535.492^{14\times 2-3}))(1-535.492^2)}\right)+$$
$$29+3+\frac{1}{2}=\frac{65}{2}-9\int_1^{1.37221\times 10^{-82}}\frac{1}{t}\,dt$$

colog((((-(1+(535.49165)^(7*2))))/((((1-(535.49165)^(14*2-11))(1-(535.49165)^(14*2-3))))) * 1/(1-(535.49165)^2)))-47-2

Input interpretation:

$$-\log\left(-\frac{1+535.49165^{7\times 2}}{(1-535.49165^{14\times 2-11})(1-535.49165^{14\times 2-3})}\times\frac{1}{1-535.49165^2}\right)-47-2$$

$\log(x)$ is the natural logarithm

Result:

139.49556...

139.49556… result practically equal to the rest mass of Pion meson 139.57 MeV

Alternative representations:

$$-\log\left(-\frac{1+535.492^{7\times 2}}{(1-535.492^{2})\left(\left(1-535.492^{14\times 2-11}\right)\left(1-535.492^{14\times 2-3}\right)\right)}\right)-47-2=$$
$$-49-\log_{e}\left(\frac{-1-535.492^{14}}{(1-535.492^{2})\left(\left(1-535.492^{17}\right)\left(1-535.492^{25}\right)\right)}\right)$$

$$-\log\left(-\frac{1+535.492^{7\times 2}}{(1-535.492^{2})\left(\left(1-535.492^{14\times 2-11}\right)\left(1-535.492^{14\times 2-3}\right)\right)}\right)-47-2=$$
$$-49-\log(a)\log_{a}\left(\frac{-1-535.492^{14}}{(1-535.492^{2})\left(\left(1-535.492^{17}\right)\left(1-535.492^{25}\right)\right)}\right)$$

$$-\log\left(-\frac{1+535.492^{7\times 2}}{(1-535.492^{2})\left(\left(1-535.492^{14\times 2-11}\right)\left(1-535.492^{14\times 2-3}\right)\right)}\right)-47-2=$$
$$\left(-49+\mathrm{Li}_{1}\left(1-\frac{-1-535.492^{14}}{(1-535.492^{2})\left(\left(1-535.492^{17}\right)\left(1-535.492^{25}\right)\right)}\right)=-49+\mathrm{Li}_{1}(1)\right)$$

Series representations:

$$-\log\left(-\frac{1+535.492^{7\times 2}}{(1-535.492^{2})\left(\left(1-535.492^{14\times 2-11}\right)\left(1-535.492^{14\times 2-3}\right)\right)}\right)-47-2=$$
$$-49-2\,i\,\pi\left\lfloor\frac{\arg(1.37221\times 10^{-82}-x)}{2\,\pi}\right\rfloor-\log(x)+$$
$$\sum_{k=1}^{\infty}\frac{(-1)^{k}\,(1.37221\times 10^{-82}-x)^{k}\,x^{-k}}{k}\quad\text{for } x<0$$

$$-\log\left(-\frac{1+535.492^{7\times 2}}{(1-535.492^{2})\left(\left(1-535.492^{14\times 2-11}\right)\left(1-535.492^{14\times 2-3}\right)\right)}\right)-47-2=$$
$$-49-\left\lfloor\frac{\arg(1.37221\times 10^{-82}-z_{0})}{2\,\pi}\right\rfloor\log\left(\frac{1}{z_{0}}\right)-\log(z_{0})-$$
$$\left\lfloor\frac{\arg(1.37221\times 10^{-82}-z_{0})}{2\,\pi}\right\rfloor\log(z_{0})+\sum_{k=1}^{\infty}\frac{(-1)^{k}\,(1.37221\times 10^{-82}-z_{0})^{k}\,z_{0}^{-k}}{k}$$

$$-\log\left(-\frac{1+535.492^{7\times 2}}{(1-535.492^{2})\left((1-535.492^{14\times 2-11})(1-535.492^{14\times 2-3})\right)}\right)-47-2=$$
$$-49-2\,i\,\pi\left\lfloor-\frac{-\pi+\arg\left(\frac{1.37221\times 10^{-82}}{z_0}\right)+\arg(z_0)}{2\,\pi}\right\rfloor-$$
$$\log(z_0)+\sum_{k=1}^{\infty}\frac{(-1)^k\,(1.37221\times 10^{-82}-z_0)^k\,z_0^{-k}}{k}$$

Integral representation:

$$-\log\left(-\frac{1+535.492^{7\times 2}}{(1-535.492^{2})\left((1-535.492^{14\times 2-11})(1-535.492^{14\times 2-3})\right)}\right)-47-2=$$
$$-49-\int_1^{1.37221\times 10^{-82}}\frac{1}{t}\,dt$$

colog((((-(1+(535.49165)^(7*2))))/((((1-(535.49165)^(14*2-11))(1-(535.49165)^(14*2-3))))) * 1/(1-(535.49165)^2)))-76+7+2Pi

Input interpretation:

$$-\log\left(-\frac{1+535.49165^{7\times 2}}{(1-535.49165^{14\times 2-11})(1-535.49165^{14\times 2-3})}\times\frac{1}{1-535.49165^{2}}\right)-76+7+2\,\pi$$

$\log(x)$ is the natural logarithm

Result:

125.77874...

125.77874… result very near to the Higgs boson mass 125.18 GeV

Alternative representations:

$$-\log\left(-\frac{1+535.492^{7\times 2}}{(1-535.492^{2})\left((1-535.492^{14\times 2-11})(1-535.492^{14\times 2-3})\right)}\right)-76+7+2\pi=$$
$$-69+2\pi-\log_{e}\left(\frac{-1-535.492^{14}}{(1-535.492^{2})\left((1-535.492^{17})(1-535.492^{25})\right)}\right)$$

$$-\log\left(-\frac{1+535.492^{7\times 2}}{(1-535.492^{2})\left((1-535.492^{14\times 2-11})(1-535.492^{14\times 2-3})\right)}\right)-76+7+2\pi=$$
$$-69+2\pi-\log(a)\log_{a}\left(\frac{-1-535.492^{14}}{(1-535.492^{2})\left((1-535.492^{17})(1-535.492^{25})\right)}\right)$$

$$-\log\left(-\frac{1+535.492^{7\times 2}}{(1-535.492^{2})\left((1-535.492^{14\times 2-11})(1-535.492^{14\times 2-3})\right)}\right)-76+7+2\pi=$$
$$\left(-69+2\pi+\text{Li}_{1}\left(1-\frac{-1-535.492^{14}}{(1-535.492^{2})\left((1-535.492^{17})(1-535.492^{25})\right)}\right)=\right.$$
$$\left.-69+2\pi+\text{Li}_{1}(1)\right)$$

Series representations:

$$-\log\left(-\frac{1+535.492^{7\times 2}}{(1-535.492^{2})\left((1-535.492^{14\times 2-11})(1-535.492^{14\times 2-3})\right)}\right)-76+7+2\pi=$$
$$-69+2\pi-2i\pi\left\lfloor\frac{\arg(1.37221\times 10^{-82}-x)}{2\pi}\right\rfloor-$$
$$\log(x)+\sum_{k=1}^{\infty}\frac{(-1)^{k}\,(1.37221\times 10^{-82}-x)^{k}\,x^{-k}}{k}\quad\text{for } x<0$$

$$-\log\left(-\frac{1+535.492^{7\times 2}}{\left(1-535.492^{2}\right)\left(\left(1-535.492^{14\times 2-11}\right)\left(1-535.492^{14\times 2-3}\right)\right)}\right)-76+7+2\pi=$$
$$-69+2\pi-\left\lfloor\frac{\arg\left(1.37221\times 10^{-82}-z_0\right)}{2\pi}\right\rfloor\log\left(\frac{1}{z_0}\right)-\log(z_0)-$$
$$\left\lfloor\frac{\arg\left(1.37221\times 10^{-82}-z_0\right)}{2\pi}\right\rfloor\log(z_0)+\sum_{k=1}^{\infty}\frac{(-1)^k\left(1.37221\times 10^{-82}-z_0\right)^k z_0^{-k}}{k}$$

$$-\log\left(-\frac{1+535.492^{7\times 2}}{\left(1-535.492^{2}\right)\left(\left(1-535.492^{14\times 2-11}\right)\left(1-535.492^{14\times 2-3}\right)\right)}\right)-76+7+2\pi=$$
$$-69+2\pi-2i\pi\left\lfloor-\frac{-\pi+\arg\left(\frac{1.37221\times 10^{-82}}{z_0}\right)+\arg(z_0)}{2\pi}\right\rfloor-$$
$$\log(z_0)+\sum_{k=1}^{\infty}\frac{(-1)^k\left(1.37221\times 10^{-82}-z_0\right)^k z_0^{-k}}{k}$$

Integral representation:

$$-\log\left(-\frac{1+535.492^{7\times 2}}{\left(1-535.492^{2}\right)\left(\left(1-535.492^{14\times 2-11}\right)\left(1-535.492^{14\times 2-3}\right)\right)}\right)-76+7+2\pi=$$
$$-69+2\pi-\int_1^{1.37221\times 10^{-82}}\frac{1}{t}\,dt$$

and:

(((((7+2)*colog((((-(1+(535.49165)^(7*2))))/((((1-(535.49165)^(14*2-11))(1-(535.49165)^(14*2-3))))) * 1/(1-(535.49165)^2)))+29+3+1/2))))^1/15

Input interpretation:

$$\left((7+2)\left(-\log\left(-\frac{1+535.49165^{7\times 2}}{\left(1-535.49165^{14\times 2-11}\right)\left(1-535.49165^{14\times 2-3}\right)}\times\frac{1}{1-535.49165^{2}}\right)\right)+29+3+\frac{1}{2}\right)\text{^}(1/15)$$

$\log(x)$ is the natural logarithm

Result:

1.643812693358468616160027948718795686894789190473449740645...

$1.643812693358\ldots \approx \zeta(2) = \frac{\pi^2}{6} = 1.644934\ldots$

From

George E. Andrews, Bruce C. Berndt - **Ramanujan's Lost Notebook Part I – The Rogers–Ramanujan Continued Fraction and Its Modular Properties**

We have that:

The most important special cases of $f(a,b)$ are defined by (in Ramanujan's notation)

$$\varphi(q) := f(q,q) = \sum_{n=-\infty}^{\infty} q^{n^2} = (-q;q^2)_\infty^2 (q^2;q^2)_\infty = \frac{(-q;-q)_\infty}{(q;-q)_\infty}, \quad |q| < 1, \tag{1.1.6}$$

$$\psi(q) := f(q,q^3) = \sum_{n=0}^{\infty} q^{n(n+1)/2} = \frac{(q^2;q^2)_\infty}{(q;q^2)_\infty}, \qquad |q| < 1, \tag{1.1.7}$$

and

$$f(-q) := f(-q,-q^2) = \sum_{n=-\infty}^{\infty} (-1)^n q^{n(3n-1)/2} = (q;q)_\infty, \qquad |q| < 1, \tag{1.1.8}$$

We now subdivide this sum into five sums according to

$$2u + v \equiv k \,(\mathrm{mod}\, 5), \qquad 0 \le k \le 4.$$

Then

$$5u = 2(2u + v) + (u - 2v) \equiv 0 (\mathrm{mod}\ 5),$$

which implies that $u - 2v \equiv -2k \,(\mathrm{mod}\, 5)$. Write

$$S = S_0 + S_1 + S_2 + S_3 + S_4, \tag{1.2.12}$$

where S_k denotes the sum for $2u + v \equiv k \,(\mathrm{mod}\, 5)$, $0 \le k \le 4$. Let $2u + v = 5m$ and $u - 2v = -5n$. Then $u = 2m - n$, $v = m + 2n$, and

$$\begin{aligned} h(u, v) &= h(2m - n, m + 2n) \\ &= (-1)^{(3m+n)} \lambda^{5(5m^2+5n^2-m-n)/2} q^{5(3m^2+3n^2-m-n)/2}. \end{aligned}$$

From

$$\begin{aligned} S_0 &= \sum_{\substack{u,v \\ 2u+v \equiv 0 \,(\mathrm{mod}\, 5)}} h(u, v) \\ &= \sum_{m=-\infty}^{\infty} \sum_{n=-\infty}^{\infty} h(2m - n, m + 2n) \\ &= \sum_{m=-\infty}^{\infty} \sum_{n=-\infty}^{\infty} (-1)^{(3m+n)} \lambda^{5(5m^2+5n^2-m-n)/2} q^{5(3m^2+3n^2-m-n)/2} \\ &= \sum_{m=-\infty}^{\infty} (-1)^m (\lambda^{25} q^{15})^{m^2/2} (\lambda^{-5} q^{-5})^{m/2} \\ &\quad \times \sum_{n=-\infty}^{\infty} (-1)^n (\lambda^{25} q^{15})^{n^2/2} (\lambda^{-5} q^{-5})^{n/2} \\ &= f(-\lambda^{10} q^5, -\lambda^{15} q^{10}) f(-\lambda^{10} q^5, -\lambda^{15} q^{10}). \end{aligned} \tag{1.2.13}$$

For: m = 2/5 ; k = 2 ; n = -1/5 ; q = 0.5 ; λ = 0.3 we obtain:

(-1)^(2/5) (0.3^25*0.5^15)^(4/25*1/2) (0.3^(-5)*0.5^(-5))^(2/5*1/2) * (-1)^(-1/5) (0.3^25*0.5^15)^(1/25*1/2) (0.3^(-5)*0.5^(-5))^(-1/5*1/2)

Input:

$$(-1)^{2/5}\,(0.3^{25}\times 0.5^{15})^{4/25\times 1/2}\left(\left(\frac{1}{0.3^5\times 0.5^5}\right)^{2/5\times 1/2}(-1)^{-1/5}\right)\,(0.3^{25}\times 0.5^{15})^{1/25\times 1/2}\left(\frac{1}{0.3^5\times 0.5^5}\right)^{-\frac{1}{2}/5}$$

Result:

0.0364058... +
0.0264503... i

Polar coordinates:

$r = 0.045$ (radius), $\theta = 36.°$ (angle)
0.045

Input interpretation:

$0.0364058 + 0.0264503\,i$

i is the imaginary unit

Result:

0.0364058... +
0.0264503... i

Polar coordinates:

$r = 0.045$ (radius), $\theta = 35.9999°$ (angle)
0.045

From which:

1+ ((3*sqrt(0.0364058 +0.0264503 i)))

Input interpretation:

$$1 + 3\sqrt{0.0364058 + 0.0264503\,i}$$

i is the imaginary unit

Result:

1.605249... +
0.1966569... i

Polar coordinates:

$r = 1.61725$ (radius), $\theta = 6.98443°$ (angle)

1.61725 result that is a very good approximation to the value of the golden ratio 1.618033988749...

Now, we have that:

$$-q^{3/5} f^3(-q^5) \left(\frac{3}{R^2(q)} + R^3(q) \right) = -q^{1/5} \sum_{n=-\infty}^{\infty} (-1)^n (10n+3) q^{(5n+3)n/2}$$

and

$$q^{3/5} f^3(-q^5) \left(\frac{1}{R^3(q)} - 3R^2(q) \right) = \sum_{n=-\infty}^{\infty} (-1)^n (10n+1) q^{n(5n+1)/2}.$$

From

$$-q^{1/5} \sum_{n=-\infty}^{\infty} (-1)^n (10n+3) q^{(5n+3)n/2}$$

for q = 0.5; n = 2 we obtain:

-0.5^(1/5) * (-1)^(2) (10*2+3)*0.5^((5*2+3)*2/2)

Input:

$$-\sqrt[5]{0.5}\ (-1)^2 \left((10 \times 2 + 3) \times 0.5^{(5 \times 2 + 3) \times 2/2} \right)$$

Result:

−0.00244417...

-0.00244417…

Inverting the expression, we obtain:

-1/(((-0.5^(1/5) * (-1)^(2) (10*2+3)*0.5^((5*2+3)*2/2))))+89-5

Where 89 and 5 are Fibonacci numbers

Input:

$$\frac{-1}{-\sqrt[5]{0.5}\ (-1)^2\ ((10\times 2+3)\times 0.5^{(5\times 2+3)\times 2/2})}+89-5$$

Result:

493.136...

