On the possible mathematical connections between some Ramanujan equations concerning p(n) and τ(n), several equations concerning Mock modularity, JT Gravity, various parameters concerning Particle Physics, ϕ and ζ(2). V

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Abstract

In this paper (part V), we describe and analyze further new mathematical connections between some Ramanujan formulas concerning p(n) and τ(n), several equations concerning Mock modularity, JT Gravity, various parameters concerning Particle Physics, ϕ and ζ(2).

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https://trinitycollegelibrarycambridge.wordpress.com/2020/04/24/remembering-ramanujan/

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"

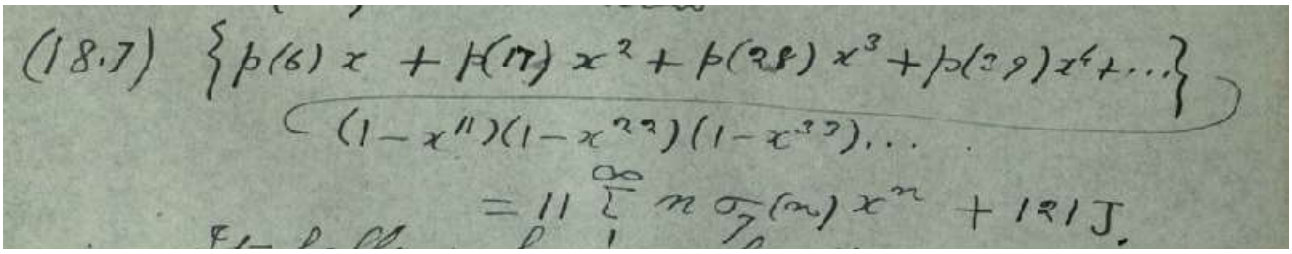
We, in our papers, through the use of “recreational number theory”, obtain possible new matematical connections between various sectors of Ramanujan's mathematics and various physical parameters concerning several topics of physics and cosmology.

From:

https://mss-cat.trin.cam.ac.uk/manuscripts/uv/view.php?n=Add.Ms.a.94.13#?c=0&m=0&s=0&cv=32&xywh=156%2C3252%2C4329%2C2511

Now, we have that

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



From the left-hand side of the above expression , considering p(6), p(17), p(28), p(39) the partition functions p(n) corresponding to the number of partitions of n and for x = 2, J = 279.1936 , we obtain:

p(6) = 11
p(17) = 297
p(28) = 3718
p(39) = 31185

(11*2+ 297*2^2+3718*2^3+31185*2^4)*((1-2^11)(1-2^22)(1-2^33))

Input:

$$(11\times 2+297\times 2^2+3718\times 2^3+31\,185\times 2^4)((1-2^{11})(1-2^{22})(1-2^{33}))$$

Result:

$$-39\,081\,650\,270\,015\,934\,232\,508\,934$$

Result:

$$-3.908165027001593423250893 4\times 10^{25}$$

$-3.908165027001593423250893 4*10^{25}$

We have also:

(11*2+ 297*2^2+3718*2^3+31185*2^4)*((1-2^11)(1-2^22)(1-2^33)) = 11*x + 121*279.1936

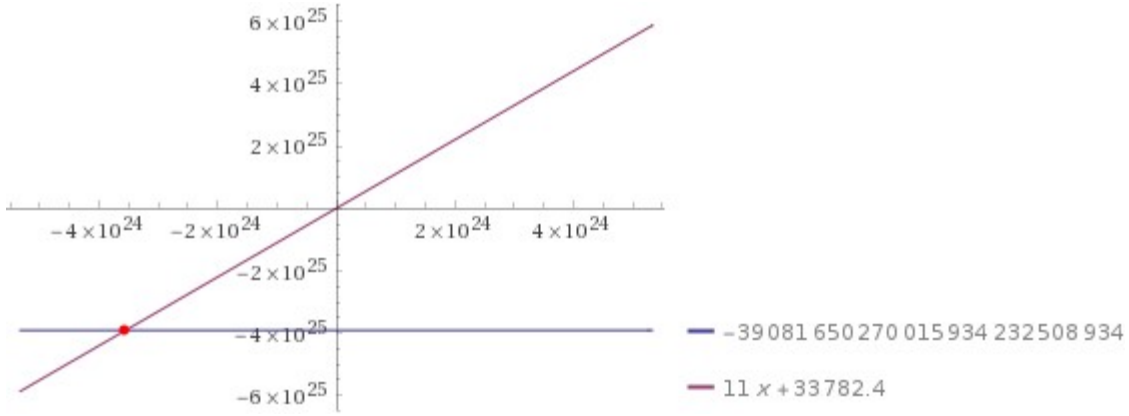
Input interpretation:

$$(11\times 2+297\times 2^2+3718\times 2^3+31\,185\times 2^4)((1-2^{11})(1-2^{22})(1-2^{33}))=$$
$$11\,x+121\times 279.1936$$

Result:

$$-39\,081\,650\,270\,015\,934\,232\,508\,934=11\,x+33\,782.4$$

Plot:



Alternate forms:

$$-11\,x-3.90817\times 10^{25}=0$$

$$-39\,081\,650\,270\,015\,934\,232\,508\,934=11\,(x+3071.13)$$

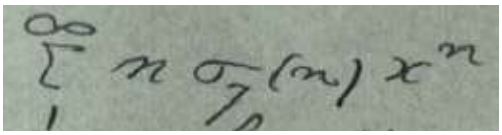
Solution:

$x = -3552877297274176084639744$

Integer solution:

$x = -3552877297274176084639744$

Thence



Is equal to -3552877297274176084639744. Indeed:

11*(-3552877297274176084639744) + 121*279.1936

Input interpretation:

$11 \times (-3552877297274176084639744) + 121 \times 279.1936$

Result:

$-3.908165027001593693100340157 44 \times 10^{25}$

-390816502700159369310034015.5744

We note that:

1/(18-4)(390816502700159342325089 34)

Input:

$\frac{1}{18-4} \times 39081650270015934232508934$

Result:

2791546447858281016607781

Scientific notation:

$2.791546447858281016607781 \times 10^{24}$

$2.791546447858281016607781 \times 10^{24}$ result very near to the value of the Planck current 2.768399×10^{24} A

Indeed:

$$I_P = \frac{q_P}{t_P} = \sqrt{\frac{\varepsilon_0 c^6}{4\pi G}}$$

sqrt(((((((8.85418781762e-12)(299792458)^6))) / (4*Pi*6.6743e-11))))

where 8.85418781762e-12 is the value of the absolute dielectric permittivity of classical vacuum.

$$\sqrt{\frac{8.85418781762 \times 10^{-12} \times 299\,792\,458^6}{4\pi \times 6.6743 \times 10^{-11}}}$$

$2.76839897648969593167120121231975652737709183850458 02\ldots \times 10^{24}$

$2.768398976\ldots * 10^{24}$

From the above expression

$$(11 \times 2 + 297 \times 2^2 + 3718 \times 2^3 + 31\,185 \times 2^4)((1 - 2^{11})(1 - 2^{22})(1 - 2^{33}))$$

we obtain also:

ln(((11*2+ 297*2^2+3718*2^3+31185*2^4)*((1-2^11)(1-2^22)(1-2^33))))+5

Input:

$$\log((11 \times 2 + 297 \times 2^2 + 3718 \times 2^3 + 31\,185 \times 2^4)((1 - 2^{11})(1 - 2^{22})(1 - 2^{33}))) + 5$$

$\log(x)$ is the natural logarithm

Exact result:

$5 + i\pi + \log(39\,081\,650\,270\,015\,934\,232\,508\,934)$

Decimal approximation:

$63.92769528613436824223920973614363544741546394961840554 66\ldots +$
$3.14159265358979323846264338327950288419716939937510582 097\ldots i$

Polar coordinates:

$r \approx 64.0048$ (radius), $\theta \approx 2.81342°$ (angle)

$64.0048 \approx 64$

Alternate forms:

$$5 + i\,\pi + 2\log(21) + 3\log(2047) + \log(10\,331\,913\,857\,738)$$

$$i\,(\pi - i\,(5 + \log(2) + 2\log(3) + 2\log(7) + \log(11) + 3\log(23) + \log(31) + \log(37) + 3\log(89) + \log(683) + \log(599\,479)))$$

$$5 + i\,\pi + \log(2) + 2\log(3) + 2\log(7) + \log(11) + 3\log(23) + \log(31) + \log(37) + 3\log(89) + \log(683) + \log(599\,479)$$

Alternative representations:

$$\log((11\times 2 + 297\times 2^2 + 3718\times 2^3 + 31\,185\times 2^4)(1-2^{11})((1-2^{22})(1-2^{33}))) + 5 = 5 + \log_e((30\,954 + 31\,185\times 2^4)(1-2^{11})(1-2^{22})(1-2^{33}))$$

$$\log((11\times 2 + 297\times 2^2 + 3718\times 2^3 + 31\,185\times 2^4)(1-2^{11})((1-2^{22})(1-2^{33}))) + 5 = 5 + \log(a)\log_a((30\,954 + 31\,185\times 2^4)(1-2^{11})(1-2^{22})(1-2^{33}))$$

$$\log((11\times 2 + 297\times 2^2 + 3718\times 2^3 + 31\,185\times 2^4)(1-2^{11})((1-2^{22})(1-2^{33}))) + 5 = 5 - \mathrm{Li}_1(1-(30\,954 + 31\,185\times 2^4)(1-2^{11})(1-2^{22})(1-2^{33}))$$

Series representations:

$$\log((11\times 2 + 297\times 2^2 + 3718\times 2^3 + 31\,185\times 2^4)(1-2^{11})((1-2^{22})(1-2^{33}))) + 5 = 5 + i\,\pi + \log(39\,081\,650\,270\,015\,934\,232\,508\,933) - \sum_{k=1}^{\infty} \frac{\left(-\frac{1}{39\,081\,650\,270\,015\,934\,232\,508\,933}\right)^k}{k}$$

$$\log((11\times 2 + 297\times 2^2 + 3718\times 2^3 + 31\,185\times 2^4)(1-2^{11})((1-2^{22})(1-2^{33}))) + 5 = 5 + i\,\pi + 2\,i\,\pi\left\lfloor \frac{\arg(39\,081\,650\,270\,015\,934\,232\,508\,934 - x)}{2\,\pi}\right\rfloor + \log(x) - \sum_{k=1}^{\infty} \frac{(-1)^k\,(39\,081\,650\,270\,015\,934\,232\,508\,934 - x)^k\,x^{-k}}{k} \quad \text{for } x < 0$$

$$\log((11\times 2 + 297\times 2^2 + 3718\times 2^3 + 31\,185\times 2^4)(1-2^{11})((1-2^{22})(1-2^{33}))) + 5 = 5 + i\,\pi + 2\,i\,\pi\left\lfloor \frac{\pi - \arg\left(\frac{1}{z_0}\right) - \arg(z_0)}{2\,\pi}\right\rfloor + \log(z_0) - \sum_{k=1}^{\infty} \frac{(-1)^k\,(39\,081\,650\,270\,015\,934\,232\,508\,934 - z_0)^k\,z_0^{-k}}{k}$$