493.136… result practically equal to the rest mass of Kaon meson 493.677

Now, for

$$\sum_{n=-\infty}^{\infty}(-1)^n(10n+1)q^{n(5n+1)/2}.$$

we obtain:

(-1)^2 (10*2+1)*0.5^(2(5*2+1)/2)

Input:

$$(-1)^2\ (10\times 2+1)\times 0.5^{2\,(1/2\,(5\times 2+1))}$$

Result:

0.01025390625

0.01025390625

Inverting the expression, we obtain:

1/((((-1)^2 (10*2+1)*0.5^(2(5*2+1)/2))))

Input:

$$\frac{1}{(-1)^2\ (10\times 2+1)\times 0.5^{2\,(1/2\,(5\times 2+1))}}$$

Result:

97.523809523809523809

$$2\pi\left(\frac{-1}{-(10\times 2+3)\,0.5^{1/2\,(5\times 2+3)\,2}\,\sqrt[5]{0.5}\;(-1)^2}+\frac{1}{(-1)^2\,(10\times 2+1)\,0.5^{2/2\,(5\times 2+1)}}\right)=$$
$$2\cos^{-1}(-1)\left(\frac{1}{21\times 0.5^{11}}--\frac{1}{23\times 0.5^{13}\,\sqrt[5]{0.5}}\right)$$

Series representations:

$$2\pi\left(\frac{-1}{-(10\times 2+3)\,0.5^{1/2\,(5\times 2+3)\,2}\,\sqrt[5]{0.5}\;(-1)^2}+\frac{1}{(-1)^2\,(10\times 2+1)\,0.5^{2/2\,(5\times 2+1)}}\right)=$$
$$4053.28\sum_{k=0}^{\infty}\frac{(-1)^k}{1+2k}$$

$$2\pi\left(\frac{-1}{-(10\times 2+3)\,0.5^{1/2\,(5\times 2+3)\,2}\,\sqrt[5]{0.5}\;(-1)^2}+\frac{1}{(-1)^2\,(10\times 2+1)\,0.5^{2/2\,(5\times 2+1)}}\right)=$$
$$-2026.64+2026.64\sum_{k=1}^{\infty}\frac{2^k}{\binom{2k}{k}}$$

$$2\pi\left(\frac{-1}{-(10\times 2+3)\,0.5^{1/2\,(5\times 2+3)\,2}\,\sqrt[5]{0.5}\;(-1)^2}+\frac{1}{(-1)^2\,(10\times 2+1)\,0.5^{2/2\,(5\times 2+1)}}\right)=$$
$$1013.32\sum_{k=0}^{\infty}\frac{2^{-k}\,(-6+50k)}{\binom{3k}{k}}$$

Integral representations:

$$2\pi\left(\frac{-1}{-(10\times 2+3)\,0.5^{1/2\,(5\times 2+3)\,2}\,\sqrt[5]{0.5}\;(-1)^2}+\frac{1}{(-1)^2\,(10\times 2+1)\,0.5^{2/2\,(5\times 2+1)}}\right)=$$
$$2026.64\int_0^{\infty}\frac{1}{1+t^2}\,dt$$

$$2\pi\left(\frac{-1}{-(10\times 2+3)\,0.5^{1/2\,(5\times 2+3)\,2}\,\sqrt[5]{0.5}\;(-1)^2}+\frac{1}{(-1)^2\,(10\times 2+1)\,0.5^{2/2\,(5\times 2+1)}}\right)=$$
$$4053.28\int_0^1\sqrt{1-t^2}\,dt$$

$$2\pi\left(\frac{-1}{-(10\times 2+3)\,0.5^{1/2\,(5\times 2+3)\,2}\,\sqrt[5]{0.5}\;(-1)^2}+\frac{1}{(-1)^2\,(10\times 2+1)\,0.5^{2/2\,(5\times 2+1)}}\right)=$$
$$2026.64\int_0^{\infty}\frac{\sin(t)}{t}\,dt$$

2Pi*[(((-1/(((-0.5^(1/5) * (-1)^(2) (10*2+3)*0.5^((5*2+3)*2/2)))))))+ (((1/((((-1)^2 (10*2+1)*0.5^(2(5*2+1)/2)))))))]-89+2

Input:

$$2\pi\left(\frac{-1}{-\sqrt[5]{0.5}\;(-1)^2\left((10\times 2+3)\times 0.5^{(5\times 2+3)\times 2/2}\right)}+\frac{1}{(-1)^2\,(10\times 2+1)\times 0.5^{2\,(1/2\,(5\times 2+1))}}\right)-$$
$$89+2$$

Result:

3096.44…

3096.44… result practically equal to the rest mass of J/Psi meson 3096.916

Alternative representations:

$$2\pi\left(\frac{-1}{-(10\times 2+3)\,0.5^{1/2\,(5\times 2+3)\,2}\,\sqrt[5]{0.5}\;(-1)^2}+\frac{1}{(-1)^2\,(10\times 2+1)\,0.5^{2/2\,(5\times 2+1)}}\right)-89+2=$$
$$-87+360^{\circ}\left(\frac{1}{21\times 0.5^{11}}--\frac{1}{23\times 0.5^{13}\,\sqrt[5]{0.5}}\right)$$

$$2\pi\left(\frac{-1}{-(10\times 2+3)\,0.5^{1/2\,(5\times 2+3)\,2}\,\sqrt[5]{0.5}\;(-1)^2}+\frac{1}{(-1)^2\,(10\times 2+1)\,0.5^{2/2\,(5\times 2+1)}}\right)-89+2=$$
$$-87-2\,i\log(-1)\left(\frac{1}{21\times 0.5^{11}}--\frac{1}{23\times 0.5^{13}\,\sqrt[5]{0.5}}\right)$$

$$2\pi\left(\frac{-1}{-(10\times 2+3)\,0.5^{1/2\,(5\times 2+3)\,2}\,\sqrt[5]{0.5}\;(-1)^2}+\frac{1}{(-1)^2\,(10\times 2+1)\,0.5^{2/2\,(5\times 2+1)}}\right)-89+2=$$
$$-87+2\cos^{-1}(-1)\left(\frac{1}{21\times 0.5^{11}}--\frac{1}{23\times 0.5^{13}\,\sqrt[5]{0.5}}\right)$$

Series representations:

$$2\pi\left(\frac{-1}{-(10\times 2+3)\,0.5^{1/2\,(5\times 2+3)\,2}\,\sqrt[5]{0.5}\,(-1)^2}+\frac{1}{(-1)^2\,(10\times 2+1)\,0.5^{2/2\,(5\times 2+1)}}\right)-89+2=$$
$$-87+4053.28\sum_{k=0}^{\infty}\frac{(-1)^k}{1+2k}$$

$$2\pi\left(\frac{-1}{-(10\times 2+3)\,0.5^{1/2\,(5\times 2+3)\,2}\,\sqrt[5]{0.5}\,(-1)^2}+\frac{1}{(-1)^2\,(10\times 2+1)\,0.5^{2/2\,(5\times 2+1)}}\right)-89+2=$$
$$-2113.64+2026.64\sum_{k=1}^{\infty}\frac{2^k}{\binom{2k}{k}}$$

$$2\pi\left(\frac{-1}{-(10\times 2+3)\,0.5^{1/2\,(5\times 2+3)\,2}\,\sqrt[5]{0.5}\,(-1)^2}+\frac{1}{(-1)^2\,(10\times 2+1)\,0.5^{2/2\,(5\times 2+1)}}\right)-89+2=$$
$$-87+1013.32\sum_{k=0}^{\infty}\frac{2^{-k}\,(-6+50k)}{\binom{3k}{k}}$$

Integral representations:

$$2\pi\left(\frac{-1}{-(10\times 2+3)\,0.5^{1/2\,(5\times 2+3)\,2}\,\sqrt[5]{0.5}\,(-1)^2}+\frac{1}{(-1)^2\,(10\times 2+1)\,0.5^{2/2\,(5\times 2+1)}}\right)-89+2=$$
$$-87+2026.64\int_0^{\infty}\frac{1}{1+t^2}\,dt$$

$$2\pi\left(\frac{-1}{-(10\times 2+3)\,0.5^{1/2\,(5\times 2+3)\,2}\,\sqrt[5]{0.5}\,(-1)^2}+\frac{1}{(-1)^2\,(10\times 2+1)\,0.5^{2/2\,(5\times 2+1)}}\right)-89+2=$$
$$-87+4053.28\int_0^{1}\sqrt{1-t^2}\,dt$$

$$2\pi\left(\frac{-1}{-(10\times 2+3)\,0.5^{1/2\,(5\times 2+3)\,2}\,\sqrt[5]{0.5}\,(-1)^2}+\frac{1}{(-1)^2\,(10\times 2+1)\,0.5^{2/2\,(5\times 2+1)}}\right)-89+2=$$
$$-87+2026.64\int_0^{\infty}\frac{\sin(t)}{t}\,dt$$

Now, we have that:

The most important special cases of $f(a,b)$ are defined by (in Ramanujan's notation)

$$\varphi(q) := f(q,q) = \sum_{n=-\infty}^{\infty} q^{n^2} = (-q;q^2)_\infty^2 (q^2;q^2)_\infty = \frac{(-q;-q)_\infty}{(q;-q)_\infty}, \quad |q|<1, \tag{1.1.6}$$

$$\psi(q) := f(q,q^3) = \sum_{n=0}^{\infty} q^{n(n+1)/2} = \frac{(q^2;q^2)_\infty}{(q;q^2)_\infty}, \qquad |q|<1, \tag{1.1.7}$$

and

$$f(-q) := f(-q,-q^2) = \sum_{n=-\infty}^{\infty} (-1)^n q^{n(3n-1)/2} = (q;q)_\infty, \qquad |q|<1, \tag{1.1.8}$$

From:

Lemma 1.10.1. *If R is defined by* (1.10.5), *then*

$$\sqrt{\frac{1}{v^6} - \frac{8+4R\omega}{v}} \pm \sqrt{\frac{1}{v^6} - \frac{8+4R\omega^2}{v}}$$

$$= \sqrt{\frac{2}{v^6} - \frac{16}{v} + \frac{4R}{v} \pm 2\sqrt{\left(\frac{1}{v^6} - \frac{8}{v} - \frac{4R\omega}{v}\right)\left(\frac{1}{v^6} - \frac{8}{v} - \frac{4R\omega^2}{v}\right)}} \tag{1.10.9}$$

$$= \sqrt{\frac{2}{v^6} - \frac{16}{v} + \frac{4R}{v} \pm 2\sqrt{\left(\frac{1}{v^6} - \frac{8}{v}\right)^2 + \left(\frac{1}{v^6} - \frac{8}{v}\right)\left(\frac{4R}{v}\right) + \frac{16R^2}{v^2}}} \tag{1.10.10}$$

$$= \sqrt{\frac{2}{v^6} - \frac{16}{v} + \frac{4R}{v} \pm \left(\frac{2}{v^3}\sqrt{\frac{1}{v^6} - \frac{4R}{v} - \frac{8}{v}} - \frac{8(1-R+2v^5)}{v\sqrt{1-8v^5-4Rv^5}}\right)}. \tag{1.10.11}$$

for R = v = 1 and ω = exp(2πi/3), we obtain:

sqrt((2-16+4+((2sqrt(1-4-8)-((8(1-1+2)))/((sqrt(1-8-4)))))))

Input:

$$\sqrt{2-16+4+\left(2\sqrt{1-4-8}-\frac{8\,(1-1+2)}{\sqrt{1-8-4}}\right)}$$

Result:

$$\sqrt{-10+\frac{16\,i}{\sqrt{11}}+2\,i\sqrt{11}}$$

Decimal approximation:

1.613637749854373369783116488943448411749380313719441835 03... +
3.550186866596614128736223944899503956997526039455638571 54... i

Polar coordinates:

$r \approx 3.8997$ (radius), $\theta \approx 65.5572°$ (angle)
3.8997

Alternate forms:

$$\frac{1}{11}\sqrt{22\left(-55+19\,i\sqrt{11}\right)}$$

$$\sqrt{-10+\frac{38\,i}{\sqrt{11}}}$$

$$\sqrt{\frac{2}{11}\left(-55+19\,i\sqrt{11}\right)}$$

Minimal polynomial:

$11\,x^4+220\,x^2+2544$

All 2nd roots of -10 + (16 i)/sqrt(11) + 2 i sqrt(11):

$$\sqrt[4]{100+\left(\frac{16}{\sqrt{11}}+2\sqrt{11}\right)^2}\ \exp\left(\frac{1}{2}\,i\left(\pi+\tan^{-1}\left(\frac{1}{10}\left(-\frac{16}{\sqrt{11}}-2\sqrt{11}\right)\right)\right)\right)$$

$\approx 1.6136+3.5502\,i$ (principal root)

$$\sqrt[4]{100+\left(\frac{16}{\sqrt{11}}+2\sqrt{11}\right)^2}\ \exp\left(i\left(-2\pi+\frac{1}{2}\left(3\pi+\tan^{-1}\left(\frac{1}{10}\left(-\frac{16}{\sqrt{11}}-2\sqrt{11}\right)\right)\right)\right)\right)$$

$\approx -1.6136-3.5502\,i$

$\tan^{-1}(x)$ is the inverse tangent function

From which:

1+1/(((sqrt((2-16+4+((2sqrt(1-4-8)-((8(1-1+2)))/((sqrt(1-8-4)))))))))^1/3

Input:

$$1+\frac{1}{\sqrt[3]{\sqrt{2-16+4+\left(2\sqrt{1-4-8}-\frac{8\,(1-1+2)}{\sqrt{1-8-4}}\right)}}}$$

Result:

$$1+\frac{1}{\sqrt[6]{-10+\frac{16\,i}{\sqrt{11}}+2\,i\sqrt{11}}}$$

Decimal approximation:

1.589665711239862026470024688857710809450922922275557296 0... –
0.236475091496475107364267258790555480388242731469044334 05... i

Input interpretation:

1.589665711239862026470024688857710809450922922275557296 0 +
$i\times$(−0.236475091496475107364267258790555480388242731469044334 05)

i is the imaginary unit

Result:

1.589665711239862026470024688857710809450922922275557296... –
0.236475091496475107364267258790555480388242731469044334 05... i

Polar coordinates:

$r = 1.607158219463784677062983701183118867522652457345195731$ (radius),
$\theta = -8.461143383057577896411614948772982044174149889540747260°$ (angle)

1.6071582194637…..