Integral representations:

$$\log((11\times 2+297\times 2^2+3718\times 2^3+31\,185\times 2^4)(1-2^{11})((1-2^{22})(1-2^{33})))+5=5+i\pi+\int_1^{39\,081\,650\,270\,015\,934\,232\,508\,934}\frac{1}{t}\,dt$$

$$\log((11\times 2+297\times 2^2+3718\times 2^3+31\,185\times 2^4)(1-2^{11})((1-2^{22})(1-2^{33})))+5=5+i\pi-\frac{i}{2\pi}\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{39\,081\,650\,270\,015\,934\,232\,508\,933^{-s}\,\Gamma(-s)^2\,\Gamma(1+s)}{\Gamma(1-s)}\,ds \quad \text{for} \quad -1<\gamma<0$$

2((ln(((11*2+ 297*2^2+3718*2^3+31185*2^4)*((1-2^11)(1-2^22)(1-2^33))))+5))-3

Input:

$$2\left(\log((11\times 2+297\times 2^2+3718\times 2^3+31\,185\times 2^4)((1-2^{11})(1-2^{22})(1-2^{33})))+5\right)-3$$

$\log(x)$ is the natural logarithm

Exact result:

$$-3+2\,(5+i\pi+\log(39\,081\,650\,270\,015\,934\,232\,508\,934))$$

Decimal approximation:

124.855390572268736484478419472287270894830927899236811093... +
6.283185307179586476925286766559005768394338798750211641 94... i

Polar coordinates:

$r \approx 125.013$ (radius), $\theta \approx 2.88091°$ (angle)

125.013 result very near to the Higgs boson mass 125.18 GeV

Alternate forms:

$$7+2\,i\pi+2\log(39\,081\,650\,270\,015\,934\,232\,508\,934)$$

$$7+2\,i\pi+4\log(21)+6\log(2047)+2\log(10\,331\,913\,857\,738)$$

$$i\,(2\pi-i\,(7+2\log(2)+4\log(3)+4\log(7)+2\log(11)+6\log(23)+2\log(31)+2\log(37)+6\log(89)+2\log(683)+2\log(599\,479)))$$

Alternative representations:

$$2\left(\log\left(\left(11\times 2+297\times 2^2+3718\times 2^3+31\,185\times 2^4\right)\left(1-2^{11}\right)\left(\left(1-2^{22}\right)\left(1-2^{33}\right)\right)\right)+5\right)-3=$$
$$-3+2\left(5+\log_e\left(\left(30\,954+31\,185\times 2^4\right)\left(1-2^{11}\right)\left(1-2^{22}\right)\left(1-2^{33}\right)\right)\right)$$

$$2\left(\log\left(\left(11\times 2+297\times 2^2+3718\times 2^3+31\,185\times 2^4\right)\left(1-2^{11}\right)\left(\left(1-2^{22}\right)\left(1-2^{33}\right)\right)\right)+5\right)-3=$$
$$-3+2\left(5+\log(a)\log_a\left(\left(30\,954+31\,185\times 2^4\right)\left(1-2^{11}\right)\left(1-2^{22}\right)\left(1-2^{33}\right)\right)\right)$$

$$2\left(\log\left(\left(11\times 2+297\times 2^2+3718\times 2^3+31\,185\times 2^4\right)\left(1-2^{11}\right)\left(\left(1-2^{22}\right)\left(1-2^{33}\right)\right)\right)+5\right)-3=$$
$$-3+2\left(5-\mathrm{Li}_1\left(1-\left(30\,954+31\,185\times 2^4\right)\left(1-2^{11}\right)\left(1-2^{22}\right)\left(1-2^{33}\right)\right)\right)$$

Series representations:

$$2\left(\log\left(\left(11\times 2+297\times 2^2+3718\times 2^3+31\,185\times 2^4\right)\left(1-2^{11}\right)\left(\left(1-2^{22}\right)\left(1-2^{33}\right)\right)\right)+5\right)-3=$$
$$7+2i\pi+2\log(39\,081\,650\,270\,015\,934\,232\,508\,933)-$$
$$2\sum_{k=1}^{\infty}\frac{\left(-\frac{1}{39\,081\,650\,270\,015\,934\,232\,508\,933}\right)^k}{k}$$

$$2\left(\log\left(\left(11\times 2+297\times 2^2+3718\times 2^3+31\,185\times 2^4\right)\left(1-2^{11}\right)\left(\left(1-2^{22}\right)\left(1-2^{33}\right)\right)\right)+5\right)-3=$$
$$7+2i\pi+4i\pi\left\lfloor\frac{\arg(39\,081\,650\,270\,015\,934\,232\,508\,934-x)}{2\pi}\right\rfloor+2\log(x)-$$
$$2\sum_{k=1}^{\infty}\frac{(-1)^k\,(39\,081\,650\,270\,015\,934\,232\,508\,934-x)^k\,x^{-k}}{k}\quad\text{for } x<0$$

$$2\left(\log\left(\left(11\times 2+297\times 2^2+3718\times 2^3+31\,185\times 2^4\right)\left(1-2^{11}\right)\left(\left(1-2^{22}\right)\left(1-2^{33}\right)\right)\right)+5\right)-3=$$
$$7+2i\pi+4i\pi\left\lfloor\frac{\pi-\arg\left(\frac{1}{z_0}\right)-\arg(z_0)}{2\pi}\right\rfloor+2\log(z_0)-$$
$$2\sum_{k=1}^{\infty}\frac{(-1)^k\,(39\,081\,650\,270\,015\,934\,232\,508\,934-z_0)^k\,z_0^{-k}}{k}$$

Integral representations:

$$2\left(\log\left(\left(11\times 2+297\times 2^2+3718\times 2^3+31\,185\times 2^4\right)\left(1-2^{11}\right)\left(\left(1-2^{22}\right)\left(1-2^{33}\right)\right)\right)+5\right)-3=$$
$$7+2i\pi+2\int_1^{39\,081\,650\,270\,015\,934\,232\,508\,934}\frac{1}{t}\,dt$$

$$2\left(\log\left(\left(11\times 2+297\times 2^2+3718\times 2^3+31\,185\times 2^4\right)\left(1-2^{11}\right)\left(\left(1-2^{22}\right)\left(1-2^{33}\right)\right)\right)+5\right)-3=$$
$$7+2\,i\,\pi-\frac{i}{\pi}\int_{-i\,\infty+\gamma}^{i\,\infty+\gamma}\frac{39\,081\,650\,270\,015\,934\,232\,508\,933^{-s}\,\Gamma(-s)^2\,\Gamma(1+s)}{\Gamma(1-s)}\,ds \quad \text{for}$$
$$-1<\gamma<0$$

2((ln(((11*2+ 297*2^2+3718*2^3+31185*2^4)*((1-2^11)(1-2^22)(1-2^33))))+5))+11

Input:

$$2\left(\log\left(\left(11\times 2+297\times 2^2+3718\times 2^3+31\,185\times 2^4\right)\left(\left(1-2^{11}\right)\left(1-2^{22}\right)\left(1-2^{33}\right)\right)\right)+5\right)+11$$

$\log(x)$ is the natural logarithm

Exact result:

$$11+2\left(5+i\,\pi+\log(39\,081\,650\,270\,015\,934\,232\,508\,934)\right)$$

Decimal approximation:

138.855390572268736484478419472287270894830927899236811093... +
6.283185307179586476925286766559005768394338798750211641 94... i

Polar coordinates:

$r \approx 138.997$ (radius), $\theta \approx 2.59086°$ (angle)

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

Alternate forms:

$$21+2\,i\,\pi+2\log(39\,081\,650\,270\,015\,934\,232\,508\,934)$$

$$21+2\,i\,\pi+4\log(21)+6\log(2047)+2\log(10\,331\,913\,857\,738)$$

$$i\left(2\,\pi-i\left(21+2\log(2)+4\log(3)+4\log(7)+2\log(11)+6\log(23)+2\log(31)+2\log(37)+6\log(89)+2\log(683)+2\log(599\,479)\right)\right)$$

Alternative representations:

$$2\left(\log\left(\left(11\times 2+297\times 2^2+3718\times 2^3+31\,185\times 2^4\right)\left(1-2^{11}\right)\left(\left(1-2^{22}\right)\left(1-2^{33}\right)\right)\right)+5\right)+11=11+2\left(5+\log_e\left(\left(30\,954+31\,185\times 2^4\right)\left(1-2^{11}\right)\left(1-2^{22}\right)\left(1-2^{33}\right)\right)\right)$$

$$2\left(\log\left(\left(11\times 2+297\times 2^2+3718\times 2^3+31\,185\times 2^4\right)\left(1-2^{11}\right)\left(\left(1-2^{22}\right)\left(1-2^{33}\right)\right)\right)+5\right)+11=11+2\left(5+\log(a)\log_a\left(\left(30\,954+31\,185\times 2^4\right)\left(1-2^{11}\right)\left(1-2^{22}\right)\left(1-2^{33}\right)\right)\right)$$

$$2\left(\log\left(\left(11\times 2+297\times 2^2+3718\times 2^3+31\,185\times 2^4\right)\left(1-2^{11}\right)\left(\left(1-2^{22}\right)\left(1-2^{33}\right)\right)\right)+5\right)+11=11+2\left(5-\text{Li}_1\left(1-\left(30\,954+31\,185\times 2^4\right)\left(1-2^{11}\right)\left(1-2^{22}\right)\left(1-2^{33}\right)\right)\right)$$

Series representations:

$$2\left(\log\left(\left(11\times 2+297\times 2^2+3718\times 2^3+31\,185\times 2^4\right)\left(1-2^{11}\right)\left(\left(1-2^{22}\right)\left(1-2^{33}\right)\right)\right)+5\right)+11=21+2i\pi+2\log(39\,081\,650\,270\,015\,934\,232\,508\,933)-2\sum_{k=1}^{\infty}\frac{\left(-\frac{1}{39\,081\,650\,270\,015\,934\,232\,508\,933}\right)^k}{k}$$

$$2\left(\log\left(\left(11\times 2+297\times 2^2+3718\times 2^3+31\,185\times 2^4\right)\left(1-2^{11}\right)\left(\left(1-2^{22}\right)\left(1-2^{33}\right)\right)\right)+5\right)+11=21+2i\pi+4i\pi\left\lfloor\frac{\arg(39\,081\,650\,270\,015\,934\,232\,508\,934-x)}{2\pi}\right\rfloor+2\log(x)-2\sum_{k=1}^{\infty}\frac{(-1)^k\,(39\,081\,650\,270\,015\,934\,232\,508\,934-x)^k\,x^{-k}}{k}\quad\text{for } x<0$$

$$2\left(\log\left(\left(11\times 2+297\times 2^2+3718\times 2^3+31\,185\times 2^4\right)\left(1-2^{11}\right)\left(\left(1-2^{22}\right)\left(1-2^{33}\right)\right)\right)+5\right)+11=21+2i\pi+4i\pi\left\lfloor\frac{\pi-\arg\left(\frac{1}{z_0}\right)-\arg(z_0)}{2\pi}\right\rfloor+2\log(z_0)-2\sum_{k=1}^{\infty}\frac{(-1)^k\,(39\,081\,650\,270\,015\,934\,232\,508\,934-z_0)^k\,z_0^{-k}}{k}$$

Integral representations:

$$2\left(\log\left(\left(11\times 2+297\times 2^2+3718\times 2^3+31\,185\times 2^4\right)\left(1-2^{11}\right)\left(\left(1-2^{22}\right)\left(1-2^{33}\right)\right)\right)+5\right)+11=21+2i\pi+2\int_1^{39\,081\,650\,270\,015\,934\,232\,508\,934}\frac{1}{t}\,dt$$

$$2\left(\log\left(\left(11\times 2+297\times 2^2+3718\times 2^3+31\,185\times 2^4\right)\left(1-2^{11}\right)\left(\left(1-2^{22}\right)\left(1-2^{33}\right)\right)\right)+5\right)+$$
$$11=21+2\,i\,\pi-$$
$$\frac{i}{\pi}\int_{-i\,\infty+\gamma}^{i\,\infty+\gamma}\frac{39\,081\,650\,270\,015\,934\,232\,508\,933^{-s}\,\Gamma(-s)^2\,\Gamma(1+s)}{\Gamma(1-s)}\,ds\quad \text{for } -1<\gamma<0$$

27((ln(((11*2+ 297*2^2+3718*2^3+31185*2^4)*((1-2^11)(1-2^22)(1-2^33))))+5))+1

Input:

$$27\left(\log\left(\left(11\times 2+297\times 2^2+3718\times 2^3+31\,185\times 2^4\right)\left(\left(1-2^{11}\right)\left(1-2^{22}\right)\left(1-2^{33}\right)\right)\right)+5\right)+1$$

$\log(x)$ is the natural logarithm

Exact result:

$$1+27\left(5+i\,\pi+\log(39\,081\,650\,270\,015\,934\,232\,508\,934)\right)$$

Decimal approximation:

1727.047772725627942540458662875878157080217526639696949 76... +
84.823001646924417438491371348546577873323573783127857 1663... i

Polar coordinates:

$r \approx 1729.13$ (radius), $\theta \approx 2.81179°$ (angle)

1729.13

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".*

Alternate forms:

$$136 + 27\,i\,\pi + 27\log(39\,081\,650\,270\,015\,934\,232\,508\,934)$$

$$136 + 27\,i\,\pi + 54\log(21) + 81\log(2047) + 27\log(10\,331\,913\,857\,738)$$

$$i\,(27\,\pi - i\,(136 + 27\log(2) + 54\log(3) + 54\log(7) + 27\log(11) + 81\log(23) + 27\log(31) + 27\log(37) + 81\log(89) + 27\log(683) + 27\log(599\,479)))$$

Alternative representations:

$$27\,(\log((11\times 2 + 297\times 2^2 + 3718\times 2^3 + 31\,185\times 2^4)(1-2^{11})((1-2^{22})(1-2^{33}))) + 5) + 1 = 1 + 27\,(5 + \log_e((30\,954 + 31\,185\times 2^4)(1-2^{11})(1-2^{22})(1-2^{33})))$$

$$27\,(\log((11\times 2 + 297\times 2^2 + 3718\times 2^3 + 31\,185\times 2^4)(1-2^{11})((1-2^{22})(1-2^{33}))) + 5) + 1 = 1 + 27\,(5 + \log(a)\log_a((30\,954 + 31\,185\times 2^4)(1-2^{11})(1-2^{22})(1-2^{33})))$$

$$27\,(\log((11\times 2 + 297\times 2^2 + 3718\times 2^3 + 31\,185\times 2^4)(1-2^{11})((1-2^{22})(1-2^{33}))) + 5) + 1 = 1 + 27\,(5 - \text{Li}_1(1-(30\,954 + 31\,185\times 2^4)(1-2^{11})(1-2^{22})(1-2^{33})))$$

Series representations:

$$27\,(\log((11\times 2 + 297\times 2^2 + 3718\times 2^3 + 31\,185\times 2^4)(1-2^{11})((1-2^{22})(1-2^{33}))) + 5) + 1 = 136 + 27\,i\,\pi + 27\log(39\,081\,650\,270\,015\,934\,232\,508\,933) - 27\sum_{k=1}^{\infty}\frac{\left(-\frac{1}{39\,081\,650\,270\,015\,934\,232\,508\,933}\right)^k}{k}$$

$$27\,(\log((11\times 2 + 297\times 2^2 + 3718\times 2^3 + 31\,185\times 2^4)(1-2^{11})((1-2^{22})(1-2^{33}))) + 5) + 1 = 136 + 27\,i\,\pi + 54\,i\,\pi\left\lfloor\frac{\arg(39\,081\,650\,270\,015\,934\,232\,508\,934 - x)}{2\,\pi}\right\rfloor + 27\log(x) - 27\sum_{k=1}^{\infty}\frac{(-1)^k\,(39\,081\,650\,270\,015\,934\,232\,508\,934 - x)^k\,x^{-k}}{k} \quad \text{for } x < 0$$

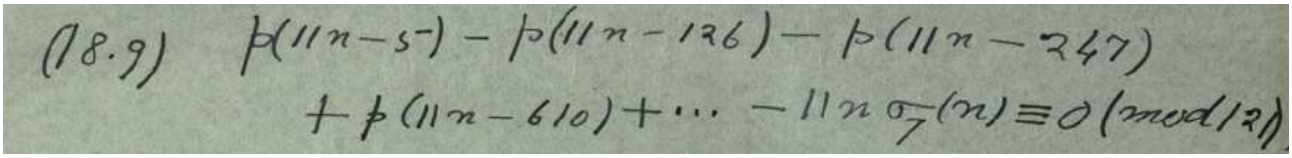
$$27\,(\log((11\times 2 + 297\times 2^2 + 3718\times 2^3 + 31\,185\times 2^4)(1-2^{11})((1-2^{22})(1-2^{33}))) + 5) + 1 = 136 + 27\,i\,\pi + 54\,i\,\pi\left\lfloor\frac{\pi - \arg\left(\frac{1}{z_0}\right) - \arg(z_0)}{2\,\pi}\right\rfloor + 27\log(z_0) - 27\sum_{k=1}^{\infty}\frac{(-1)^k\,(39\,081\,650\,270\,015\,934\,232\,508\,934 - z_0)^k\,z_0^{-k}}{k}$$

Integral representations:

$$27\left(\log\left(\left(11\times 2+297\times 2^2+3718\times 2^3+31\,185\times 2^4\right)\left(1-2^{11}\right)\left(\left(1-2^{22}\right)\left(1-2^{33}\right)\right)\right)+5\right)+1=136+27\,i\,\pi+27\int_1^{39\,081\,650\,270\,015\,934\,232\,508\,934}\frac{1}{t}\,dt$$

$$27\left(\log\left(\left(11\times 2+297\times 2^2+3718\times 2^3+31\,185\times 2^4\right)\left(1-2^{11}\right)\left(\left(1-2^{22}\right)\left(1-2^{33}\right)\right)\right)+5\right)+1=136+27\,i\,\pi-\frac{27\,i}{2\,\pi}\int_{-i\,\infty+\gamma}^{i\,\infty+\gamma}\frac{39\,081\,650\,270\,015\,934\,232\,508\,933^{-s}\,\Gamma(-s)^2\,\Gamma(1+s)}{\Gamma(1-s)}\,ds\quad\text{for}\quad -1<\gamma<0$$

Now, we have that:



We consider n = 121 and obtain:

p(11*121-5) – p(11*121-126) – p(11*121-247) + p(11*121-610)

p(1326) – p(1205) – p(1084) + p(721)

p(1326) = 39569707141143974333841203841660034 16
p(1205) = 55403558110955564979344325681437822
p(1084) = 62557838100713199371540012921865 5
p(721) = 16106175575027947763553476 2

(39569707141143974333841203841660034 16-
55403558110955564979344325681437822-
62557838100713199371540012921865 5+16106175575027947763553476 2)

Input:

3 956 970 714 114 397 433 384 120 384 166 003 416 −
55 403 558 110 955 564 979 344 325 681 437 822 −
625 578 381 007 131 993 715 400 129 218 655 +
161 061 755 750 279 477 635 534 762

Result:

3 900 941 577 783 496 492 161 340 135 990 881 701

Scientific notation:

$3.900941577783496492161340135990881701 \times 10^{36}$

$3.900941577783496492161340135990881701 \times 10^{36}$

1/123(3.900941577783496492161340135990881701 × 10^36)

Input interpretation:

$\frac{1}{123} \times 3.900941577783496492161340135990881701 \times 10^{36}$

Result:

$3.171497217710159749724666777228359106504065040650406504065... \times 10^{34}$

$3.17149721771....*10^{34}$ result very near to the value of Planck mass flow 3.212525×10^{34} kg/s

Indeed:

$$t_{r_s}^{-1} = \frac{m_P}{t_P} = \frac{c}{2\pi r_s} = \frac{c^3}{4\pi G}$$

(299792458)^3 / (4*Pi*6.6743e-11)

$$\frac{299\,792\,458^3}{4\pi \times 6.6743 \times 10^{-11}}$$

$3.212525037385978802209821179903078103517045043203000 3... \times 10^{34}$

$3.212525...*10^{34}$

(3.90094157778349 × 10^36)^1/17 –e

Input interpretation:

$\sqrt[17]{3.90094157778349 \times 10^{36}} - e$

Result:

139.3253382717505...