Alternate forms:

$$\frac{\sqrt[3]{11} + \sqrt[6]{22\left(-55 + 19\,i\sqrt{11}\right)}}{\sqrt[6]{22\left(-55 + 19\,i\sqrt{11}\right)}}$$

$$1 + \frac{1}{\sqrt[6]{-10 + \frac{38\,i}{\sqrt{11}}}}$$

$$1 + \frac{1}{\sqrt[6]{\frac{2}{11}\left(-55 + 19\,i\sqrt{11}\right)}}$$

Minimal polynomial:

$$2544\,x^{12} - 30528\,x^{11} + 167904\,x^{10} - 559680\,x^{9} + 1259280\,x^{8} - 2014848\,x^{7} + 2350876\,x^{6} - 2016168\,x^{5} + 1262580\,x^{4} - 564080\,x^{3} + 171204\,x^{2} - 31848\,x + 2775$$

sqrt(1-8+4(exp(((2Pi*i)/3))))+sqrt(1-8+4(((exp(2Pi*i)/3))))

Input:

$$\sqrt{1 - 8 + 4\exp\left(\frac{1}{3}(2\,\pi\,i)\right)} + \sqrt{1 - 8 + 4\left(\frac{1}{3}\exp(2\,\pi\,i)\right)}$$

i is the imaginary unit

Exact result:

$$i\sqrt{\frac{17}{3}} + \sqrt{-7 + 4\,e^{(2\,i\,\pi)/3}}$$

Decimal approximation:

0.567296554278692492994013513842984951796686777476627450 60... +
5.433642594336378439152325556306413421825419544632938936 2... i

Input interpretation:

$$0.567296554278692492994013513842984951796686777476627450 60 + 5.433642594336378439152325556306413421825419544632938936 2\, i$$

i is the imaginary unit

Result:

0.567296554278692492994013513842984951796686777476627450 6... +
5.433642594336378439152325556306413421825419544632938936 2... i

Polar coordinates:

$r = 5.463176477424379045203567125938694225806609745274288 1666$ (radius),
$\theta = 84.039658622893832096070140556098070249380759049831094842°$ (angle)

5.46317647…

Alternate forms:

$$\sqrt{4(-1)^{2/3} - 7} + i\sqrt{\frac{17}{3}}$$

$$\frac{1}{3}\left(3\sqrt{4(-1)^{2/3} - 7} + i\sqrt{51}\right)$$

$$\sqrt{\frac{2}{3}\left(-22 + 3i\sqrt{3} - \sqrt{51\left(9 - 2i\sqrt{3}\right)}\right)}$$

Series representations:

$$\sqrt{1 - 8 + 4\exp\left(\frac{2(\pi i)}{3}\right)} + \sqrt{1 - 8 + \frac{4}{3}\exp(2\pi i)} = \sum_{k=0}^{\infty}\binom{\frac{1}{2}}{k}\left(\left(-8 + 4\exp\left(\frac{2i\pi}{3}\right)\right)^{-k}\sqrt{-8 + 4\exp\left(\frac{2i\pi}{3}\right)} + \left(-8 + \frac{4}{3}\exp(2i\pi)\right)^{-k}\sqrt{-8 + \frac{4}{3}\exp(2i\pi)}\right)$$

$$\sqrt{1-8+4\exp\left(\frac{2(\pi i)}{3}\right)}+\sqrt{1-8+\frac{4}{3}\exp(2\pi i)}=$$
$$\sum_{k=0}^{\infty}\frac{1}{k!}\left(-\frac{1}{2}\right)_k\left(\left(-\frac{1}{4}\right)^k\left(-2+\exp\left(\frac{2i\pi}{3}\right)\right)^{-k}\sqrt{-8+4\exp\left(\frac{2i\pi}{3}\right)}+\left(-\frac{3}{4}\right)^k(-6+\exp(2i\pi))^{-k}\sqrt{-8+\frac{4}{3}\exp(2i\pi)}\right)$$

$$\sqrt{1-8+4\exp\left(\frac{2(\pi i)}{3}\right)}+\sqrt{1-8+\frac{4}{3}\exp(2\pi i)}=$$
$$\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(\left(-7+4\exp\left(\frac{2i\pi}{3}\right)-z_0\right)^k+\left(-7+\frac{4}{3}\exp(2i\pi)-z_0\right)^k\right)z_0^{-k}}{k!}$$
for $(\text{not}\ (z_0\in\mathbb{R}\ \text{and}\ -\infty<z_0\le 0))$

We have also:

1+1/(((sqrt(1-8+4(exp(((2Pi*i)/3))))+sqrt(1-8+4(((exp(2Pi*i)/3)))))))^1/4

Input:

$$1+\frac{1}{\sqrt[4]{\sqrt{1-8+4\exp\left(\frac{1}{3}(2\pi i)\right)}+\sqrt{1-8+4\left(\frac{1}{3}\exp(2\pi i)\right)}}}$$

i is the imaginary unit

Exact result:

$$1+\frac{1}{\sqrt[4]{i\sqrt{\frac{17}{3}}+\sqrt{-7+4e^{(2i\pi)/3}}}}$$

Decimal approximation:

1.6106067131360742967147889935815711490967722280248767413... −
0.2345111956161100556433885077744321884456067874594032338 8... i

Input interpretation:

$$1.6106067131360742967147889935815711490967722280248767413+i\times(-0.2345111956161100556433885077744321884456067874594032338 8)$$

i is the imaginary unit

Result:

1.6106067131360742967147889935815711490967722280248767413... −
0.2345111956161100556433885077744321884456067874594032338 8... i

Polar coordinates:

$r = 1.627590085146836398210372469659278865685544396733662879 1$ (radius),

$\theta = -8.284292829850051301138644247412279152522457271938309772°$ (angle)

1.627590085146836

Alternate forms:

$$1+\frac{1}{\sqrt[4]{\sqrt{4(-1)^{2/3}-7}+i\sqrt{\frac{17}{3}}}}$$

$$1+\frac{1}{\sqrt[4]{\frac{1}{3}\left(3\sqrt{4(-1)^{2/3}-7}+i\sqrt{51}\right)}}$$

$$\frac{1+\sqrt[4]{i\sqrt{\frac{17}{3}}+\sqrt{-7+4e^{(2i\pi)/3}}}}{\sqrt[4]{i\sqrt{\frac{17}{3}}+\sqrt{-7+4e^{(2i\pi)/3}}}}$$

Series representations:

$$1+\frac{1}{\sqrt[4]{\sqrt{1-8+4\exp\left(\frac{2(\pi i)}{3}\right)}+\sqrt{1-8+\frac{4}{3}\exp(2\pi i)}}}=$$

$$1+1\Big/\left(\left(\sum_{k=0}^{\infty}\binom{\frac{1}{2}}{k}\right)\left(\left(-8+4\exp\left(\frac{2i\pi}{3}\right)\right)^{-k}\sqrt{-8+4\exp\left(\frac{2i\pi}{3}\right)}+\left(-8+\frac{4}{3}\exp(2i\pi)\right)^{-k}\sqrt{-8+\frac{4}{3}\exp(2i\pi)}\right)\right)\text{^}(1/4)$$

$$1+\frac{1}{\sqrt[4]{\sqrt{1-8+4\exp\left(\frac{2(\pi i)}{3}\right)}+\sqrt{1-8+\frac{4}{3}\exp(2\pi i)}}}=1+\frac{1}{\sqrt[4]{\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{2}\right)_k\left(\left(-\frac{1}{4}\right)^k\left(-2+\exp\left(\frac{2i\pi}{3}\right)\right)^{-k}\sqrt{-8+4\exp\left(\frac{2i\pi}{3}\right)}+\left(-\frac{3}{4}\right)^k(-6+\exp(2i\pi))^{-k}\sqrt{-8+\frac{4}{3}\exp(2i\pi)}\right)}{k!}}}$$

$$1+\frac{1}{\sqrt[4]{\sqrt{1-8+4\exp\left(\frac{2(\pi i)}{3}\right)}+\sqrt{1-8+\frac{4}{3}\exp(2\pi i)}}}=$$
$$1+1\Big/\left(\left(\sum_{k=0}^{\infty}\frac{1}{k!}(-1)^k x^{-k}\left(\left(-7-x+4\exp\left(\frac{2i\pi}{3}\right)\right)^k\exp\left(\pi\mathcal{A}\left\lfloor\frac{\arg\left(-7-x+4\exp\left(\frac{2i\pi}{3}\right)\right)}{2\pi}\right\rfloor\right)+\left(-7-x+\frac{4}{3}\exp(2i\pi)\right)^k\exp\left(\pi\mathcal{A}\left\lfloor\frac{\arg\left(-7-x+\frac{4}{3}\exp(2i\pi)\right)}{2\pi}\right\rfloor\right)\right)\left(-\frac{1}{2}\right)_k\sqrt{x}\right)\text{^}(1/4)\right)\quad\text{for}\ (x\in\mathbb{R}\ \text{and}\ x<0)$$

From the ratio between the two results, we obtain:

(((sqrt(1-8+4(exp(((2Pi*i)/3))))+sqrt(1-8+4(((exp(2Pi*i)/3)))))))) * 1 /((((sqrt((2-16+4+((2sqrt(1-4-8)-((8(1-1+2)))/((sqrt(1-8-4))))))))))

Input:

$$\left(\sqrt{1-8+4\exp\left(\frac{1}{3}(2\pi i)\right)}+\sqrt{1-8+4\left(\frac{1}{3}\exp(2\pi i)\right)}\right)\times\frac{1}{\sqrt{2-16+4+\left(2\sqrt{1-4-8}-\frac{8(1-1+2)}{\sqrt{1-8-4}}\right)}}$$

i is the imaginary unit

Exact result:

$$\frac{i\sqrt{\frac{17}{3}}+\sqrt{-7+4e^{(2i\pi)/3}}}{\sqrt{-10+\frac{16i}{\sqrt{11}}+2i\sqrt{11}}}$$

Decimal approximation:

1.32866372916845775671936231609515265610428353383285001 44... +
0.44411335380813555443875670540300766408066529365137018121... i

Polar coordinates:

$r \approx 1.40092$ (radius), $\theta \approx 18.4825°$ (angle)

1.40092

Alternate forms:

$$\frac{3\sqrt{4(-1)^{2/3}-7}+i\sqrt{51}}{3\sqrt{-10+\frac{38i}{\sqrt{11}}}}$$

$$\frac{3\sqrt{4(-1)^{2/3}-7}+i\sqrt{51}}{3\sqrt{\frac{2}{11}\left(-55+19i\sqrt{11}\right)}}$$

$$\frac{\sqrt[4]{11}\left(i\sqrt{\frac{17}{3}}+\sqrt{-7+4e^{(2i\pi)/3}}\right)}{\sqrt{2\left(-5\sqrt{11}+19i\right)}}$$

Series representations:

$$\frac{\sqrt{1-8+4\exp\left(\frac{2\pi i}{3}\right)}+\sqrt{1-8+\frac{4}{3}\exp(2\pi i)}}{\sqrt{2-16+4+\left(2\sqrt{1-4-8}-\frac{8(1-1+2)}{\sqrt{1-8-4}}\right)}}=$$
$$\left(\sqrt{-8+4\exp\left(\frac{2i\pi}{3}\right)}\sum_{k=0}^{\infty}\binom{\frac{1}{2}}{k}\left(-8+4\exp\left(\frac{2i\pi}{3}\right)\right)^{-k}+\sqrt{-8+\frac{4}{3}\exp(2i\pi)}\sum_{k=0}^{\infty}\binom{\frac{1}{2}}{k}\left(-8+\frac{4}{3}\exp(2i\pi)\right)^{-k}\right)\Big/$$
$$\left(\sqrt{-11-\frac{16}{\sqrt{-11}}+2\sqrt{-11}}\sum_{k=0}^{\infty}\binom{\frac{1}{2}}{k}\left(-11-\frac{16}{\sqrt{-11}}+2\sqrt{-11}\right)^{-k}\right)$$

$$\frac{\sqrt{1-8+4\exp\left(\frac{2\pi i}{3}\right)}+\sqrt{1-8+\frac{4}{3}\exp(2\pi i)}}{\sqrt{2-16+4+\left(2\sqrt{1-4-8}-\frac{8(1-1+2)}{\sqrt{1-8-4}}\right)}}=$$
$$\left(\sqrt{-8+4\exp\left(\frac{2i\pi}{3}\right)}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{4}\right)^k\left(-2+\exp\left(\frac{2i\pi}{3}\right)\right)^{-k}\left(-\frac{1}{2}\right)_k}{k!}+\sqrt{-8+\frac{4}{3}\exp(2i\pi)}\sum_{k=0}^{\infty}\frac{\left(-\frac{3}{4}\right)^k(-6+\exp(2i\pi))^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)\Big/$$
$$\left(\sqrt{-11-\frac{16}{\sqrt{-11}}+2\sqrt{-11}}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(-11-\frac{16}{\sqrt{-11}}+2\sqrt{-11}\right)^{-k}}{k!}\right)$$

$$\frac{\sqrt{1-8+4\exp\left(\frac{2\pi i}{3}\right)}+\sqrt{1-8+\frac{4}{3}\exp(2\pi i)}}{\sqrt{2-16+4+\left(2\sqrt{1-4-8}-\frac{8(1-1+2)}{\sqrt{1-8-4}}\right)}}=$$
$$\left(\sum_{j=0}^{\infty}\left(\operatorname{Res}_{s=-\frac{1}{2}+j}\left(-8+4\exp\left(\frac{2i\pi}{3}\right)\right)^{-s}\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)+\operatorname{Res}_{s=-\frac{1}{2}+j}\left(-8+\frac{4}{3}\exp(2i\pi)\right)^{-s}\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)\right)\right)\Big/$$
$$\left(\sum_{j=0}^{\infty}\operatorname{Res}_{s=-\frac{1}{2}+j}\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)\left(-11-\frac{16}{\sqrt{-11}}+2\sqrt{-11}\right)^{-s}\right)$$

And we obtain also:

sqrt[2(((((((sqrt(1-8+4(exp(((2Pi*i)/3))))+sqrt(1-8+4(((exp(2Pi*i)/3))))))) * 1 /((((sqrt((2-16+4+((2sqrt(1-4-8)-((8(1-1+2)))/((sqrt(1-8-4))))))))))))))]

Input:

$$\sqrt{\left(2\left(\left(\sqrt{1-8+4\exp\left(\frac{1}{3}(2\pi i)\right)}+\sqrt{1-8+4\left(\frac{1}{3}\exp(2\pi i)\right)}\right)\times\frac{1}{\sqrt{2-16+4+\left(2\sqrt{1-4-8}-\frac{8(1-1+2)}{\sqrt{1-8-4}}\right)}}\right)\right)}$$

i is the imaginary unit

Exact result:

$$\sqrt{\frac{2\left(i\sqrt{\frac{17}{3}}+\sqrt{-7+4e^{(2i\pi)/3}}\right)}{\sqrt{-10+\frac{16i}{\sqrt{11}}+2i\sqrt{11}}}}$$

Decimal approximation:

1.652145960218050552365172062709362587406128119268312337 8... +
0.268809998935881782315108750061124654257404706239215884 81... i

Polar coordinates:

$r \approx 1.67387$ (radius), $\theta \approx 9.24125°$ (angle)

1.67387

Alternate forms:

$$\sqrt{\frac{3\sqrt{4(-1)^{2/3}-7}+i\sqrt{51}}{3\sqrt{-\frac{5}{2}+\frac{19i}{2\sqrt{11}}}}}$$

$$\sqrt{\sqrt{4(-1)^{2/3}-7}+i\sqrt{\frac{17}{3}}}$$

root of $159x^8+55x^4+11$ near $x=0.60211-0.387715\,i$

$$\sqrt[8]{11}\sqrt{\frac{i\sqrt{\frac{17}{3}}+\sqrt{-7+4e^{(2i\pi)/3}}}{\sqrt{\frac{1}{2}(-5\sqrt{11}+19i)}}}$$

All 2nd roots of (2 (i sqrt(17/3) + sqrt(-7 + 4 e^((2 i π)/3))))/sqrt(-10 + (16 i)/sqrt(11) + 2 i sqrt(11)):

$$\left(\sqrt{2}\,\exp\left(\frac{1}{2}\,i\arg\left(\frac{i\sqrt{\frac{17}{3}}+\sqrt{-7+4e^{(2i\pi)/3}}}{\sqrt{-10+\frac{16i}{\sqrt{11}}+2i\sqrt{11}}}\right)\right)\right.$$
$$\left.\sqrt[4]{\left(\sqrt{\frac{17}{3}}+\mathrm{Im}\left(\sqrt{-7+4e^{(2i\pi)/3}}\right)\right)^2+\mathrm{Re}\left(\sqrt{-7+4e^{(2i\pi)/3}}\right)^2}\right)\Big/$$
$$\left(\sqrt[8]{100+\left(\frac{16}{\sqrt{11}}+2\sqrt{11}\right)^2}\right)\approx 1.6521+0.2688\,i \text{ (principal root)}$$

$$\left(\sqrt{2}\,\exp\left(i\left(-2\pi+\frac{1}{2}\left(2\pi+\arg\left(\frac{i\sqrt{\frac{17}{3}}+\sqrt{-7+4e^{(2i\pi)/3}}}{\sqrt{-10+\frac{16i}{\sqrt{11}}+2i\sqrt{11}}}\right)\right)\right)\right)\right.$$
$$\left.\sqrt[4]{\left(\sqrt{\frac{17}{3}}+\mathrm{Im}\left(\sqrt{-7+4e^{(2i\pi)/3}}\right)\right)^2+\mathrm{Re}\left(\sqrt{-7+4e^{(2i\pi)/3}}\right)^2}\right)\Big/$$
$$\left(\sqrt[8]{100+\left(\frac{16}{\sqrt{11}}+2\sqrt{11}\right)^2}\right)\approx -1.6521-0.2688\,i$$