139.3253382717505… result practically equal to the rest mass of Pion meson 139.57 MeV

(3.90094157778349 × 10^36)^1/17 -18 + golden ratio

Input interpretation:

$\sqrt[17]{3.90094157778349 \times 10^{36}} - 18 + \phi$

ϕ is the golden ratio

Result:

125.6616540889594...

125.6616540889594… result very near to the Higgs boson mass 125.18 GeV

(3.90094157778349 × 10^36)^1/12 + 521+ 76 +11

Input interpretation:

$\sqrt[12]{3.90094157778349 \times 10^{36}} + 521 + 76 + 11$

Result:

1728.118887824051...

1728.118887824051…

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)

((((3.90094157778349 × 10^36)^1/12 + 521+ 76 +11)))^1/15

Input interpretation:

$$\sqrt[15]{\sqrt[12]{3.90094157778349 \times 10^{36}} + 521 + 76 + 11}$$

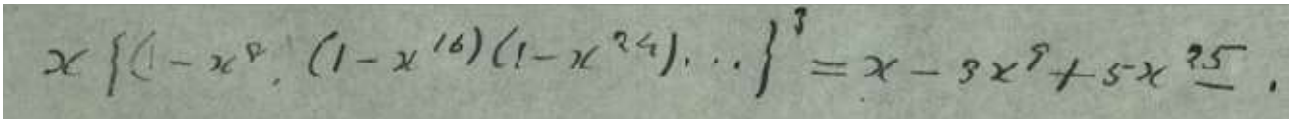
Result:

1.6437593687072004...

$1.6437593687072004\ldots \approx \zeta(2) = \frac{\pi^2}{6} = 1.644934\ldots$

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=35&xywh=298%2C1952%2C4329%2C2511



For x = 2, we obtain:

2(((1-2^8)(1-2^16)(1-2^24)))^3 = 2 – 3*2^9 + 5*2^25

2(((1-2^8)(1-2^16)(1-2^24)))^3 = x(2 – 3*2^9 + 5*2^25)

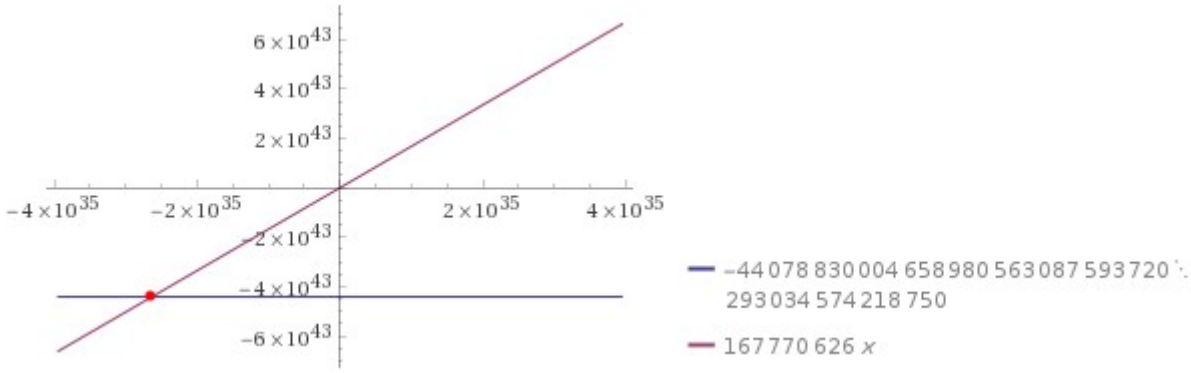
Input:

$$2\left(\left(1-2^8\right)\left(1-2^{16}\right)\left(1-2^{24}\right)\right)^3 = x\left(2-3\times 2^9+5\times 2^{25}\right)$$

Result:

$-44\,078\,830\,004\,658\,980\,563\,087\,593\,720\,293\,034\,574\,218\,750 = 167\,770\,626\,x$

Plot:



Alternate form:

$-167\,770\,626\,x - 44\,078\,830\,004\,658\,980\,563\,087\,593\,720\,293\,034\,574\,218\,750 = 0$

Solution:

$x \approx -262\,732\,702\,711\,969\,265\,336\,038\,270\,076\,715\,008$

$-2.627327027119692653360382700767150 08\times 10^{35}$

2(((1-2^8)(1-2^16)(1-2^24)))^3

Input:

$2\left(\left(1-2^{8}\right)\left(1-2^{16}\right)\left(1-2^{24}\right)\right)^{3}$

Result:

$-44\,078\,830\,004\,658\,980\,563\,087\,593\,720\,293\,034\,574\,218\,750$

$-4.407883000465898056308759372029303457421875\times 10^{43}$

(-2.627327027119692653360382700767150 08×10^35)* (2 – 3*2^9 + 5*2^25)

Input interpretation:

$-2.627327027119692653360382700767150 08\times 10^{35}\left(2-3\times 2^{9}+5\times 2^{25}\right)$

Result:

$-44\,078\,830\,004\,658\,981\,338\,187\,240\,930\,727\,544\,915\,755\,008$

$-4.407883000465898133818724093072754491575500 8\times 10^{43}$

We have also that:

0.421024438 * -((2(((1-2^8)(1-2^16)(1-2^24)))^3))

where 0.421024438 is the constant $K_0(+1)$ concerning the Bessel function of the second kind

Input interpretation:

$\left(2\left(\left(1-2^8\right)\left(1-2^{16}\right)\left(1-2^{24}\right)\right)^3\right)\times(-0.421024438)$

Result:

$1.855826463040908467322687769085870407692501850781 25 \times 10^{43}$

$1.855826463\ldots*10^{43}$ result about equal to the value of the angular Planck frequency 1.854858×10^{43} rad/s

Indeed:

$$f_p = \frac{c}{l_P} = \sqrt{\frac{c^5}{\hbar G}}$$

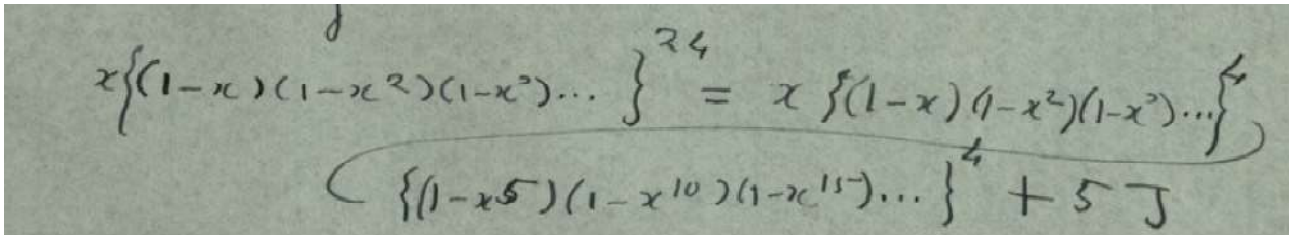
sqrt((((299792458)^5 / (1.054571e-34*6.6743e-11))))

$$\sqrt{\frac{299\,792\,458^5}{1.054571 \times 10^{-34} \times 6.6743 \times 10^{-11}}}$$

$1.85485934886243903266580827003112841675876556235709 16\ldots \times 10^{43}$

$1.8548593\ldots*10^{43}$

Now:



For x = 2 and J = 279.1936 , we obtain:

2((1-2)(1-2^2)(1-2^3))^24 = 2((1-2)(1-2^2)(1-2^3))^4 * ((1-2^5)(1-2^10)(1-2^15))^4 + 5*279.1936

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

Input:

$2\left((1-2)\left(1-2^2\right)\left(1-2^3\right)\right)^{24}$

Result:

108 216 396 754 545 168 261 021 186 525 762

Scientific notation:

$1.082163967545451682610211865257 62 \times 10^{32}$

$1.0821639675\ldots *10^{32}$

2((1-2)(1-2^2)(1-2^3))^4 * ((1-2^5)(1-2^10)(1-2^15))^4 + 5*279.1936

Input interpretation:

$2\left((1-2)\left(1-2^2\right)\left(1-2^3\right)\right)^4 \left(\left(1-2^5\right)\left(1-2^{10}\right)\left(1-2^{15}\right)\right)^4 + 5 \times 279.1936$

Result:

$4.535270649163144122462497230466258515609179 68 \times 10^{41}$

$4.535270649\ldots *10^{41}$

For

$x \approx 4.19093 \times 10^9$

we obtain

(((2((1-2)(1-2^2)(1-2^3))^24)))(4.19093e+9)

Input interpretation:

$\left(2\left((1-2)\left(1-2^2\right)\left(1-2^3\right)\right)^{24}\right) \times 4.19093 \times 10^9$

Result:

453 527 343 650 525 982 020 161 521 246 411 738 660 000

Scientific notation:

$4.535273436505259820201615212464117386 6 \times 10^{41}$

$4.5352734365\ldots * 10^{41}$

From which:

41*(((2((1-2)(1-2^2)(1-2^3))^24)))(4.19093e+9)

where 41 is an Eisenstein prime number

Input interpretation:

$41\,(2\,((1-2)(1-2^2)(1-2^3))^{24}) \times 4.19093 \times 10^9$

Result:

18 594 621 089 671 565 262 826 622 371 102 881 285 060 000

Scientific notation:

$1.859462108967156526282662237110288128506 \times 10^{43}$

$1.8594621089\ldots * 10^{43}$ result very near to the value of the angular Planck frequency 1.854858×10^{43} rad/s

And we obtain also:

(((2((1-2)(1-2^2)(1-2^3))^4 * ((1-2^5)(1-2^10)(1-2^15))^4 + 5*279.1936)))^1/12 – 1232

where 1232 is equal to the rest mass of Delta baryon and 1232 = 77*16

Input interpretation:

$\sqrt[12]{2\,((1-2)(1-2^2)(1-2^3))^4\,((1-2^5)(1-2^{10})(1-2^{15}))^4 + 5 \times 279.1936} - 1232$

Result:

1728.626354606169725668510328599163258091790955...

1728.6263546…

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)

((((((2((1-2)(1-2^2)(1-2^3))^4 * ((1-2^5)(1-2^10)(1-2^15))^4 + 5*279.1936)))^1/12 – 1232)))^1/15

Input interpretation:

$$\sqrt[15]{\sqrt[12]{2\left((1-2)\left(1-2^2\right)\left(1-2^3\right)\right)^4\left(\left(1-2^5\right)\left(1-2^{10}\right)\left(1-2^{15}\right)\right)^4+5\times 279.1936}-1232}$$

Result:

1.643791543923627268494368431468294341530692936 04...

1.6437915439…. $\approx \zeta(2) = \frac{\pi^2}{6} = 1.644934$ ...

(((2((1-2)(1-2^2)(1-2^3))^4 * ((1-2^5)(1-2^10)(1-2^15))^4 + 5*279.1936)))^1/20 + 4

Input interpretation:

$$\sqrt[20]{2\left((1-2)\left(1-2^2\right)\left(1-2^3\right)\right)^4\left(\left(1-2^5\right)\left(1-2^{10}\right)\left(1-2^{15}\right)\right)^4+5\times 279.1936}+4$$

Result:

125.012479752785972688364929659892740253701036 92...

125.01247975… result very near to the Higgs boson mass 125.18 GeV

(((2((1-2)(1-2^2)(1-2^3))^4 * ((1-2^5)(1-2^10)(1-2^15))^4 + 5*279.1936)))^1/20 + 18

Input interpretation:

$$\sqrt[20]{2\left((1-2)\left(1-2^2\right)\left(1-2^3\right)\right)^4\left(\left(1-2^5\right)\left(1-2^{10}\right)\left(1-2^{15}\right)\right)^4+5\times 279.1936}+18$$

Result:

139.012479752785972688364929659892740253701036 92...

139.0124797… result practically equal to the rest mass of Pion meson 139.57 MeV

(((2((1-2)(1-2^2)(1-2^3))^4 * ((1-2^5)(1-2^10)(1-2^15))^4 + 5*279.1936)))^1/199

Input interpretation:

$$\sqrt[199]{2\left((1-2)\left(1-2^2\right)\left(1-2^3\right)\right)^4\left(\left(1-2^5\right)\left(1-2^{10}\right)\left(1-2^{15}\right)\right)^4+5\times 279.1936}$$

Result:

1.619308756549232521666313310788171173137761948 19...

1.6193087565… result that is a very good approximation to the value of the golden ratio 1.618033988749...

From:

Duality and Mock Modularity

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

The elliptic genus of a compact target $\mathcal{X}$ is given by the partition function of a $(0,1)$ supersymmetric sigma model with periodic boundary conditions for fermions in both directions on T^2. When $\mathcal{X}$ is not compact, the partition function is in general not holomorphic and has a holomorphic anomaly. If $\mathcal{X}$ has a "boundary"[14] $\mathcal{Y}$, then the holomorphic anomaly is governed by the one-point function of the supercharge in a sigma model with target $\mathcal{Y}$ [14]. More precisely, let $Z_{\mathcal{X}}$ be the partition function of a heterotic sigma model with target $\mathcal{X}$ on a torus with complex structure τ. Then[15]

$$\frac{\partial Z_{\mathcal{X}}}{\partial\bar{\tau}} = \langle -2\pi i\bar{T}(z_0)\rangle_{\mathcal{X}} = \langle -\pi\{Q,\bar{G}(z_0)\}\rangle_{\mathcal{X}} = \frac{-e^{\pi i/4}}{\sqrt{8\,\tau_2}\eta(\tau)}\langle\bar{G}(z_0)\rangle_{\mathcal{Y}} \tag{4.32}$$

where $\langle\mathcal{O}(z_0)\rangle$ is a path integral with an insertion of operator $\mathcal{O}(z_0)$ at an arbitrary point z_0.

We have the following partition function:

$$\frac{\partial Z_\chi}{\partial \bar{\tau}} = \langle -2\pi i \bar{T}(z_0) \rangle_\chi = \langle -\pi \{Q, \bar{G}(z_0)\} \rangle_\chi = \frac{-e^{\pi i/4}}{\sqrt{8\,\tau_2}\eta(\tau)} \langle \bar{G}(z_0) \rangle_\gamma$$

And we have also the following equation:

$$\langle \bar{G} \rangle_\gamma - -i \left(\int_\gamma h \right) \cdot e^{3\pi i/4} \overline{\eta(\tau)^3} \cdot \frac{1}{8\pi^2 \tau_2 \eta(\tau)^2 \overline{\eta(\tau)^2}} \cdot \frac{\bar{\chi}_v^{\widehat{u(1)}_2}(\tau)}{2\pi\sqrt{2}}$$
$$- \frac{3i \cdot e^{3\pi i/4}}{4\pi\sqrt{2}\tau_2 \eta(\tau)^2} \cdot \sum_{n \in \mathbb{Z}} \bar{q}^{(n+v/2)^2}. \qquad (4.37)$$

We note that the eq. (4.37) is an evaluation of one of the factors in eq. (4.32). Thence, we have that:

From the following data

(see ref. “On the mathematical connections between some Ramanujan formulas concerning p(n) and τ(n), several equations concerning Mock Modularity in M-Theory duality, various parameters concerning Particle Physics, ϕ and ζ(2).” https://fermatslibrary.com/p/a308d666)

$-3.05774*10^{16} = \eta(\tau)$; $-3.3805503749….*10^{34} = \tau_2(n)$;

we obtain:

-exp((Pi*i)/4) * (((-3*i*exp((3Pi*i)/4)))) * [(((exp(2Pi))^((2+i/2)^2))) / (((4Pi*sqrt2 * (-3.3805503749e+34)*(-3.05774e+16)^2)))] * [(((((1/(((sqrt(8*-3.3805503749e+34)*-3.05774e+16)))))))]

Input interpretation:

$$-\exp\left(\frac{\pi i}{4}\right)\left(-3\,i\exp\left(\frac{1}{4}(3\pi i)\right)\right) \times \frac{\exp^{\left(2+\frac{i}{2}\right)^2}(2\pi)}{4\pi\sqrt{2}\,(-3.3805503749\times 10^{34})(-3.05774\times 10^{16})^2} \times \frac{1}{\sqrt{8\,(-3.3805503749\times 10^{34})}\,(-3.05774\times 10^{16})}$$

i is the imaginary unit

Result:

$-5.74105... \times 10^{-93}$

(using the principal branch of the logarithm for complex exponentiation)

-5.74105…*10^-93

We observe that, performing the square root and inverting the expression, we obtain:

1/(((((-exp((Pi*i)/4) (((-3*i*exp((3Pi*i)/4)))) [((((exp(2Pi))^((2+i/2)^2)))/(((4Pi*sqrt2 (-3.3805503749e+34)*(-3.05774e+16)^2)))] [((((1/(((sqrt(8*-3.3805503749e+34)*-3.05774e+16)))))))])))))^1/2

Input interpretation:

$$1 \Big/ \left(\sqrt{\left(-\exp\left(\frac{\pi i}{4}\right)\left(-3\, i \exp\left(\frac{1}{4}(3\pi i)\right)\right) \times \frac{\exp^{\left(2+\frac{i}{2}\right)^2}(2\pi)}{4\pi\sqrt{2}\,(-3.3805503749\times 10^{34}\,(-3.05774\times 10^{16})^2)} \times \frac{1}{\sqrt{8\,(-3.3805503749\times 10^{34})}\,(-3.05774\times 10^{16})}\right)} \right)$$

i is the imaginary unit

Result:

-0

$1.31979... \times 10^{46}\, i$

(using the principal branch of the logarithm for complex exponentiation)

Polar coordinates:

$r = 1.31979 \times 10^{46}$ (radius), $\theta = -90°$ (angle)

1.31979 * 10^46

From which:

24/(Pi^2*1729) (1.31979×10^46)

Input interpretation:

$$\frac{24}{1729\,\pi^2} \times 1.31979 \times 10^{46}$$

Result:

$1.85619... \times 10^{43}$

$1.85619\ldots*10^{43}$ result practically equal to the Planck frequency 1.8549×10^{43} Hz

We obtain also:

1/2(((-1/(((((-exp((Pi*i)/4)(((-3*i*exp((3Pi*i)/4))))
[(((exp(2Pi))^((2+i/2)^2)))/(((4Pi*sqrt2 (-3.38055e+34)*(-3.05774e+16)^2)))]
[(((((1/(((sqrt(8*-3.38055e+34)*-3.05774e+16)))))))])))))^1/26)))+34+2

Input interpretation:

$$\left(\frac{1}{2}\times(-1)\right)\Bigg/ \left(\left(\left(-\exp\left(\frac{\pi i}{4}\right)\left(-3\,i\exp\left(\frac{1}{4}(3\pi i)\right)\right)\right)\times\frac{\exp^{\left(2+\frac{i}{2}\right)^2}(2\pi)}{4\pi\sqrt{2}\,(-3.38055\times10^{34}\,(-3.05774\times10^{16})^2)}\times\frac{1}{\sqrt{8\,(-3.38055\times10^{34})\,(-3.05774\times10^{16})}}\right)\text{^}(1/26)\right)+34+2$$

i is the imaginary unit

Result:

$-1715.96... + 212.726... i$

(using the principal branch of the logarithm for complex exponentiation)

Polar coordinates:

$r = 1729.09$ (radius), $\theta = 172.933°$ (angle)

1729.09

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)

1/26(((-1/(((((-exp((Pi*i)/4)(((-3*i*exp((3Pi*i)/4))))
[(((exp(2Pi))^((2+i/2)^2)))/(((4Pi*sqrt2 (-3.38055e+34)*(-3.05774e+16)^2)))]
[(((((1/(((sqrt(8*-3.38055e+34)*-3.05774e+16)))))))])))))^1/26)))-4

Input interpretation:

$$\left(\frac{1}{26}\times(-1)\right)\Big/ \left(\left(\left(-\exp\left(\frac{\pi i}{4}\right)\left(-3\,i\exp\left(\frac{1}{4}(3\pi i)\right)\right)\right)\times\frac{\exp^{\left(2+\frac{i}{2}\right)^2}(2\pi)}{4\pi\sqrt{2}\,(-3.38055\times10^{34}\,(-3.05774\times10^{16})^2)}\times\frac{1}{\sqrt{8\,(-3.38055\times10^{34})}\,(-3.05774\times10^{16})}\right)\wedge(1/26)\right)-4$$

i is the imaginary unit

Result:

$-138.766\ldots + 16.3635\ldots\,i$

(using the principal branch of the logarithm for complex exponentiation)

Polar coordinates:

$r = 139.727$ (radius), $\theta = 173.275°$ (angle)

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

1/26(((-1/(((((-exp((Pi*i)/4)(((-3*i*exp((3Pi*i)/4))))
[(((exp(2Pi))^((2+i/2)^2)))/(((4Pi*sqrt2 (-3.38055e+34)*(-3.05774e+16)^2)))]
[(((((1/(((sqrt(8*-3.38055e+34)*-3.05774e+16)))))))])))))^1/26)))+11