Series representations:

$$\sqrt{\frac{2\left(\sqrt{1-8+4\exp\left(\frac{2\pi i}{3}\right)}+\sqrt{1-8+\frac{4}{3}\exp(2\pi i)}\right)}{\sqrt{2-16+4+\left(2\sqrt{1-4-8}-\frac{8(1-1+2)}{\sqrt{1-8-4}}\right)}}}=$$

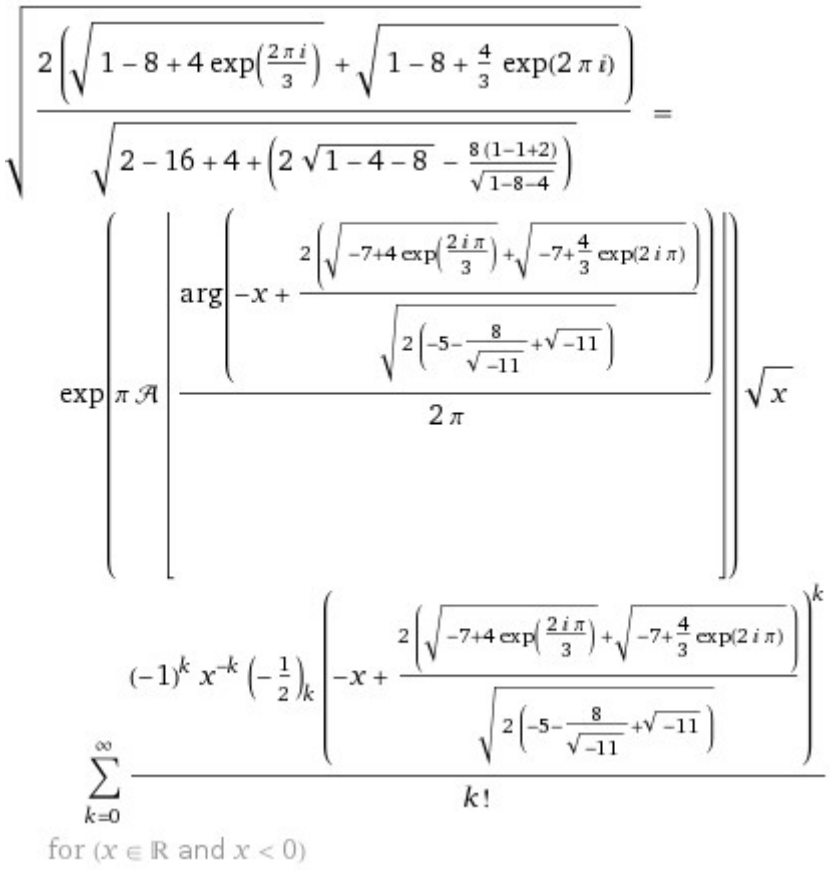
$$\sqrt{-1+\frac{2\left(\sqrt{-7+4\exp\left(\frac{2i\pi}{3}\right)}+\sqrt{-7+\frac{4}{3}\exp(2i\pi)}\right)}{\sqrt{2\left(-5-\frac{8}{\sqrt{-11}}+\sqrt{-11}\right)}}}$$

$$\sum_{k=0}^{\infty}\binom{\frac{1}{2}}{k}\left(-1+\frac{2\left(\sqrt{-7+4\exp\left(\frac{2i\pi}{3}\right)}+\sqrt{-7+\frac{4}{3}\exp(2i\pi)}\right)}{\sqrt{2\left(-5-\frac{8}{\sqrt{-11}}+\sqrt{-11}\right)}}\right)^{-k}$$

$$\sqrt{\frac{2\left(\sqrt{1-8+4\exp\left(\frac{2\pi i}{3}\right)}+\sqrt{1-8+\frac{4}{3}\exp(2\pi i)}\right)}{\sqrt{2-16+4+\left(2\sqrt{1-4-8}-\frac{8(1-1+2)}{\sqrt{1-8-4}}\right)}}}=$$

$$\sqrt{-1+\frac{2\left(\sqrt{-7+4\exp\left(\frac{2i\pi}{3}\right)}+\sqrt{-7+\frac{4}{3}\exp(2i\pi)}\right)}{\sqrt{2\left(-5-\frac{8}{\sqrt{-11}}+\sqrt{-11}\right)}}}$$

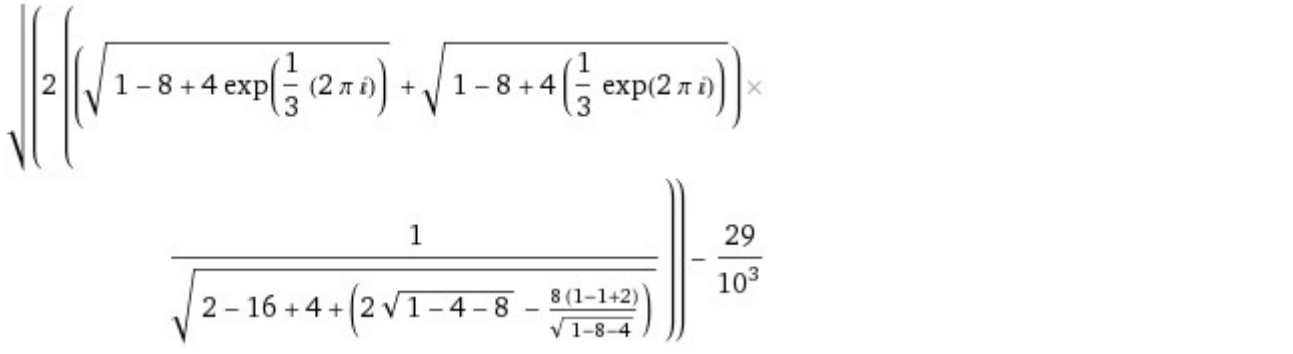
$$\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(-1+\frac{2\left(\sqrt{-7+4\exp\left(\frac{2i\pi}{3}\right)}+\sqrt{-7+\frac{4}{3}\exp(2i\pi)}\right)}{\sqrt{2\left(-5-\frac{8}{\sqrt{-11}}+\sqrt{-11}\right)}}\right)^{-k}}{k!}$$



We have also:

sqrt[2(((((((sqrt(1-8+4(exp(((2Pi*i)/3))))+sqrt(1-8+4(((exp(2Pi*i)/3))))))) * 1 /((((sqrt((2-16+4+((2sqrt(1-4-8)-((8(1-1+2)))/((sqrt(1-8-4))))))))))))]-29/10^3

Input:



i is the imaginary unit

Exact result:

$$-\frac{29}{1000}+\sqrt{\frac{2\left(i\sqrt{\frac{17}{3}}+\sqrt{-7+4\,e^{(2\,i\,\pi)/3}}\right)}{\sqrt{-10+\frac{16\,i}{\sqrt{11}}+2\,i\sqrt{11}}}}$$

Decimal approximation:

1.623145960218050552365172062709362587406128119268312337 8... +
0.268809998935881782315108750061124654257404706239215884 81... i

Input interpretation:

1.623145960218050552365172062709362587406128119268312337 8 +
0.268809998935881782315108750061124654257404706239215884 81 i

i is the imaginary unit

Result:

1.623145960218050552365172062709362587406128119268312337 8... +
0.268809998935881782315108750061124654257404706239215884 81... i

Polar coordinates:

$r = 1.645254273266015896927554398142703961156836839731549064 7$ (radius),

$\theta = 9.403433241970401868909139004417889790783145500139543780°$ (angle)

$1.64525427\ldots \approx \zeta(2) = \frac{\pi^2}{6} = 1.644934\ldots$

Alternate forms:

$$-\frac{29}{1000}+\sqrt{\frac{3\sqrt{4\,(-1)^{2/3}-7}+i\sqrt{51}}{3\sqrt{-\frac{5}{2}+\frac{19\,i}{2\sqrt{11}}}}}$$

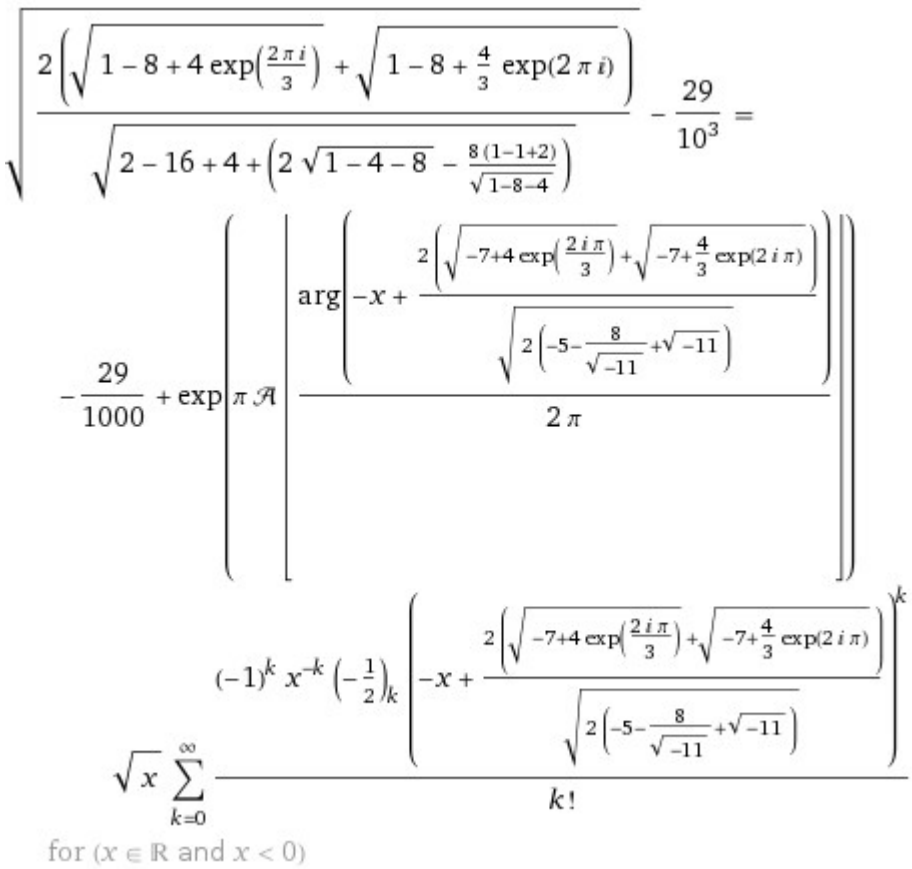
$$-\frac{29}{1000}+\sqrt[8]{11}\sqrt{\frac{i\sqrt{\frac{17}{3}}+\sqrt{-7+4\,e^{(2\,i\,\pi)/3}}}{\sqrt{\frac{1}{2}\left(-5\sqrt{11}+19\,i\right)}}}$$

$$\frac{-29+1000\sqrt[8]{11}\,\sqrt{\frac{i\sqrt{\frac{17}{3}}+\sqrt{-7+4\,e^{(2\,i\,\pi)/3}}}{\sqrt{\frac{1}{2}\left(-5\sqrt{11}+19\,i\right)}}}}{1000}$$

Series representations:

$$\sqrt{\frac{2\left(\sqrt{1-8+4\exp\left(\frac{2\pi i}{3}\right)}+\sqrt{1-8+\frac{4}{3}\exp(2\pi i)}\right)}{\sqrt{2-16+4+\left(2\sqrt{1-4-8}-\frac{8(1-1+2)}{\sqrt{1-8-4}}\right)}}}-\frac{29}{10^3}=$$
$$-\frac{29}{1000}+\sqrt{-1+\frac{2\left(\sqrt{-7+4\exp\left(\frac{2i\pi}{3}\right)}+\sqrt{-7+\frac{4}{3}\exp(2i\pi)}\right)}{\sqrt{2\left(-5-\frac{8}{\sqrt{-11}}+\sqrt{-11}\right)}}}$$
$$\sum_{k=0}^{\infty}\binom{\frac{1}{2}}{k}\left(-1+\frac{2\left(\sqrt{-7+4\exp\left(\frac{2i\pi}{3}\right)}+\sqrt{-7+\frac{4}{3}\exp(2i\pi)}\right)}{\sqrt{2\left(-5-\frac{8}{\sqrt{-11}}+\sqrt{-11}\right)}}\right)^{-k}$$

$$\sqrt{\frac{2\left(\sqrt{1-8+4\exp\left(\frac{2\pi i}{3}\right)}+\sqrt{1-8+\frac{4}{3}\exp(2\pi i)}\right)}{\sqrt{2-16+4+\left(2\sqrt{1-4-8}-\frac{8(1-1+2)}{\sqrt{1-8-4}}\right)}}}-\frac{29}{10^3}=$$
$$-\frac{29}{1000}+\sqrt{-1+\frac{2\left(\sqrt{-7+4\exp\left(\frac{2i\pi}{3}\right)}+\sqrt{-7+\frac{4}{3}\exp(2i\pi)}\right)}{\sqrt{2\left(-5-\frac{8}{\sqrt{-11}}+\sqrt{-11}\right)}}}$$
$$\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(-1+\frac{2\left(\sqrt{-7+4\exp\left(\frac{2i\pi}{3}\right)}+\sqrt{-7+\frac{4}{3}\exp(2i\pi)}\right)}{\sqrt{2\left(-5-\frac{8}{\sqrt{-11}}+\sqrt{-11}\right)}}\right)^{-k}}{k!}$$



1.627590085146836+1.6071582194637+1.67387

1/3(1.627590085146836+1.6071582194637+1.67387)

Input interpretation:

$$\frac{1}{3}(1.627590085146836 + 1.6071582194637 + 1.67387)$$

Result:

1.6362061015368453333333333333333333333333333333333333333333333...

Repeating decimal:

1.6362061015368453 (period 1)

1.6362061015368453

From which:

1/3(1.627590085146836+1.6071582194637+1.67387)-(11+7)1/10^3

Input interpretation:

$$\frac{1}{3}(1.627590085146836 + 1.6071582194637 + 1.67387) - (11 + 7) \times \frac{1}{10^3}$$

Result:

1.6182061015368453333333333333333333333333333333333333333333333...

Repeating decimal:

$1.6182061015368453\overline{3}$ (period 1)

1.6182061015368453 result that is a very good approximation to the value of the golden ratio 1.618033988749...

Now, we have that:

Entry 2.2.2 (pp. 204, 210). *We have*

$$S(e^{-\pi/\sqrt{35}}) = \left(5\sqrt{5} - 7 + \sqrt{35(5 - 2\sqrt{5})}\right)^{1/5}.$$

(5sqrt5-7+(35(5-2sqrt5))^0.5)^1/5

Input:

$$\sqrt[5]{5\sqrt{5} - 7 + \sqrt{35\left(5 - 2\sqrt{5}\right)}}$$

Decimal approximation:

1.533433933531672725045223292893931793005891204687420376743...

1.5334339335…

Minimal polynomial:

$x^{20} + 28x^{15} - 306x^{10} - 28x^5 + 1$

Entry 2.2.3 (p. 210). *We have*

$$S(e^{-\pi\sqrt{7/5}}) = \left(-5\sqrt{5} - 7 + \sqrt{35(5+2\sqrt{5})}\right)^{1/5}. \qquad (2.2.25)$$

(-5sqrt5-7+(35(5+2sqrt5))^0.5)^1/5

Input:

$$\sqrt[5]{-5\sqrt{5} - 7 + \sqrt{35\left(5 + 2\sqrt{5}\right)}}$$

Exact result:

$$\sqrt[5]{-7 - 5\sqrt{5} + \sqrt{35\left(5 + 2\sqrt{5}\right)}}$$

Decimal approximation:

0.48731297839151096836428789843891609242196016689765382260 2...

0.4873129783…

Minimal polynomial:

$$x^{20} + 28\,x^{15} - 306\,x^{10} - 28\,x^5 + 1$$

Entry 2.2.4 (p. 210). *We have*

$$S(e^{-\pi/\sqrt{15}}) = \left(\frac{5\sqrt{5} - 3 + \sqrt{30(5-\sqrt{5})}}{4}\right)^{1/5}. \qquad (2.2.26)$$

(1/4(5sqrt5-3+(30(5-sqrt5))^0.5))^1/5

Input:

$$\sqrt[5]{\frac{1}{4}\left(5\sqrt{5} - 3 + \sqrt{30\left(5 - \sqrt{5}\right)}\right)}$$

Exact result:

$$\frac{\sqrt[5]{-3+5\sqrt{5}+\sqrt{30\left(5-\sqrt{5}\right)}}}{2^{2/5}}$$

Decimal approximation:

1.340072390306138126503073359233198144708174724298375381579...

1.3400723903…

Alternate form:

$$\text{root of } x^{20}+3x^{15}-31x^{10}-3x^5+1 \text{ near } x=1.34007$$

Minimal polynomial:

$$x^{20}+3x^{15}-31x^{10}-3x^5+1$$

Entry 2.2.5 (p. 210). *We have*

$$S(e^{-\pi\sqrt{3/5}}) = \left(\frac{-5\sqrt{5}-3+\sqrt{30(5+\sqrt{5})}}{4}\right)^{1/5}. \qquad (2.2.32)$$

(1/4(-5sqrt5-3+(30(5+sqrt5))^0.5))^1/5

Input:

$$\sqrt[5]{\frac{1}{4}\left(-5\sqrt{5}-3+\sqrt{30\left(5+\sqrt{5}\right)}\right)}$$

Exact result:

$$\frac{\sqrt[5]{-3-5\sqrt{5}+\sqrt{30\left(5+\sqrt{5}\right)}}}{2^{2/5}}$$

Decimal approximation:

0.673271499377838882300517039899565654880002651514020129820...

0.673271499…

Minimal polynomial:

$x^{20} + 3x^{15} - 31x^{10} - 3x^5 + 1$

Alternate form:

root of $x^{20} + 3x^{15} - 31x^{10} - 3x^5 + 1$ near $x = 0.673271$

From the four results, we obtain:

1/(Pi^2)(1.533433933531672725+0.487312978391510968+1.340072390306138126 +0.673271499377838882)^2

Input interpretation:

$$\frac{1}{\pi^2}(1.533433933531672725 + 0.487312978391510968 + 1.340072390306138126 + 0.673271499377838882)^2$$

Result:

1.64888965497089957...

1.648889654…. $\approx \zeta(2) = \frac{\pi^2}{6} = 1.644934$ ...

Alternative representations:

$$\frac{1}{\pi^2}(1.5334339335316727250000 + 0.4873129783915109680000 + 1.3400723903061381260000 + 0.6732714993778388820000)^2 = \frac{4.0340908016071607010002}{(180^\circ)^2}$$

$$\frac{1}{\pi^2}(1.5334339335316727250000 + 0.4873129783915109680000 + 1.3400723903061381260000 + 0.6732714993778388820000)^2 = \frac{4.034090801607160701000^2}{6\,\zeta(2)}$$

$$\frac{1}{\pi^2}(1.5334339335316727250000 + 0.4873129783915109680000 + 1.3400723903061381260000 + 0.6732714993778388820000)^2 = \frac{4.034090801607160701000^2}{(-i\log(-1))^2}$$

Series representations:

$$\frac{1}{\pi^2}(1.5334339335316727250000 + 0.4873129783915109680000 + 1.3400723903061381260000 + 0.6732714993778388820000)^2 = \frac{1.0171180372257190249146}{\left(\sum_{k=0}^{\infty}\frac{(-1)^k}{1+2\,k}\right)^2}$$

$$\frac{1}{\pi^2}(1.5334339335316727250000 + 0.4873129783915109680000 + 1.3400723903061381260000 + 0.6732714993778388820000)^2 = \frac{4.068472148902876099659}{\left(-1.000000000000000000000 + \sum_{k=1}^{\infty}\frac{2^k}{\binom{2\,k}{k}}\right)^2}$$

$$\frac{1}{\pi^2}(1.5334339335316727250000 + 0.4873129783915109680000 + 1.3400723903061381260000 + 0.6732714993778388820000)^2 = \frac{16.273888595611504398 63}{\left(\sum_{k=0}^{\infty}\frac{2^{-k}(-6+50\,k)}{\binom{3\,k}{k}}\right)^2}$$

Integral representations:

$$\frac{1}{\pi^2}(1.5334339335316727250000 + 0.4873129783915109680000 + 1.3400723903061381260000 + 0.6732714993778388820000)^2 = \frac{4.068472148902876099659}{\left(\int_0^{\infty}\frac{1}{1+t^2}\,dt\right)^2}$$

$$\frac{1}{\pi^2}(1.533433933531672725 + 0.48731297839151096800 + 1.34007239030613812600 + 0.673271499377838820000)^2 = \frac{1.017118037225719024 9146}{\left(\int_0^1 \sqrt{1-t^2}\, dt\right)^2}$$

$$\frac{1}{\pi^2}(1.533433933531672725 + 0.48731297839151096800 + 1.34007239030613812600 + 0.673271499377838820000)^2 = \frac{4.068472148902876099659}{\left(\int_0^\infty \frac{\sin(t)}{t}\, dt\right)^2}$$

27*4(1.533433933531672725+0.487312978391510968+1.340072390306138126+0.673271499377838882)^2-29

Input interpretation:

$$27 \times 4 \left(1.533433933531672725 + 0.487312978391510968 + 1.340072390306138126 + 0.673271499377838882\right)^2 - 29$$

Result:

1728.579968326042475052500848834591631308

1728.5799683…

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 **Z**/3**Z**, and its outer automorphism group is the cyclic group **Z**/2**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".*

8(1.533433933531672725+0.487312978391510968+1.340072390306138126+0.673271499377838882)^2+11-2

Input interpretation:

$$8\,(1.533433933531672725 + 0.487312978391510968 + 1.340072390306138126 + 0.673271499377838882)^2 + 11 - 2$$

Result:

139.191108764892035189074136950710491208

139.19110876… result practically equal to the rest mass of Pion meson 139.57 MeV

and:

8(1.533433933531672725+0.487312978391510968+1.340072390306138126+0.673271499377838882)^2-5

Input interpretation:

$$8\,(1.533433933531672725 + 0.487312978391510968 + 1.340072390306138126 + 0.673271499377838882)^2 - 5$$

Result:

125.191108764892035189074136950710491208

125.19110876… result very near to the Higgs boson mass 125.18 GeV

From:

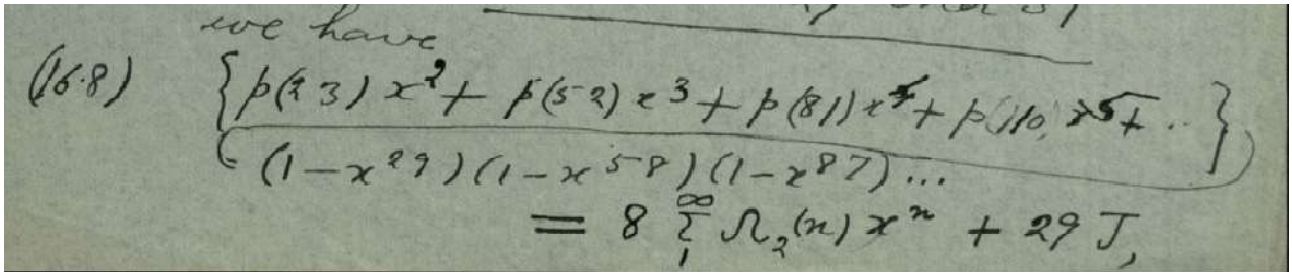
https://mss-cat.trin.cam.ac.uk/manuscripts/uv/view.php?n=Add.Ms.a.94.13#?c=0&m=0&s=0&cv=27&xywh=-142%2C-39%2C5437%2C3154

https://mss-cat.trin.cam.ac.uk/manuscripts/uv/view.php?n=Add.Ms.a.94.13#?c=0&m=0&s=0&cv=28&xywh=-746%2C-805%2C6969%2C4346

https://mss-cat.trin.cam.ac.uk/manuscripts/uv/view.php?n=Add.Ms.a.94.13#?c=0&m=0&s=0&cv=30&xywh=-149%2C719%2C4824%2C3008

https://mss-cat.trin.cam.ac.uk/manuscripts/uv/view.php?n=Add.Ms.a.94.13#?c=0&m=0&s=0&cv=31&xywh=-3630%2C0%2C11908%2C7425

We have that (for the data, see papers https://fermatslibrary.com/p/a308d666 - https://fermatslibrary.com/p/e68c93f8)



For x = 2, J = 279.1936

p(23) = 1255
p(52) = 281589
p(81) = 18004327
p(110) = 607163746

(1255*2^2 + 281589*2^3+18004327*2^4+607163746*2^5)*(1-2^29)(1-2^58)(1-2^87) = 8*x + 29*279.1936

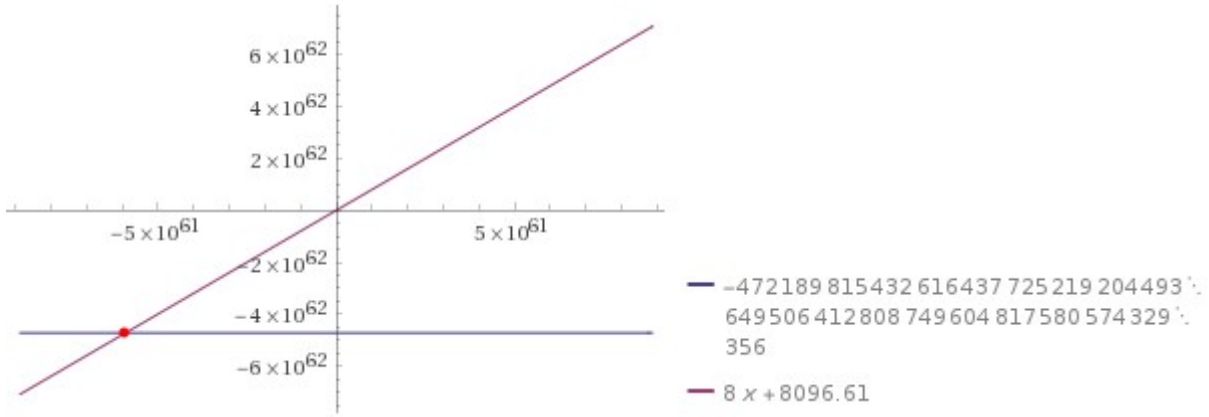
Input interpretation:

$$(1255\times 2^2 + 281\,589\times 2^3 + 18\,004\,327\times 2^4 + 607\,163\,746\times 2^5)$$
$$(1-2^{29})(1-2^{58})(1-2^{87}) = 8\,x + 29\times 279.1936$$

Result:

$$-472\,189\,815\,432\,616\,437\,725\,219\,204\,493\,649\,506\,412\,808\,749\,604\,817\,580\,574\,329\ldots.$$
$$356 = 8\,x + 8096.61$$

Plot:



Alternate forms:

$$-8\,x - 4.7219\times 10^{62} = 0$$

$$-472\,189\,815\,432\,616\,437\,725\,219\,204\,493\,649\,506\,412\,808\,749\,604\,817\,580\,574\,329\ldots.$$
$$356 = 8\,(x + 1012.08)$$

Solution:

$$x =$$
$$-59\,023\,726\,929\,077\,051\,999\,034\,469\,422\,655\,296\,959\,042\,733\,480\,788\,273\,018\,175\,48$$

Integer solution:

$x =$

$-59\,023\,726\,929\,077\,051\,999\,034\,469\,422\,655\,296\,959\,042\,733\,480\,788\,273\,018\,175\,48$

Result:

$-5.902372692907705199903446942265529695904273348078827301817548 8 \times 10^{61}$

x = -5902372692907705199903446942265529695904273348078827301817548 8

We have that:

(1255*2^2 + 281589*2^3+18004327*2^4+607163746*2^5)*(1-2^29)(1-2^58)(1-2^87)

Input:

$$(1255 \times 2^2 + 281\,589 \times 2^3 + 18\,004\,327 \times 2^4 + 607\,163\,746 \times 2^5)$$
$$(1 - 2^{29})(1 - 2^{58})(1 - 2^{87})$$

Result:

$-472\,189\,815\,432\,616\,437\,725\,219\,204\,493\,649\,506\,412\,808\,749\,604\,817\,580\,574\,329\,356$

-472189815432616437725219204493649506412808749604817580574329356

$-4.721898154326164377252192044936495064128087496048175805743293 56 \times 10^{62}$

From:

(8 * 5902372692907705199903446942265529695904273348078827301817548 8 +29*279.1936)

Input interpretation:

$$8 \times 59\,023\,726\,929\,077\,051\,999\,034\,469\,422\,655\,296\,959\,042\,733\,480\,788\,273\,018\,175\,488 + 29 \times 279.1936$$

Result:

$4.721898154326164159922757553812423756723418678463061 8... \times 10^{62}$

$4.721898154326164159922757553812423756723418678463061 8 \times 10^{62}$

p(3626) =
476652957079169370323367144257918215251763873879427700257710773

(476652957079169370323367144257918215251763873879427700257710773 /
472189815432616415992275755381242375672341867846306180000000000)

Input:

476 652 957 079 169 370 323 367 144 257 918 215 251 763 873 879 427 700 257 710 773 /
472 189 815 432 616 415 992 275 755 381 242 375 672 341 867 846 306 180 000 000 000

Exact result:

158 884 319 026 389 790 107 789 048 085 972 738 417 254 624 626 475 900 085 903 591 /
157 396 605 144 205 471 997 425 251 793 747 458 557 447 289 282 102 060 000 000 000

Decimal approximation:

1.009452007435746704427130239861635824522224827153975108968...

1.0094520074…

Alternate form:

158 884 319 026 389 790 107 789 048 085 972 738 417 254 624 626 475 900 085 903 591 /
157 396 605 144 205 471 997 425 251 793 747 458 557 447 289 282 102 060 000 000 000

We have also:

(476652957079169370323367144257918215251763873879427700257710773 /
472189815432616415992275755381242375672341867846306180000000000)^51

Input:

$$(476\,652\,957\,079\,169\,370\,323\,367\,144\,257\,918\,215\,251\,763\,873\,879\,427\,700\,257\,710\cdot 773/ 472\,189\,815\,432\,616\,415\,992\,275\,755\,381\,242\,375\,672\,341\,867\,846\,306\,180\cdot 000\,000\,000)^{51}$$

Decimal approximation:

1.615732561811254942210345296133727767210128405477224508132...

1.615732561…. result that is a good approximation to the value of the golden ratio 1.618033988749...

(1/(476652957079169370323367144257918215251763873879427700257710773 / 472189815432616415992275755381242375672341867846306180000000000))^1/16

Input:

$$\sqrt[16]{\frac{1}{\frac{476\,652\,957\,079\,169\,370\,323\,367\,144\,257\,918\,215\,251\,763\,873\,879\,427\,700\,257\,710\,773}{472\,189\,815\,432\,616\,415\,992\,275\,755\,381\,242\,375\,672\,341\,867\,846\,306\,180\,000\,000\,000}}}$$

Result:

$$(7\,869\,830\,257\,210\,273\,599\,871\,262\,589\,687\,372\,927\,872\,364\,464\,105\,103 / 158\,884\,319\,026\,389\,790\,107\,789\,048\,085\,972\,738\,417\,254\,624\,626\,475\,900\cdot 085\,903\,591)\,\hat{}\,(1/16)\,2^{11/16}\times 5^{5/8}$$

Decimal approximation:

0.999412196779341521774798061543787329907015118368619591055...

0.999412196779…. result very near to the value of the following Rogers-Ramanujan continued fraction:

$$\frac{e^{-\frac{\pi}{\sqrt{5}}}}{\frac{\sqrt{5}}{1+\sqrt[5]{\sqrt{\varphi^5\sqrt[4]{5^3}}-1}}-\varphi+1}=1-\cfrac{e^{-\pi\sqrt{5}}}{1+\cfrac{e^{-2\pi\sqrt{5}}}{1+\cfrac{e^{-3\pi\sqrt{5}}}{1+\cfrac{e^{-4\pi\sqrt{5}}}{1+\ldots}}}}\approx 0.9991104684$$

and to the Omega mesons ($\omega/\omega_3 \mid 5+3 \mid m_{u/d}=255-390 \mid 0.988-1.18$) Regge slope value (0.988) connected to the dilaton scalar field $\mathbf{0.989117352243 = \phi}$

A_1^{**} above the two low-lying pseudo-scalars. (bound states of gluons, or 'glueballs').