Input interpretation:

$$\left(\frac{1}{26}\times(-1)\right)\Big/ \left(\left(\left(-\exp\left(\frac{\pi i}{4}\right)\left(-3\,i\exp\left(\frac{1}{4}(3\pi i)\right)\right)\right)\times\frac{\exp^{\left(2+\frac{i}{2}\right)^2}(2\pi)}{4\pi\sqrt{2}\,(-3.38055\times10^{34}\,(-3.05774\times10^{16})^2)}\times\frac{1}{\sqrt{8\,(-3.38055\times10^{34})}\,(-3.05774\times10^{16})}\right)\wedge(1/26)\right)+11$$

i is the imaginary unit

Result:

$$-123.766\ldots + 16.3635\ldots\, i$$

(using the principal branch of the logarithm for complex exponentiation)

Polar coordinates:

$r = 124.843$ (radius), $\theta = 172.468°$ (angle)

124.843 result very near to the Higgs boson mass 125.18 GeV

We have also:

-1/sqrt(((((-exp((Pi*i)/4) (((-3*i*exp((3Pi*i)/4))))
[(((exp(2Pi))^((2+i/2)^2)))/(((4Pi*sqrt2 (-3.3805503749e+34)*(-3.05774e+16)^2)))]
[(((((1/(((sqrt(8*-3.3805503749e+34)*-3.05774e+16)))))))]))))

Input interpretation:

$$-\left(1\Big/\left(\sqrt{\left(-\exp\left(\frac{\pi\, i}{4}\right)\left(-3\, i \exp\left(\frac{1}{4}(3\,\pi\, i)\right)\right)\times \frac{\exp^{\left(2+\frac{i}{2}\right)^2}(2\,\pi)}{4\,\pi\sqrt{2}\,\left(-3.3805503749\times 10^{34}\left(-3.05774\times 10^{16}\right)^2\right)}\times \frac{1}{\sqrt{8\left(-3.3805503749\times 10^{34}\right)}\left(-3.05774\times 10^{16}\right)}\right)}\right)\right)$$

i is the imaginary unit

Result:

$$1.319788573947300574219666148071915593685523208353829 8\ldots \times 10^{46}\, i$$

(using the principal branch of the logarithm for complex exponentiation)

Polar coordinates:

$r = 1.31979\times 10^{46}$ (radius), $\theta = 90.°$ (angle)

$1.31979*10^{46}$

that is:

131978857394730057421966614807191559368552320 83

With regard the partition numbers, we have:

p(2037) = 133296484194692653158633471039323140557219548 84

The ratio between the two values is:

(133296484194692653158633471039323140557219548 84)/(1319788573947300574 219666148071915593685523 2083)

Input:

$$\frac{13\,329\,648\,419\,469\,265\,315\,863\,347\,103\,932\,314\,055\,721\,954\,884}{13\,197\,885\,739\,473\,005\,742\,196\,661\,480\,719\,155\,936\,855\,232\,083}$$

Exact result:

$$\frac{13\,329\,648\,419\,469\,265\,315\,863\,347\,103\,932\,314\,055\,721\,954\,884}{13\,197\,885\,739\,473\,005\,742\,196\,661\,480\,719\,155\,936\,855\,232\,083}$$ (irreducible)

Decimal approximation:

1.009983620300801367919502596281303157524635312886279240163...

1.0099836203008……

From which:

[1/(1.009983620300801367919502596281303157524635312886279240163)]^1/12

Input interpretation:

$$\sqrt[12]{\frac{1}{1.009983620300801367919502596281303157524635312886279240163}}$$

Result:

0.999172499800810567036490970047979398455255387754932208680...

0.9991724998…. result very near to the value of the following Rogers-Ramanujan continued fraction:

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

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)

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and

[1/(1.00998362030080136791950259628130315752463531288627924016 3)]^(sqrt2 * Pi)

Input interpretation:

$$\left(\frac{1}{1.00998362030080136791950259628130315752463531288627924016 3}\right)^{\sqrt{2}\,\pi}$$

Result:

0.95682372295787704753895414313668533491046870313198459699 1...

0.9568237229….. result very near to the spectral index n_s , to the mesonic Regge slope, to the inflaton value at the end of the inflation 0.9402 and to the value of the following Rogers-Ramanujan continued fraction:

$$\frac{e^{-\frac{\pi}{5}}}{\sqrt{(\varphi-1)\sqrt{5}}-\varphi+1}=1-\cfrac{e^{-\pi}}{1+\cfrac{e^{-2\pi}}{1+\cfrac{e^{-3\pi}}{1+\cfrac{e^{-4\pi}}{1+\ldots}}}}\approx 0.9568666373$$

From:

Astronomy & Astrophysics manuscript no. ms c ESO 2019 - September 24, 2019
Planck 2018 results. VI. Cosmological parameters

The primordial fluctuations are consistent with Gaussian purely adiabatic scalar perturbations characterized by a power spectrum with a spectral index $n_s = 0.965 \pm 0.004$, consistent with the predictions of slow-roll, single-field, inflation.

Furthermore:

[(1.009983620300801367919502596281303157524635312886279240163)]^48

Input interpretation:

$1.009983620300801367919502596281303157524635312886279240163^{48}$

Result:

1.610971532745658291695292163640234345173091312385006998087...

1.610971532745….. result that is a very good approximation to the value of the golden ratio 1.618033988749...

[(1.009983620300801367919502596281303157524635312886279240163)]^50

Input interpretation:

$1.009983620300801367919502596281303157524635312886279240163^{50}$

Result:

1.643298758783230554123613214026718887428496460574333590967...

$1.643298758\ldots \approx \zeta(2) = \frac{\pi^2}{6} = 1.644934\ldots$

From:

Vafa-Witten theory and iterated integrals of modular forms
Jan Manschot, - arXiv:1709.10098v2 [hep-th] 19 Jul 2018

we have that:

$$b_{3,j}(\tau, z) := \sum_{k_1,k_2 \in \mathbb{Z}+\frac{j}{3}} e^{2\pi i z(k_1+2k_2)} q^{k_1^2+k_2^2+k_1k_2}.$$

For j = 1, k_1 = 2+1/3 = 2.333333… k_2 = 3+1/3 = 3.333333; $q = e^{2\pi i\tau}$,

Exp(2Pi)(7/3+2*10/3)*(((exp(2Pi))^(49/9+100/9+7/3*10/3)))

Input:

$$\exp(2\pi)\left(\frac{7}{3}+2\times\frac{10}{3}\right)\exp^{\frac{49}{9}+\frac{100}{9}+\frac{7}{3}\times\frac{10}{3}}(2\pi)$$

Exact result:

$$9\,e^{(152\pi)/3}$$

Decimal approximation:

$1.209607406636623384590408449417684238662082727695275 5\ldots \times 10^{70}$

$1.209607406636623\ldots*10^{70}$

Property:

$9\,e^{(152\pi)/3}$ is a transcendental number

Series representations:

$$\exp(2\pi)\left(\frac{7}{3}+\frac{2\times 10}{3}\right)\exp^{\frac{49}{9}+\frac{100}{9}+\frac{10\times 7}{3\times 3}}(2\pi)=9\,e^{608/3\sum_{k=0}^{\infty}(-1)^k/(1+2k)}$$

$$\exp(2\pi)\left(\frac{7}{3}+\frac{2\times 10}{3}\right)\exp^{\frac{49}{9}+\frac{100}{9}+\frac{10\times 7}{3\times 3}}(2\pi)=9\left(\sum_{k=0}^{\infty}\frac{1}{k!}\right)^{(152\pi)/3}$$

$$\exp(2\pi)\left(\frac{7}{3}+\frac{2\times 10}{3}\right)\exp^{\frac{49}{9}+\frac{100}{9}+\frac{10\times 7}{3\times 3}}(2\pi)=9\left(\frac{1}{\sum_{k=0}^{\infty}\frac{(-1)^k}{k!}}\right)^{(152\pi)/3}$$

Integral representations:

$$\exp(2\pi)\left(\frac{7}{3}+\frac{2\times 10}{3}\right)\exp^{\frac{49}{9}+\frac{100}{9}+\frac{10\times 7}{3\times 3}}(2\pi)=9\,e^{608/3\int_0^1\sqrt{1-t^2}\,dt}$$

$$\exp(2\pi)\left(\frac{7}{3}+\frac{2\times 10}{3}\right)\exp^{\frac{49}{9}+\frac{100}{9}+\frac{10\times 7}{3\times 3}}(2\pi)=9\,e^{38\left(\sqrt{3}+32\int_0^{\frac{1}{4}}\sqrt{-(-1+t)t}\,dt\right)}$$

$$\exp(2\pi)\left(\frac{7}{3}+\frac{2\times 10}{3}\right)\exp^{\frac{49}{9}+\frac{100}{9}+\frac{10\times 7}{3\times 3}}(2\pi)=9\,e^{304/3\int_0^1 1/\sqrt{1-t^2}\,dt}$$

Now, we have that:

We will consider in this subsection the function Φ, which is of signature $(2,1)$ and will occur in the refined VW partition functions (6.13). We define the function $\Phi(\tau,u,v) := \Phi(u,v)$ by[11]

$$\Phi(u,v) := \frac{1}{2} + \frac{e^{2\pi i u}}{b_{3,0}(\tau,v)} \sum_{k_1,k_2\in\mathbb{Z}} \frac{e^{2\pi i v(k_1+2k_2)} q^{k_1^2+k_2^2+k_1k_2+2k_1+k_2}}{1-e^{2\pi i u} q^{2k_1+k_2}}, \tag{5.14}$$

where $b_{3,0}$ is defined in Equation (4.6). Note that Φ involves the same quadratic form in the numerator as is associated to $b_{3,0}$, namely the quadratic form of the A_2 root lattice.

We will now show that this function can be expressed in terms of the classical Appell-Lerch sum μ (5.3), such that its completion and other properties can be readily determined. To this end, we make the change of variables $k = k_2$, $\ell = 2k_1 + k_2$ in the sum in Equation (5.14), such that Φ takes the form

$$\begin{aligned}\Phi(u,v) &= \frac{1}{2} + \frac{e^{2\pi i u}}{b_{3,0}(\tau,v)} \left(\sum_{\ell,k\in 2\mathbb{Z}} + \sum_{\ell,k\in 2\mathbb{Z}+1} \right) \frac{e^{\pi i v(\ell+3k)} q^{\frac{1}{4}\ell^2+\ell+\frac{3}{4}k^2}}{1-e^{2\pi i u} q^{\ell}} \\ &= \frac{1}{2} + \frac{e^{2\pi i u}}{b_{3,0}(\tau,v)} \left(\theta_3(6\tau,3v) \sum_{\ell\in\mathbb{Z}} \frac{e^{2\pi i v\ell} q^{\ell^2+2\ell}}{1-e^{2\pi i u} q^{2\ell}} + \theta_2(6\tau,3v) \sum_{\ell\in\mathbb{Z}} \frac{e^{2\pi i v(\ell-\frac{1}{2})} q^{\ell^2+\ell-\frac{3}{4}}}{1-e^{2\pi i u} q^{2\ell-1}} \right).\end{aligned} \tag{5.15}$$

From

$$\Phi(u,v) := \frac{1}{2} + \frac{e^{2\pi i u}}{b_{3,0}(\tau,v)} \sum_{k_1,k_2\in\mathbb{Z}} \frac{e^{2\pi i v(k_1+2k_2)} q^{k_1^2+k_2^2+k_1k_2+2k_1+k_2}}{1-e^{2\pi i u} q^{2k_1+k_2}},$$

For j = 1, $k_1 = 2+1/3 = 2.333333\ldots$ $k_2 = 3+1/3 = 3.333333$; $q = e^{2\pi i\tau}$,

we obtain:

(1/2 + exp(1/5*2Pi)) / (1.209607406636623e+70) * (((exp(2Pi(7/3+2*10/3)) (exp(2Pi))^(49/9+100/9+7/3*10/3+2*7/3+10/3)))) / (((((1-(exp(1/5*2Pi))*(exp(2Pi))^(2*7/3+10/3))))

Input interpretation:

$$\frac{\frac{1}{2} + \exp\left(\frac{1}{5}\times 2\pi\right)}{1.209607406636623\times 10^{70}} \times \frac{\exp\left(2\pi\left(\frac{7}{3}+2\times\frac{10}{3}\right)\right) \exp^{\frac{49}{9}+\frac{100}{9}+\frac{7}{3}\times\frac{10}{3}+2\times\frac{7}{3}+\frac{10}{3}}(2\pi)}{1-\exp\left(\frac{1}{5}\times 2\pi\right)\exp^{2\times\frac{7}{3}+\frac{10}{3}}(2\pi)}$$

Result:

$-8.58145921926391... \times 10^{20}$

-8.581459219…*10^{20}

From which:

5^2(((((1/2 + exp(1/5*2Pi)) / (1.209607406636623e+70) * (((exp(2Pi(7/3+2*10/3)) (exp(2Pi))^(49/9+100/9+7/3*10/3+2*7/3+10/3)))) / (((((1-(exp(1/5*2Pi))*(exp(2Pi))^(2*7/3+10/3)))))))))^2

Input interpretation:

$$5^2\left(\frac{\frac{1}{2}+\exp\left(\frac{1}{5}\times 2\pi\right)}{1.209607406636623\times 10^{70}}\times\frac{\exp\left(2\pi\left(\frac{7}{3}+2\times\frac{10}{3}\right)\right)\exp^{\frac{49}{9}+\frac{100}{9}+\frac{7}{3}\times\frac{10}{3}+2\times\frac{7}{3}+\frac{10}{3}}(2\pi)}{1-\exp\left(\frac{1}{5}\times 2\pi\right)\exp^{2\times\frac{7}{3}+\frac{10}{3}}(2\pi)}\right)^2$$

Result:

$1.84103605829724... \times 10^{43}$

1.841036058…*10^{43} result very near to the Planck frequency 1.8549×10^{43} Hz

From the following partition number:

p(482) = 841457028742823649455

we perform the ratio between this value and the previous result and obtain:

(-8.581459219263910130572859095066009811923405786 4 × 10^20 / 841457028742823649455)

Input interpretation:

$$-\frac{8.581459219263910130572859095066009811923405786 4\times 10^{20}}{841\,457\,028\,742\,823\,649\,455}$$

Result:

$-1.019833327922284224565555579619022712173604079806522647 42...$

-1.0198333279222842…..

1/(-(-858145921926391013057.2859095 / 841457028742823649455))^1/32

Input interpretation:

$$\frac{1}{\sqrt[32]{-\left(-\frac{8.581459219263910130572859095\times 10^{20}}{841\,457\,028\,742\,823\,649\,455}\right)}}$$

Result:

0.99938646298002787880115036159 5...

0.99938646298…… 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)

We have also:

(-(-858145921926391013057.2859095 / 841457028742823649455))^25

Input interpretation:

$$\left(-\left(-\frac{8.581459219263910130572859095\times 10^{20}}{841\,457\,028\,742\,823\,649\,455}\right)\right)^{25}$$

Result:

1.633917080240438131281729339161367947073846844263444677328...

$1.633917080240438\ldots \approx \zeta(2) = \frac{\pi^2}{6} = 1.644934\ldots$

and again:

1

/8((((-(1/2 + exp(1/5*2Pi)) / (1.209607406636623e+70) (((exp(2Pi(7/3+2*10/3)) (exp(2Pi))^(49/9+100/9+7/3*10/3+2*7/3+10/3)))) / (((((1-(exp(1/5*2Pi))*(exp(2Pi))^(2*7/3+10/3)))))))))^1/5-199+7

Input interpretation:

$$\frac{1}{8}\left(-\frac{\frac{1}{2}+\exp\left(\frac{1}{5}\times 2\pi\right)}{1.209607406636623\times 10^{70}}\times \frac{\exp\left(2\pi\left(\frac{7}{3}+2\times\frac{10}{3}\right)\right)\exp^{\frac{49}{9}+\frac{100}{9}+\frac{7}{3}\times\frac{10}{3}+2\times\frac{7}{3}+\frac{10}{3}}(2\pi)}{1-\exp\left(\frac{1}{5}\times 2\pi\right)\exp^{2\times\frac{7}{3}+\frac{10}{3}}(2\pi)}\right)\text{^}(1/5)-199+7$$

Result:

1729.419710905228...

1729.41971….

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)

8+1/Pi((((-(1/2 + exp(1/5*2Pi)) / (1.209607406636623e+70) (((exp(2Pi(7/3+2*10/3)) (exp(2Pi))^(49/9+100/9+7/3*10/3+2*7/3+10/3)))) / (((((1-(exp(1/5*2Pi))*(exp(2Pi))^(2*7/3+10/3)))))))))^1/8

Input interpretation:

$$8+\frac{1}{\pi}\left(-\frac{\frac{1}{2}+\exp\left(\frac{1}{5}\times 2\pi\right)}{1.209607406636623\times 10^{70}}\times \frac{\exp\left(2\pi\left(\frac{7}{3}+2\times\frac{10}{3}\right)\right)\exp^{\frac{49}{9}+\frac{100}{9}+\frac{7}{3}\times\frac{10}{3}+2\times\frac{7}{3}+\frac{10}{3}}(2\pi)}{1-\exp\left(\frac{1}{5}\times 2\pi\right)\exp^{2\times\frac{7}{3}+\frac{10}{3}}(2\pi)}\right)\text{^}(1/8)$$

Result:

139.6877174785462...

139.687717… result practically equal to the rest mass of Pion meson 139.57 MeV

1/Pi((((-(1/2 + exp(1/5*2Pi)) / (1.209607406636623e+70) (((exp(2Pi(7/3+2*10/3)) (exp(2Pi))^(49/9+100/9+7/3*10/3+2*7/3+10/3)))) / (((((1-(exp(1/5*2Pi))*(exp(2Pi))^(2*7/3+10/3)))))))))^1/8-8+2

Input interpretation:

$$\frac{1}{\pi}\left(-\frac{\frac{1}{2}+\exp\left(\frac{1}{5}\times 2\pi\right)}{1.209607406636623\times 10^{70}}\times \frac{\exp\left(2\pi\left(\frac{7}{3}+2\times\frac{10}{3}\right)\right)\exp^{\frac{49}{9}+\frac{100}{9}+\frac{7}{3}\times\frac{10}{3}+2\times\frac{7}{3}+\frac{10}{3}}(2\pi)}{1-\exp\left(\frac{1}{5}\times 2\pi\right)\exp^{2\times\frac{7}{3}+\frac{10}{3}}(2\pi)}\right)\text{^}(1/8)-8+2$$

Result:

125.6877174785462...

125.687717… result very near to the Higgs boson mass 125.18 GeV

Now, we have that:

As a final example, we introduce the theta series Θ_{E_6}, whose associated lattice is the six-dimensional root lattice Λ_{E_6} of E_6. It is explicitly given as

$$\begin{aligned}\Theta_{E_6}(\tau) &= \sum_{k\in\Lambda_{E_6}} q^{Q(k)/2} \\ &= 1 + 72q + 270q^2 + 720q^3 + 936q^4 + \dots,\end{aligned} \tag{3.12}$$

For q = exp(2Pi) , from

$$\begin{aligned}\Theta_{E_6}(\tau) &= \sum_{k\in\Lambda_{E_6}} q^{Q(k)/2} \\ &= 1 + 72q + 270q^2 + 720q^3 + 936q^4 + \dots,\end{aligned}$$

1+72(exp(2Pi))+270(exp(2Pi))^2+720(exp(2Pi))^3+936(exp(2Pi))^4

Input:

$1 + 72\exp(2\pi) + 270\exp^2(2\pi) + 720\exp^3(2\pi) + 936\exp^4(2\pi)$

Exact result:

$1 + 72e^{2\pi} + 270e^{4\pi} + 720e^{6\pi} + 936e^{8\pi}$

Decimal approximation:

$7.707446696301258329116730749520128185397325340581988 3\ldots \times 10^{13}$

$7.7074466963\ldots*10^{13}$

Property:

$1 + 72e^{2\pi} + 270e^{4\pi} + 720e^{6\pi} + 936e^{8\pi}$ is a transcendental number

Alternate form:

$1 + 18e^{2\pi}\left(4 + 15e^{2\pi} + 40e^{4\pi} + 52e^{6\pi}\right)$

Series representations:

$$1 + 72\exp(2\pi) + 270\exp^2(2\pi) + 720\exp^3(2\pi) + 936\exp^4(2\pi) = 1 + 72\,e^{8\sum_{k=0}^{\infty}(-1)^k/(1+2k)} + 270\,e^{16\sum_{k=0}^{\infty}(-1)^k/(1+2k)} + 720\,e^{24\sum_{k=0}^{\infty}(-1)^k/(1+2k)} + 936\,e^{32\sum_{k=0}^{\infty}(-1)^k/(1+2k)}$$

$$1 + 72\exp(2\pi) + 270\exp^2(2\pi) + 720\exp^3(2\pi) + 936\exp^4(2\pi) = 1 + 72\left(\sum_{k=0}^{\infty}\frac{1}{k!}\right)^{2\pi} + 270\left(\sum_{k=0}^{\infty}\frac{1}{k!}\right)^{4\pi} + 720\left(\sum_{k=0}^{\infty}\frac{1}{k!}\right)^{6\pi} + 936\left(\sum_{k=0}^{\infty}\frac{1}{k!}\right)^{8\pi}$$

$$1 + 72\exp(2\pi) + 270\exp^2(2\pi) + 720\exp^3(2\pi) + 936\exp^4(2\pi) = 1 + 72\left(\frac{1}{\sum_{k=0}^{\infty}\frac{(-1)^k}{k!}}\right)^{2\pi} + 270\left(\frac{1}{\sum_{k=0}^{\infty}\frac{(-1)^k}{k!}}\right)^{4\pi} + 720\left(\frac{1}{\sum_{k=0}^{\infty}\frac{(-1)^k}{k!}}\right)^{6\pi} + 936\left(\frac{1}{\sum_{k=0}^{\infty}\frac{(-1)^k}{k!}}\right)^{8\pi}$$