A_1^{**}	0.943(39) [2.5]	0.988(38)	0.152(53)
A_4	1.03(10) [2.5]	0.999(32)	0.035(21)

(**Glueball Regge trajectories -** *Harvey Byron Meyer*, Lincoln College -Thesis submitted for the degree of Doctor of Philosophy at the University of Oxford Trinity Term, 2004)

Alternate form:

$$\left(2^{11/16}\times 5^{5/8}\sqrt[16]{7\,869\,830\,257\,210\,273\,599\,871\,262\,589\,687\,372\,927\,872\,364\,464\,105\,103\,158\,884\,319\,026\,389\,790\,107\,789\,048\,085\,972\,738\,417\,254\,624\,626\,475\,900\,085\,903\,591^{15/16}}\right)\Big/ 158\,884\,319\,026\,389\,790\,107\,789\,048\,085\,972\,738\,417\,254\,624\,626\,475\,900\,085\,903\,591$$

All 16th roots of 157396605144205471997425251793747458557447289282102060000000000/158884319026389790107789048085972738417254624626475900085903591:

$$(7\,869\,830\,257\,210\,273\,599\,871\,262\,589\,687\,372\,927\,872\,364\,464\,105\,103 / 158\,884\,319\,026\,389\,790\,107\,789\,048\,085\,972\,738\,417\,254\,624\,626\,475\,900\,085\,903\,591)^{(1/16)}\, 2^{11/16}\times 5^{5/8}\, e^0 \approx 0.9994 \text{ (real, principal root)}$$

$$(7\,869\,830\,257\,210\,273\,599\,871\,262\,589\,687\,372\,927\,872\,364\,464\,105\,103 / 158\,884\,319\,026\,389\,790\,107\,789\,048\,085\,972\,738\,417\,254\,624\,626\,475\,900 \cdot 085\,903\,591)\,\hat{}\,(1/16)\,2^{11/16} \times 5^{5/8}\, e^{(i\pi)/8} \approx 0.9233 + 0.3825\, i$$

$$(7\,869\,830\,257\,210\,273\,599\,871\,262\,589\,687\,372\,927\,872\,364\,464\,105\,103 / 158\,884\,319\,026\,389\,790\,107\,789\,048\,085\,972\,738\,417\,254\,624\,626\,475\,900 \cdot 085\,903\,591)\,\hat{}\,(1/16)\,2^{11/16} \times 5^{5/8}\, e^{(i\pi)/4} \approx 0.70669 + 0.70669\, i$$

$$(7\,869\,830\,257\,210\,273\,599\,871\,262\,589\,687\,372\,927\,872\,364\,464\,105\,103 / 158\,884\,319\,026\,389\,790\,107\,789\,048\,085\,972\,738\,417\,254\,624\,626\,475\,900 \cdot 085\,903\,591)\,\hat{}\,(1/16)\,2^{11/16} \times 5^{5/8}\, e^{(3i\pi)/8} \approx 0.3825 + 0.9233\, i$$

$$(7\,869\,830\,257\,210\,273\,599\,871\,262\,589\,687\,372\,927\,872\,364\,464\,105\,103 / 158\,884\,319\,026\,389\,790\,107\,789\,048\,085\,972\,738\,417\,254\,624\,626\,475\,900 \cdot 085\,903\,591)\,\hat{}\,(1/16)\,2^{11/16} \times 5^{5/8}\, e^{(i\pi)/2} \approx 0.9994\, i$$

From the result of the expression

-472189815432616437725219204493649506412808749604817580574329356

we obtain also:

1/(sqrt2+1.5236)[(-(-472189815432616437725219204493649506412808749604817580574329356))/14258^3*1/1729^2]

where 1.5236 is the following Hausdorff dimension:

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

(Boundary of the Dragon curve), while 14258^3 and 1729 are Ramanujan taxicab numbers

Input interpretation:

$$\frac{1}{\sqrt{2}+1.5236}\left(-\frac{1}{14258^3}\right.$$
$$(-472\,189\,815\,432\,616\,437\,725\,219\,204\,493\,649\,506\,412\,808\,749\,604\,817\,580\,\cdot$$
$$\left.574\,329\,356)\times\frac{1}{1729^2}\right)$$

Result:

$1.85493\ldots\times10^{43}$

1.85493…*10^{43} result practically equal to the value of Planck frequency

1.8549×10^{43} Hz

Now, (personal interpretation) let's try to insert in the same formula instead of the partition numbers (the way of writing n as a sum of positive integers) the prime numbers (for example p(23) will correspond to the twenty-third prime number, and so on). Thence:

p(23) = 83
p(52) = 239
p(81) = 419
p(110) = 601

we obtain:

(83*2^2 + 239*2^3+419*2^4+601*2^5)*(1-2^29)(1-2^58)(1-2^87) = 8*x + 29*279.1936

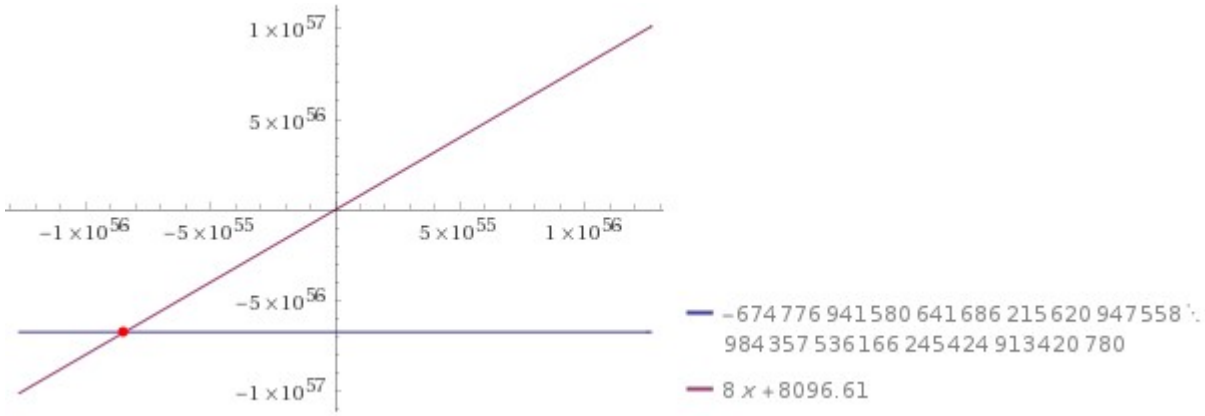
Input interpretation:

$$(83\times2^2+239\times2^3+419\times2^4+601\times2^5)(1-2^{29})(1-2^{58})(1-2^{87})=$$
$$8x+29\times279.1936$$

Result:

$$-674\,776\,941\,580\,641\,686\,215\,620\,947\,558\,984\,357\,536\,166\,245\,424\,913\,420\,780=$$
$$8x+8096.61$$

Plot:



Alternate forms:

$-8\,x - 6.74777 \times 10^{56} = 0$

$-674\,776\,941\,580\,641\,686\,215\,620\,947\,558\,984\,357\,536\,166\,245\,424\,913\,420\,780 = 8\,(x + 1012.08)$

Solution:

$x = -84\,347\,117\,697\,580\,211\,069\,590\,469\,391\,895\,928\,820\,708\,051\,907\,426\,385\,920$

Integer solution:

$x = -84\,347\,117\,697\,580\,211\,069\,590\,469\,391\,895\,928\,820\,708\,051\,907\,426\,385\,920$

Result:

$-8.434711769758021106959046939189592882070805190742638592 \times 10^{55}$

-8.434711769758021106959046939189592882070805190742638592×10^55

(83*2^2 + 239*2^3+419*2^4+601*2^5)*(1-2^29)(1-2^58)(1-2^87)

Input:

$(83 \times 2^2 + 239 \times 2^3 + 419 \times 2^4 + 601 \times 2^5)(1 - 2^{29})(1 - 2^{58})(1 - 2^{87})$

Result:

$-674\,776\,941\,580\,641\,686\,215\,620\,947\,558\,984\,357\,536\,166\,245\,424\,913\,420\,780$

-674776941580641686215620947558984357536166245424913420780

Result:

$-6.74776941580641686215620947558984357536166245424913420 78 \times 10^{56}$

and:

8*-
843471176975802110695904693918959288207080519074263859 20+29*279.1936

Input interpretation:

$8 \times (-84\,347\,117\,697\,580\,211\,069\,590\,469\,391\,895\,928\,820\,708\,051\,907\,426\,385\,920) + 29 \times 279.1936$

Result:

$-6.74776941580641688556723755135167430565664415259411 0\ldots \times 10^{56}$

-6.747769415…*10^{56}

From the ratio between the two values, we obtain:

p(3013) = 669412022792912607478124722008951497681624714586978010470

674776941580641686215620947558984357536166245424913420780 /
669412022792912607478124722008951497681624714586978010470

Input:

$$\frac{674\,776\,941\,580\,641\,686\,215\,620\,947\,558\,984\,357\,536\,166\,245\,424\,913\,420\,780}{669\,412\,022\,792\,912\,607\,478\,124\,722\,008\,951\,497\,681\,624\,714\,586\,978\,010\,470}$$

Exact result:

$$\frac{22\,492\,564\,719\,354\,722\,873\,854\,031\,585\,299\,478\,584\,538\,874\,847\,497\,114\,026}{22\,313\,734\,093\,097\,086\,915\,937\,490\,733\,631\,716\,589\,387\,490\,486\,232\,600\,349}$$

Decimal approximation:

1.00801437471252104281282898631517902601921428395954538764 7...

1.0080143747…

Alternate form:

$$\frac{22\,492\,564\,719\,354\,722\,873\,854\,031\,585\,299\,478\,584\,538\,874\,847\,497\,114\,026}{22\,313\,734\,093\,097\,086\,915\,937\,490\,733\,631\,716\,589\,387\,490\,486\,232\,600\,349}$$

And we have:

(6747769415806416862156209475589843575361662454249134207 80 / 669412022792912607478124722008951497681624714586978010470)^60

Input:

$$\left(\frac{674\,776\,941\,580\,641\,686\,215\,620\,947\,558\,984\,357\,536\,166\,245\,424\,913\,420\,780}{669\,412\,022\,792\,912\,607\,478\,124\,722\,008\,951\,497\,681\,624\,714\,586\,978\,010\,470}\right)^{60}$$

Decimal approximation:

1.614371651195309963791785055889092067016703893846994154385...

1.6143716511…. result that is a good approximation to the value of the golden ratio 1.618033988749...

((1/(6747769415806416862156209475589843575361662454249134207 80 / 669412022792912607478124722008951497681624714586978010470)))^1/16

Input:

$$\sqrt[16]{\frac{1}{\frac{674\,776\,941\,580\,641\,686\,215\,620\,947\,558\,984\,357\,536\,166\,245\,424\,913\,420\,780}{669\,412\,022\,792\,912\,607\,478\,124\,722\,008\,951\,497\,681\,624\,714\,586\,978\,010\,470}}}$$

Result:

$$\frac{\sqrt[16]{\frac{22\,313\,734\,093\,097\,086\,915\,937\,490\,733\,631\,716\,589\,387\,490\,486\,232\,600\,349}{145\,354\,793\,487\,580\,534\,950\,022\,786\,646}}}{536\,870\,911^{3/16}}$$

Decimal approximation:

0.999501222544914848766054854788014945672067356263295803538...

0.9995012225…. result very near to the value of the following Rogers-Ramanujan continued fraction:

$$\frac{e^{-\frac{\pi}{\sqrt{5}}}}{\frac{\sqrt{5}}{1+\sqrt[5]{\sqrt{\varphi^5\sqrt[4]{5^3}}-1}}-\varphi+1}=1-\cfrac{e^{-\pi\sqrt{5}}}{1+\cfrac{e^{-2\pi\sqrt{5}}}{1+\cfrac{e^{-3\pi\sqrt{5}}}{1+\cfrac{e^{-4\pi\sqrt{5}}}{1+\ldots}}}}\approx 0.9991104684$$

and to the Omega mesons ($\omega/\omega_3 \mid 5+3 \mid m_{u/d}=255-390 \mid 0.988-1.18$) Regge slope value (0.988) connected to the dilaton scalar field $\mathbf{0.989117352243 = \phi}$

A_1^{**} above the two low-lying pseudo-scalars. (bound states of gluons, or 'glueballs').

A_1^{**}	0.943(39) [2.5]	0.988(38)	0.152(53)
A_4	1.03(10) [2.5]	0.999(32)	0.035(21)

(**Glueball Regge trajectories -** *Harvey Byron Meyer*, Lincoln College -Thesis submitted for the degree of Doctor of Philosophy at the University of Oxford Trinity Term, 2004)

Alternate form:

$$\left(\sqrt[16]{22\,313\,734\,093\,097\,086\,915\,937\,490\,733\,631\,716\,589\,387\,490\,486\,232\,600\,349}\;\;536\,870\,911^{13/16}\times 145\,354\,793\,487\,580\,534\,950\,022\,786\,646^{15/16}\right)\Big/ 78\,036\,760\,397\,894\,228\,984\,486\,072\,937\,396\,654\,506$$

All 16th roots of 22313734093097086915937490733631716589387490486232600349/224925647193547228738540315852994785845388748474971140 26:

$$\frac{\sqrt[16]{\frac{22\,313\,734\,093\,097\,086\,915\,937\,490\,733\,631\,716\,589\,387\,490\,486\,232\,600\,349}{145\,354\,793\,487\,580\,534\,950\,022\,786\,646}}\,e^0}{536\,870\,911^{3/16}}\approx 0.99950$$

(real, principal root)

$$\frac{\sqrt[16]{\frac{22\,313\,734\,093\,097\,086\,915\,937\,490\,733\,631\,716\,589\,387\,490\,486\,232\,600\,349}{145\,354\,793\,487\,580\,534\,950\,022\,786\,646}}\, e^{(i\,\pi)/8}}{536\,870\,911^{3/16}}$$

$$\approx 0.92342 + 0.38249\,i$$

$$\frac{\sqrt[16]{\frac{22\,313\,734\,093\,097\,086\,915\,937\,490\,733\,631\,716\,589\,387\,490\,486\,232\,600\,349}{145\,354\,793\,487\,580\,534\,950\,022\,786\,646}}\, e^{(i\,\pi)/4}}{536\,870\,911^{3/16}}$$

$$\approx 0.70675 + 0.70675\,i$$

$$\frac{\sqrt[16]{\frac{22\,313\,734\,093\,097\,086\,915\,937\,490\,733\,631\,716\,589\,387\,490\,486\,232\,600\,349}{145\,354\,793\,487\,580\,534\,950\,022\,786\,646}}\, e^{(3\,i\,\pi)/8}}{536\,870\,911^{3/16}}$$

$$\approx 0.38249 + 0.92342\,i$$

$$\frac{\sqrt[16]{\frac{22\,313\,734\,093\,097\,086\,915\,937\,490\,733\,631\,716\,589\,387\,490\,486\,232\,600\,349}{145\,354\,793\,487\,580\,534\,950\,022\,786\,646}}\, e^{(i\,\pi)/2}}{536\,870\,911^{3/16}} \approx 0.99950\,i$$

From the result of the expression

-6747769415806416862156209475589843575361662454249134207 80

we have also:

1/4*1/(1729+7)^4(-(-6747769415806416862156209475589843575361662454249134207 80))

where 1729 is the Hardy-Ramanujan number and 7 is a Lucas number

Input:

$$\frac{1}{4} \times \frac{1}{(1729+7)^4 (-(-674\,776\,941\,580\,641\,686\,215\,620\,947\,558\,984\,357\,536\,166\,245\,424\,913\,420\,780))}$$

Exact result:

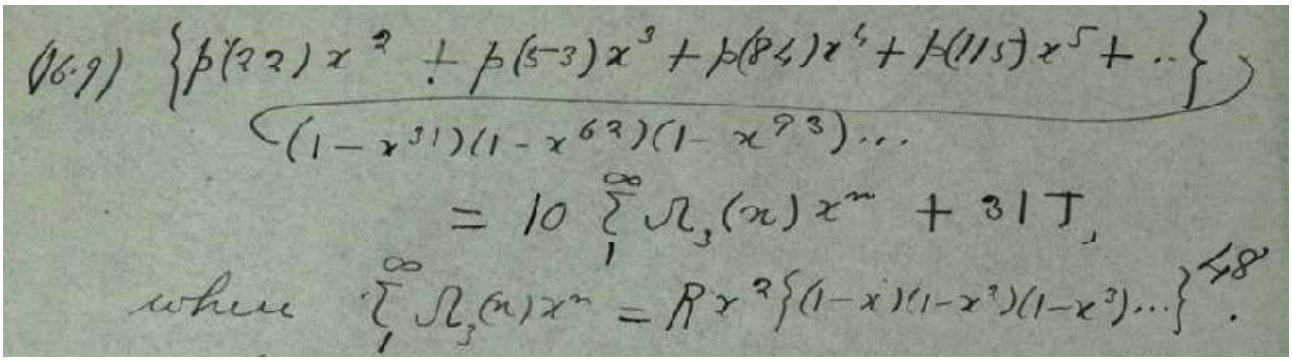
$$\frac{24\,099\,176\,485\,022\,917\,364\,843\,605\,269\,963\,727\,054\,863\,080\,193\,746\,907\,885}{1\,297\,480\,511\,488}$$

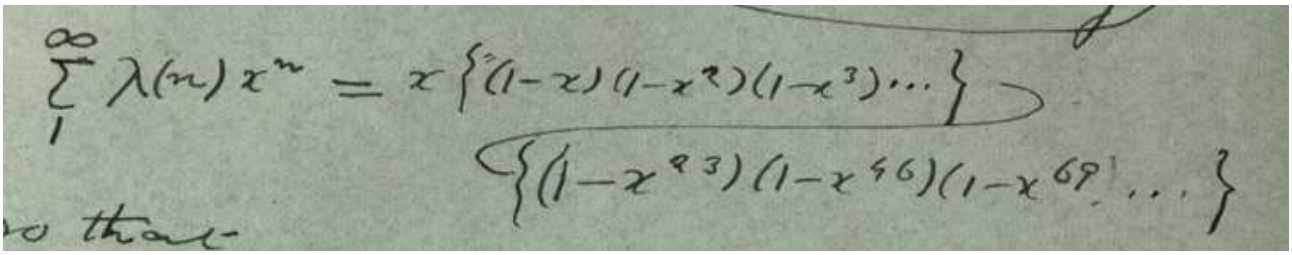
Decimal approximation:

$1.857382540365486119263955018123245364601984593084128 6\ldots \times 10^{43}$

$1.85738254\ldots*10^{43}$ result very near to the value of Planck frequency 1.8549×10^{43} Hz

Now, we have that:





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

1002* 2^2 + 329931* 2^3 + 26543660* 2^4 + 1064144451* 2^5 (1-2^31)(1-2^62)(1-2^93) = 10*(9.83114i*2^2((1-2)(1-2^2)(1-2^3)^48)) + 31*279.1936

p(22) = 1002
p(53) = 329931
p(84) = 26543660
p(115) = 1064144451

(((1002* 2^2 + 329931* 2^3 + 26543660* 2^4 + 1064144451* 2^5 (1-2^31)(1-2^62)(1-2^93)))) = (((10*(9.83114i*2^2((1-2)(1-2^2)(1-2^3)^48)) + 31*279.1936)))x

Input interpretation:

$$1002\times 2^2 + 329\,931\times 2^3 + 26\,543\,660\times 2^4 + 1\,064\,144\,451\times 2^5\left((1-2^{31})\left(1-2^{62}\right)(1-2^{93})\right) = \left(10\left(9.83114\,i\times 2^2\left((1-2)(1-2^2)(1-2^3)^{48}\right)\right)+31\times 279.1936\right)x$$

i is the imaginary unit

Result:

$$-3\,339\,871\,488\,481\,854\,478\,854\,834\,418\,665\,181\,073\,132\,300\,806\,783\,565\,630\,981\,\ldots : 633\,572\,576 = (8655. + 4.33003\times 10^{43}\,i)\,x$$

Alternate forms:

$$(4.33003\times 10^{43}\,i)\,x = -3\,339\,871\,488\,481\,854\,478\,854\,834\,418\,665\,181\,073\,132\,300\,806\,783\,565\,630\,981\,\ldots : 633\,572\,576$$

$$-3\,339\,871\,488\,481\,854\,478\,854\,834\,418\,665\,181\,073\,132\,300\,806\,783\,565\,630\,981\,\ldots : 633\,572\,576 + (-8655. - 4.33003\times 10^{43}\,i)\,x = 0$$

Alternate form assuming x is real:

$$-3\,339\,871\,488\,481\,854\,478\,854\,834\,418\,665\,181\,073\,132\,300\,806\,783\,565\,630\,981\,\ldots : 633\,572\,576 = 8655.\,x + i\,(4.33003\times 10^{43}\,x + 0) + 0$$

Complex solution:

$$x = -1.54175\times 10^{-17} + 7.71327\times 10^{22}\,i$$

Input interpretation:

$$-1.54175\times 10^{-17} + 7.71327\times 10^{22}\,i$$

i is the imaginary unit

Result:

$$-1.54175\ldots\times 10^{-17} + 7.71327\ldots\times 10^{22}\,i$$

Polar coordinates:

$r = 7.71327\times 10^{22}$ (radius), $\theta = 90°$ (angle)

$7.71327*10^{22} = x$

(((1002* 2^2 + 329931* 2^3 + 26543660* 2^4 + 1064144451* 2^5 (1-2^31)(1-2^62)(1-2^93))))

Input:

$$1002 \times 2^2 + 329\,931 \times 2^3 + 26\,543\,660 \times 2^4 + 1\,064\,144\,451 \times 2^5 \left((1-2^{31})\left(1-2^{62}\right)\left(1-2^{93}\right)\right)$$

Result:

$$-3\,339\,871\,488\,481\,854\,478\,854\,834\,418\,665\,181\,073\,132\,300\,806\,783\,565\,630\,981 \cdot 633\,572\,576$$

-3339871488481854478854834418665181073132300806783565630981633572576

(((10*(9.83114i*2^2((1-2)(1-2^2)(1-2^3)^48)) + 31*279.1936)))(-1.54175×10^-17 + 7.71327×10^22 i)

Input interpretation:

$$\left(10\left(9.83114\,i \times 2^2\left((1-2)\left(1-2^2\right)\left(1-2^3\right)^{48}\right)\right) + 31 \times 279.1936\right) \times \left(-1.54175 \times 10^{-17} + 7.71327 \times 10^{22}\,i\right)$$

i is the imaginary unit

Result:

$$-3.33987\ldots \times 10^{66} + 1.04820\ldots \times 10^{21}\,i$$

Alternate form:

$$-3.33987 \times 10^{66}$$

-3.33987*10^66

Note that, from the above result, we obtain :

1/13*sqrt(3.33987e+66)

Input interpretation:

$$\frac{1}{13}\sqrt{3.33987 \times 10^{66}}$$

Result:

$$1.40579\ldots \times 10^{32}$$

$1.40579\ldots*10^{32}$ result very near to the value of Planck temperature 1.416785×10^{32} K

and:

5/(64*16+64*4+144)*sqrt(3.33987e+66)*14258^3

where 14258^3 is a Ramanujan taxicab number and 144 is a Fibonacci number (144 = 64*2+16)

5/(64*16+64*4+144)*sqrt(3.33987e+66)*14258^3

Input interpretation:

$$\frac{5}{64\times16+64\times4+144}\sqrt{3.33987\times10^{66}}\times14258^3$$

Result:

$1.85995\ldots\times10^{43}$

$1.85995\ldots*10^{43}$ result very near to the value of Planck frequency $1.8549*10^{43}$ Hz

or:

5/(64*16+64*4+64*2+16)*sqrt(3.33987e+66)*14258^3

Input interpretation:

$$\frac{5}{64\times16+64\times4+64\times2+16}\sqrt{3.33987\times10^{66}}\times14258^3$$

Result:

$1.85995\ldots\times10^{43}$

$1.85995\ldots*10^{43}$ as above

Note that:

p(4059) =
3324592346930308697315988820761976488098727395789954522383492129920

From the following ratio, we obtain:

(3339870000000000000000000000000000000000000000000000000000000000000000000000 /
3324592346930308697315988820761976488098727395789954522383492129920)

Input:

$$\frac{3\,339\,870\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000}{3\,324\,592\,346\,930\,308\,697\,315\,988\,820\,761\,976\,488\,098\,727\,395\,789\,954\,522\,383\,492\,129\,920}$$

Decimal approximation:

1.004595346278709206916326498712991430204460659463691060105...

1.00459534627…

Alternate form:

$$\frac{1\,739\,515\,625\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000}{1\,731\,558\,514\,026\,202\,446\,518\,744\,177\,480\,196\,087\,551\,420\,518\,640\,601\,313\,741\,402\,151}$$

and also:

(3.3398700000000e+66 / 3.3245923469303e+66)^105

Input interpretation:

$$\left(\frac{3.3398700000000 \times 10^{66}}{3.3245923469303 \times 10^{66}}\right)^{105}$$

Result:

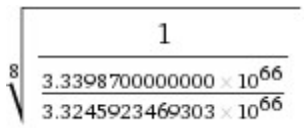
1.618348347600211060994544328262396585331791716182013370261...

1.6183483476…. result that is a very good approximation to the value of the golden ratio 1.618033988749...

and again:

(1/(3.3398700000000e+66 / 3.3245923469303e+66))^1/8

Input interpretation:



Result:

0.99942706170300...

0.999427061703…. result very near to the value of the following Rogers-Ramanujan continued fraction:

$$\frac{e^{-\frac{\pi}{\sqrt{5}}}}{\frac{\sqrt{5}}{1+\sqrt[5]{\sqrt{\varphi^5}\sqrt[4]{5^3}}-1}-\varphi+1}=1-\frac{e^{-\pi\sqrt{5}}}{1+\frac{e^{-2\pi\sqrt{5}}}{1+\frac{e^{-3\pi\sqrt{5}}}{1+\frac{e^{-4\pi\sqrt{5}}}{1+\ldots}}}}\approx 0.9991104684$$

and to the Omega mesons ($\omega/\omega_3 \mid 5+3 \mid m_{u/d}=255-390 \mid 0.988-1.18$) Regge slope value (0.988) connected to the dilaton scalar field $\mathbf{0.989117352243 = \phi}$

A_1^{**} above the two low-lying pseudo-scalars. (bound states of gluons, or 'glueballs').

A_1^{**}	0.943(39) [2.5]	0.988(38)	0.152(53)
A_4	1.03(10) [2.5]	0.999(32)	0.035(21)

(**Glueball Regge trajectories -** *Harvey Byron Meyer*, Lincoln College -Thesis submitted for the degree of Doctor of Philosophy at the University of Oxford Trinity Term, 2004)

From the following expression, we obtain:

((2((1-2)(1-2^2)(1-2^3))*((1-2^23)(1-2^46)(1-2^69))))

Input:

$$2\left((1-2)\left(1-2^2\right)\left(1-2^3\right)\right)\left(\left(1-2^{23}\right)\left(1-2^{46}\right)\left(1-2^{69}\right)\right)$$

Result:

14 634 862 291 923 768 995 004 131 989 248 025 175 261 142

Scientific notation:

$1.463486229192376899500413198924802517526 1142 \times 10^{43}$

$1.46348622919\ldots*10^{43}$

From which, multiplying by √(8/5), we obtain:

((2((1-2)(1-2^2)(1-2^3))*((1-2^23)(1-2^46)(1-2^69))))*sqrt(8/5)

Input:

$$\left(2\left((1-2)\left(1-2^2\right)\left(1-2^3\right)\right)\left(\left(1-2^{23}\right)\left(1-2^{46}\right)\left(1-2^{69}\right)\right)\right)\sqrt{\frac{8}{5}}$$

Exact result:

$$29\,269\,724\,583\,847\,537\,990\,008\,263\,978\,496\,050\,350\,522\,284\sqrt{\frac{2}{5}}$$

Decimal approximation:

$1.85117992341564565810048554362928802555348131299890 88\ldots \times 10^{43}$

$1.8511799234\ldots*10^{43}$ result very near to the value of Planck frequency

1.8549×10^{43} Hz

Alternate form:

$$\frac{29\,269\,724\,583\,847\,537\,990\,008\,263\,978\,496\,050\,350\,522\,284\sqrt{10}}{5}$$

This is the formula of Planck frequency

$$\left(f_p = \frac{c}{l_P} = \sqrt{\frac{c^5}{\hbar G}} \right) = \left(1.8549 \times 10^{43}\ \text{Hz} \right)$$

Indeed:

sqrt((299792458^5/(1.054571817×10^−34 * 6.6743×10^−11)))

Input interpretation:

$$\sqrt{\frac{299\,792\,458^5}{1.054571817 \times 10^{-34} \times 6.6743 \times 10^{-11}}}$$

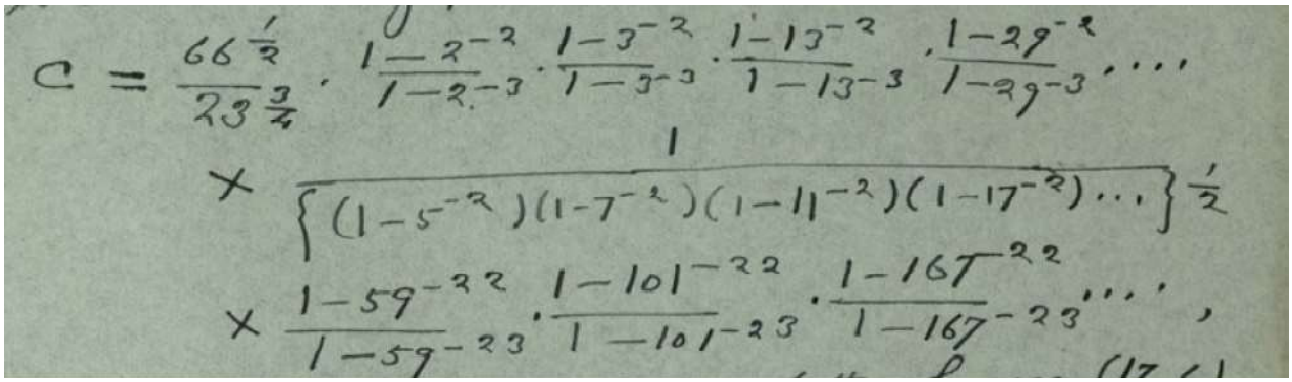
Result:

$1.85486... \times 10^{43}$

1.85486…*10^{43}

We note that in the above formula, there exist a link between the speed of light and the Gravitational Constant, which is expressed through the fraction inside the square root

Now, we have:



66^(1/2) / 23^(3/4) * (1-2^-2) / (1-2^-3) * (1-3^-2) / (1-3^-3) * (1-13^-2) / (1-13^-3) * (1-29^-2) / (1-29^-3)

Input:

$$\frac{\sqrt{66}}{23^{3/4}} \times \frac{1-\frac{1}{2^2}}{1-\frac{1}{2^3}} \times \frac{1-\frac{1}{3^2}}{1-\frac{1}{3^3}} \times \frac{1-\frac{1}{13^2}}{1-\frac{1}{13^3}} \times \frac{1-\frac{1}{29^2}}{1-\frac{1}{29^3}}$$

Result:

$$\frac{41\,760\sqrt{66}}{53\,131 \times 23^{3/4}}$$

Decimal approximation:

0.607979016830812026810049370554453062940199825133190522152...

0.607979016…

Alternate form:

$$\frac{41\,760\left(\sqrt[4]{23}\ \sqrt{66}\right)}{1\,222\,013}$$

1/((1-5^-2)(1-7^-2)(1-11^-2)(1-17^-2))^0.5

Input:

$$\frac{1}{\sqrt{\left(1-\frac{1}{5^2}\right)\left(1-\frac{1}{7^2}\right)\left(1-\frac{1}{11^2}\right)\left(1-\frac{1}{17^2}\right)}}$$

Exact result:

$$\frac{1309\sqrt{\frac{5}{6}}}{1152}$$

Decimal approximation:

1.037281290182671357805517137856264457963169568507465393204...

1.03728129…

Alternate form:

$$\frac{1309\sqrt{30}}{6912}$$

(1-59^-22) / (1-59^-23) * (1-101^-22) / (1-101^-23) * (1-167^-22) / (1-167^-23)

Input:

$$\frac{1-\frac{1}{59^{22}}}{1-\frac{1}{59^{23}}}\times\frac{1-\frac{1}{101^{22}}}{1-\frac{1}{101^{23}}}\times\frac{1-\frac{1}{167^{22}}}{1-\frac{1}{167^{23}}}$$

Exact result:

928 817 992 199 859 671 320 176 971 362 312 203 637 108 454 232 016 003 772 180 ⋱
845 231 404 613 952 757 275 770 457 130 105 524 678 719 030 902 417 477 365 483 ⋱
716 582 822 080 /
928 817 992 199 859 671 320 176 971 362 312 203 638 112 527 815 110 208 581 528 ⋱
177 459 675 707 937 558 654 767 377 476 848 196 893 935 889 109 733 100 779 ⋱
111 797 465 402 151

Decimal approximation:

0.999999999999999999999999999999999999999989189770315321885 86...

0.999999999999999999999999999999999999999989189770315321885 86…

Thence, in conclusion, we obtain:

(0.607979016830812026810049370554453062940199825133190522152*1.0372812
90182671357805517137856264457963169568507465393204 *
0.999999999999999999999999999999999999999989189770315321885 86)

Input interpretation:

0.607979016830812026810049370554453062940199825133190522152×
1.037281290182671357805517137856264457963169568507465393204×
0.999999999999999999999999999999999999999891897703153218858 6

Result:

0.630645258982256763438790385915944528647371928967885607694...

0.6306452589…

From which:

1+(0.607979016830812026810049370554453062940199825133190522152*1.03728
1290182671357805517137856264457963169568507465393204 *
0.999999999999999999999999999999999999999891897703153218858 6)

Input interpretation:

1 + 0.607979016830812026810049370554453062940199825133190522152×
1.037281290182671357805517137856264457963169568507465393204×
0.999999999999999999999999999999999999999891897703153218858 6

Result:

1.630645258982256763438790385915944528647371928967885607694...

Repeating decimal:

1.630645258982256763438790385915944528647371928967885607694...

1.630645258982…

and:

1+(0.607979016830812026810049370554453062940199825133190522152*1.03728
1290182671357805517137856264457963169568507465393204 *
0.999999999999999999999999999999999999999891897703153218858 6)-12/10^3

Input interpretation:

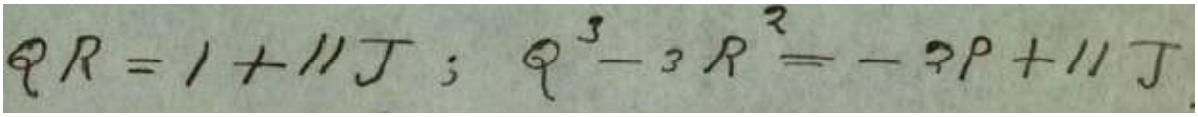
$$1 + 0.607979016830812026810049370554453062940199825133190522152\times 1.037281290182671357805517137856264457963169568507465393204\times 0.999999999999999999999999999999999999999891897703153218858\,6 - \frac{12}{10^3}$$

Result:

1.6186452589822567634387903859159445286473719289678856076 94...

1.6186452589822….. result that is a very good approximation to the value of the golden ratio 1.618033988749...

Now, we have that:



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

-312.388^3 – 3*9.83114i^2 = -2*P + 11*279.1936

Input interpretation:

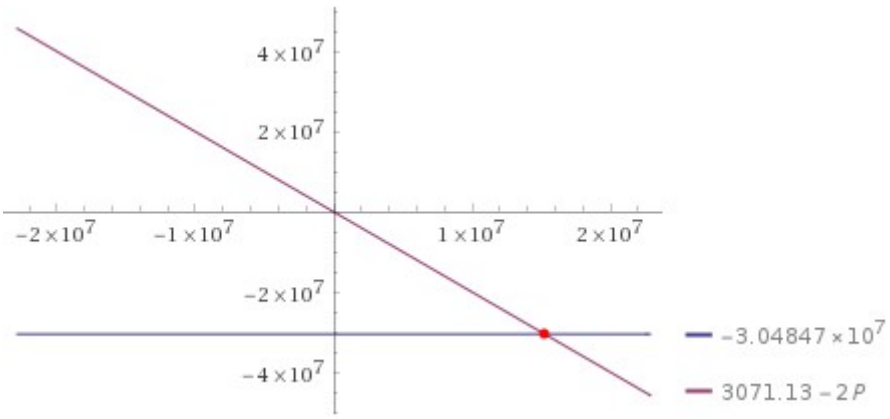
$$-312.388^3 + 3\,i^2 \times (-9.83114) = -2\,P + 11 \times 279.1936$$

i is the imaginary unit

Result:

$$-3.04847 \times 10^7 = 3071.13 - 2\,P$$

Plot:



Alternate forms:

$-3.04847\times10^7 = -2\,(P - 1535.56)$

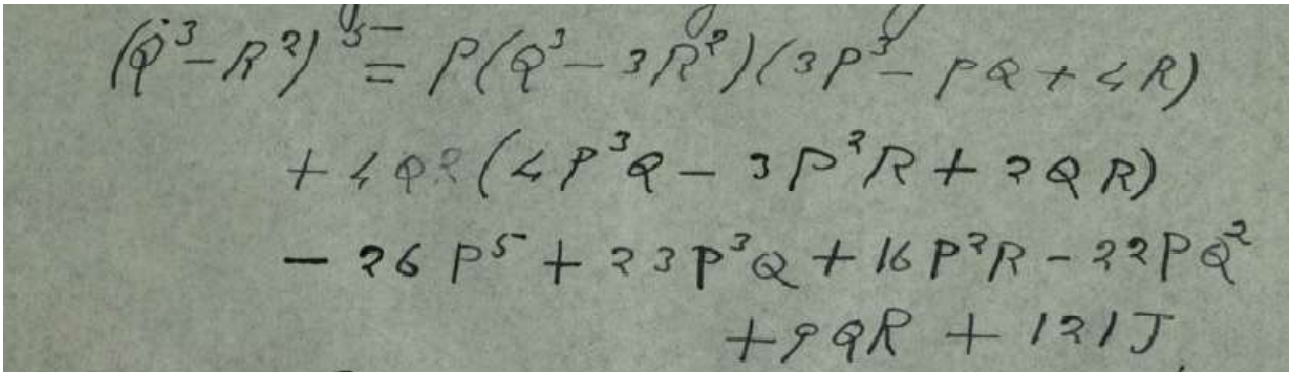
$2\,P - 3.04878\times10^7 = 0$

Solution:

$P \approx 1.52439\times10^7$

P = 1.52439*10^7

From:



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

(1.52439e+7)(-312.388^3-3*9.83114i^2)((3*(1.52439e+7)^3-(1.52439e+7)(-312.388)+4*9.83114i)) + 4*(-312.388)(9.83114i)(4*(1.52439e+7)^3*(-312.388)-3*(1.52439e+7)^2*(9.83114i)+2*(-312.388)(9.83114i))

Input interpretation:

$$1.52439\times10^7\left(-312.388^3 + 3\,i^2\times(-9.83114)\right)\left(3\left(1.52439\times10^7\right)^3 - 1.52439\times10^7\times(-312.388) + 4\times9.83114\,i\right) + 4\times(-312.388)\,(9.83114\,i)\left(4\left(1.52439\times10^7\right)^3\times(-312.388) - 3\left(1.52439\times10^7\right)^2(9.83114\,i) + 2\times(-312.388)\,(9.83114\,i)\right)$$

i is the imaginary unit

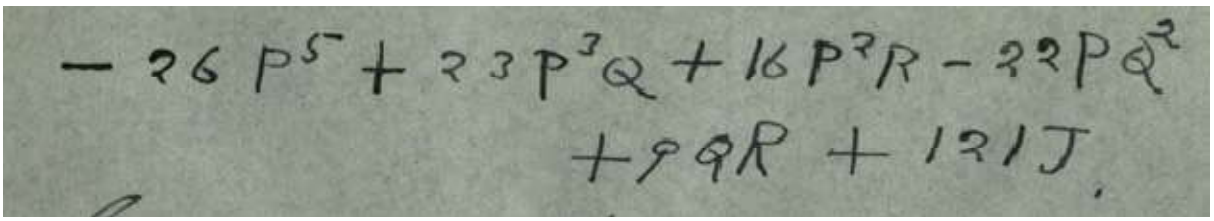
Result:

$-4.93842...\times10^{36} + 5.43752...\times10^{28}\,i$

Polar coordinates:

$r = 4.93842\times10^{36}$ (radius), $\theta = 180.^\circ$ (angle)

$4.93842*10^{36}$



-26*(1.52439e+7)^5+23*(1.52439e+7)^3*(-312.388)+16*(1.52439e+7)^2*(9.83114i)-22*(1.52439e+7)*(-312.388)^2+9*(-312.388)*(9.83114i)+121*279.1936

Input interpretation:

$$-26\,(1.52439\times 10^7)^5 + 23\,(1.52439\times 10^7)^3\times(-312.388) + 16\,(1.52439\times 10^7)^2\,(9.83114\,i) - 22\times 1.52439\times 10^7\,(-312.388)^2 + 9\times(-312.388)\,(9.83114\,i) + 121\times 279.1936$$

i is the imaginary unit

Result:

$$-2.14020...\times 10^{37} + 3.65524...\times 10^{16}\,i$$

Alternate form:

$$-2.1402\times 10^{37}$$

$-2.1402*10^{37}$

Thence, in conclusion, we obtain:

4.93842×10^36 + (2.1402×10^37)

Input interpretation:

$$4.93842\times 10^{36} + 2.1402\times 10^{37}$$

Result:

26 340 420 000 000 000 000 000 000 000 000 000 000

Scientific notation:

$$2.634042\times 10^{37}$$

$2.634042*10^{37}$

From which:

2.06/1729(((4.93842×10^36 + (2.1402×10^37))))

Where 2.06 is a Hausdorff dimension (Lorenz attractor = 2.06 ± 0.01) and 1729 is the Hardy-Ramanujan number

Input interpretation:

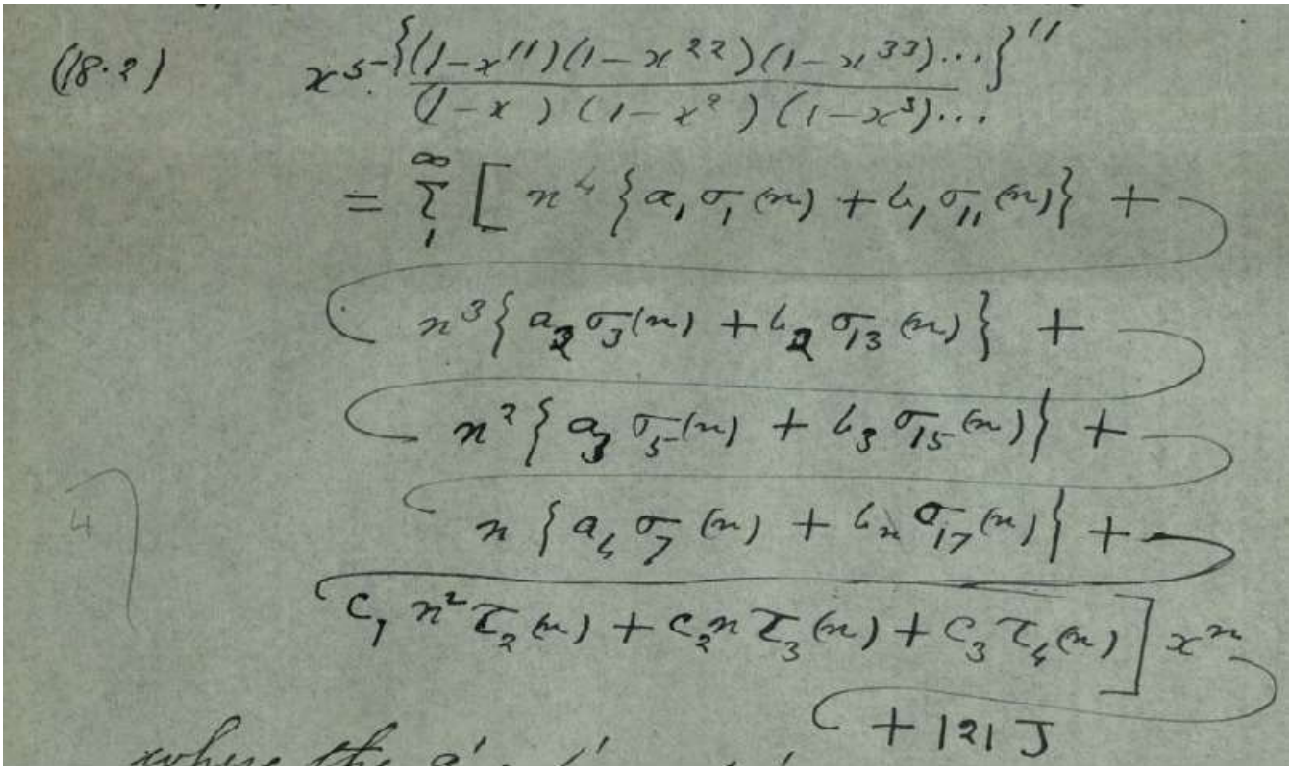
$$\frac{2.06}{1729}\left(4.93842\times10^{36}+2.1402\times10^{37}\right)$$

Result:

$3.13830336610757663389242336610757663389242336610757 66\ldots\times10^{34}$

3.13830336…*10^{34} result very near to the value of Planck mass flows 3.212525 × 10^{34} kg/s

Now, we have:



2^5 ((((1-2^11)(1-2^22)(1-2^33))^11)) / (((1-2)(1-2^2)(1-2^3)))

Input:

$$2^5 \times \frac{((1-2^{11})(1-2^{22})(1-2^{33}))^{11}}{(1-2)(1-2^2)(1-2^3)}$$

Decimal approximation:

$5.350239089471420872822324518682028772852841185020141 1\ldots \times 10^{218}$

$5.3502390894714208728223245186820287728528411850201411 \times 10^{218}$

From which:

64*2*sqrt(5.3502390894714208728223245186820287728528411850201411 × 10^218)

Input interpretation:

$$64 \times 2\sqrt{5.3502390894714208728223245186820287728528411850201411 \times 10^{218}}$$

Result:

$2.960714731984487552114469611010338068126610027483831 5\ldots \times 10^{111}$

$2.96071473\ldots.*10^{111}$ result very near to the value of the Planck pressure 2.933848×10^{111} Pa

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

Separable Integer Partition Classes - *George E. Andrews* - CANT 2020: ZOOM CONFERENCE - CUNY Graduate Center (Via Zoom) - June 1-5, 2020

George E. Andrews, Bruce C. Berndt - **Ramanujan's Lost Notebook Part I – The Rogers–Ramanujan Continued Fraction and Its Modular Properties**

https://mss-cat.trin.cam.ac.uk/manuscripts/uv/view.php?n=Add.Ms.a.94.13#?c=0&m=0&s=0&cv=27&xywh=-142%2C-39%2C5437%2C3154

https://mss-cat.trin.cam.ac.uk/manuscripts/uv/view.php?n=Add.Ms.a.94.13#?c=0&m=0&s=0&cv=28&xywh=-746%2C-805%2C6969%2C4346

https://mss-cat.trin.cam.ac.uk/manuscripts/uv/view.php?n=Add.Ms.a.94.13#?c=0&m=0&s=0&cv=30&xywh=-149%2C719%2C4824%2C3008

https://mss-cat.trin.cam.ac.uk/manuscripts/uv/view.php?n=Add.Ms.a.94.13#?c=0&m=0&s=0&cv=31&xywh=-3630%2C0%2C11908%2C7425