Integral representations:

$$1 + 72\exp(2\pi) + 270\exp^2(2\pi) + 720\exp^3(2\pi) + 936\exp^4(2\pi) = 1 + 72\,e^{4\int_0^{\infty}1/(1+t^2)\,dt} + 270\,e^{8\int_0^{\infty}1/(1+t^2)\,dt} + 720\,e^{12\int_0^{\infty}1/(1+t^2)\,dt} + 936\,e^{16\int_0^{\infty}1/(1+t^2)\,dt}$$

$$1 + 72\exp(2\pi) + 270\exp^2(2\pi) + 720\exp^3(2\pi) + 936\exp^4(2\pi) = 1 + 72\,e^{8\int_0^1\sqrt{1-t^2}\,dt} + 270\,e^{16\int_0^1\sqrt{1-t^2}\,dt} + 720\,e^{24\int_0^1\sqrt{1-t^2}\,dt} + 936\,e^{32\int_0^1\sqrt{1-t^2}\,dt}$$

$$1 + 72\exp(2\pi) + 270\exp^2(2\pi) + 720\exp^3(2\pi) + 936\exp^4(2\pi) = 1 + 72\,e^{4\int_0^1 1/\sqrt{1-t^2}\,dt} + 270\,e^{8\int_0^1 1/\sqrt{1-t^2}\,dt} + 720\,e^{12\int_0^1 1/\sqrt{1-t^2}\,dt} + 936\,e^{16\int_0^1 1/\sqrt{1-t^2}\,dt}$$

From which:

21+(((1+72(exp(2Pi))+270(exp(2Pi))^2+720(exp(2Pi))^3+936(exp(2Pi))^4)))^1/4

Input:

$$21 + \sqrt[4]{1 + 72\exp(2\pi) + 270\exp^2(2\pi) + 720\exp^3(2\pi) + 936\exp^4(2\pi)}$$

Exact result:

$$21+\sqrt[4]{1+72\,e^{2\pi}+270\,e^{4\pi}+720\,e^{6\pi}+936\,e^{8\pi}}$$

Decimal approximation:

2983.97258019931282620537766049046022997718269563856416399 0...

2983.97258… result very near to the rest mass of Charmed eta meson 2980.3

Property:

$21+\sqrt[4]{1+72\,e^{2\pi}+270\,e^{4\pi}+720\,e^{6\pi}+936\,e^{8\pi}}$ is a transcendental number

Alternate form:

$$21+\sqrt[4]{1+18\,e^{2\pi}\left(4+15\,e^{2\pi}+40\,e^{4\pi}+52\,e^{6\pi}\right)}$$

Series representations:

$$21+\sqrt[4]{1+72\exp(2\pi)+270\exp^2(2\pi)+720\exp^3(2\pi)+936\exp^4(2\pi)}=$$
$$21+\left(1+72\,e^{8\sum_{k=0}^{\infty}(-1)^k/(1+2k)}+270\,e^{16\sum_{k=0}^{\infty}(-1)^k/(1+2k)}+\right.$$
$$\left.720\,e^{24\sum_{k=0}^{\infty}(-1)^k/(1+2k)}+936\,e^{32\sum_{k=0}^{\infty}(-1)^k/(1+2k)}\right)\text{^}(1/4)$$

$$21+\sqrt[4]{1+72\exp(2\pi)+270\exp^2(2\pi)+720\exp^3(2\pi)+936\exp^4(2\pi)}=$$
$$21+\sqrt[4]{1+72\left(\sum_{k=0}^{\infty}\frac{1}{k!}\right)^{2\pi}+270\left(\sum_{k=0}^{\infty}\frac{1}{k!}\right)^{4\pi}+720\left(\sum_{k=0}^{\infty}\frac{1}{k!}\right)^{6\pi}+936\left(\sum_{k=0}^{\infty}\frac{1}{k!}\right)^{8\pi}}$$

$$21+\sqrt[4]{1+72\exp(2\pi)+270\exp^2(2\pi)+720\exp^3(2\pi)+936\exp^4(2\pi)}=$$
$$21+\left(1+72\left(\frac{1}{\sum_{k=0}^{\infty}\frac{(-1)^k}{k!}}\right)^{2\pi}+270\left(\frac{1}{\sum_{k=0}^{\infty}\frac{(-1)^k}{k!}}\right)^{4\pi}+\right.$$
$$\left.720\left(\frac{1}{\sum_{k=0}^{\infty}\frac{(-1)^k}{k!}}\right)^{6\pi}+936\left(\frac{1}{\sum_{k=0}^{\infty}\frac{(-1)^k}{k!}}\right)^{8\pi}\right)\text{^}(1/4)$$

Integral representations:

$$21+\sqrt[4]{1+72\exp(2\pi)+270\exp^2(2\pi)+720\exp^3(2\pi)+936\exp^4(2\pi)}=$$
$$21+\left(1+72\,e^4\int_0^\infty 1/(1+t^2)\,dt+270\,e^8\int_0^\infty 1/(1+t^2)\,dt+\right.$$
$$\left.720\,e^{12}\int_0^\infty 1/(1+t^2)\,dt+936\,e^{16}\int_0^\infty 1/(1+t^2)\,dt\right)\text{^}(1/4)$$

$$21+\sqrt[4]{1+72\exp(2\pi)+270\exp^2(2\pi)+720\exp^3(2\pi)+936\exp^4(2\pi)}=$$
$$21+\sqrt[4]{1+72\,e^4\int_0^\infty \sin(t)/t\,dt+270\,e^8\int_0^\infty \sin(t)/t\,dt+720\,e^{12}\int_0^\infty \sin(t)/t\,dt+936\,e^{16}\int_0^\infty \sin(t)/t\,dt}$$

$$21+\sqrt[4]{1+72\exp(2\pi)+270\exp^2(2\pi)+720\exp^3(2\pi)+936\exp^4(2\pi)}=21+$$
$$\sqrt[4]{1+72\,e^8\int_0^1\sqrt{1-t^2}\,dt+270\,e^{16}\int_0^1\sqrt{1-t^2}\,dt+720\,e^{24}\int_0^1\sqrt{1-t^2}\,dt+936\,e^{32}\int_0^1\sqrt{1-t^2}\,dt}$$

(((21+(((1+72(exp(2Pi))+270(exp(2Pi))^2+720(exp(2Pi))^3+936(exp(2Pi))^4)))^1/4)
))^1/16

Input:

$$\sqrt[16]{21+\sqrt[4]{1+72\exp(2\pi)+270\exp^2(2\pi)+720\exp^3(2\pi)+936\exp^4(2\pi)}}$$

Exact result:

$$\sqrt[16]{21+\sqrt[4]{1+72\,e^{2\pi}+270\,e^{4\pi}+720\,e^{6\pi}+936\,e^{8\pi}}}$$

Decimal approximation:

1.648825429106175653812891907568044728158213141471880543823...

$1.648825429\ldots \approx \zeta(2)=\frac{\pi^2}{6}=1.644934\ldots$

Property:

$$\sqrt[16]{21+\sqrt[4]{1+72\,e^{2\pi}+270\,e^{4\pi}+720\,e^{6\pi}+936\,e^{8\pi}}}$$ is a transcendental number

Alternate form:

$$\sqrt[16]{21+\sqrt[4]{1+18\,e^{2\pi}\left(4+15\,e^{2\pi}+40\,e^{4\pi}+52\,e^{6\pi}\right)}}$$

All 16th roots of 21 + (1 + 72 e^(2 π) + 270 e^(4 π) + 720 e^(6 π) + 936 e^(8 π))^(1/4):

$$\sqrt[16]{21+\sqrt[4]{1+72\,e^{2\pi}+270\,e^{4\pi}+720\,e^{6\pi}+936\,e^{8\pi}}}\quad e^{0}\approx 1.6488$$ (real, principal root)

$$\sqrt[16]{21+\sqrt[4]{1+72\,e^{2\pi}+270\,e^{4\pi}+720\,e^{6\pi}+936\,e^{8\pi}}}\quad e^{(i\pi)/8}\approx 1.5233+0.6310\,i$$

$$\sqrt[16]{21+\sqrt[4]{1+72\,e^{2\pi}+270\,e^{4\pi}+720\,e^{6\pi}+936\,e^{8\pi}}}\quad e^{(i\pi)/4}\approx 1.1659+1.1659\,i$$

$$\sqrt[16]{21+\sqrt[4]{1+72\,e^{2\pi}+270\,e^{4\pi}+720\,e^{6\pi}+936\,e^{8\pi}}}\quad e^{(3i\pi)/8}\approx 0.6310+1.5233\,i$$

$$\sqrt[16]{21+\sqrt[4]{1+72\,e^{2\pi}+270\,e^{4\pi}+720\,e^{6\pi}+936\,e^{8\pi}}}\quad e^{(i\pi)/2}\approx 1.6488\,i$$

Series representations:

$$\sqrt[16]{21+\sqrt[4]{1+72\exp(2\pi)+270\exp^2(2\pi)+720\exp^3(2\pi)+936\exp^4(2\pi)}} =$$
$$\left(21+\left(1+72\,e^{8\sum_{k=0}^{\infty}(-1)^k/(1+2k)}+270\,e^{16\sum_{k=0}^{\infty}(-1)^k/(1+2k)}+\right.\right.$$
$$\left.\left.720\,e^{24\sum_{k=0}^{\infty}(-1)^k/(1+2k)}+936\,e^{32\sum_{k=0}^{\infty}(-1)^k/(1+2k)}\right)\text{^}\,(1/4)\right)\text{^}\,(1/16)$$

$$\sqrt[16]{21+\sqrt[4]{1+72\exp(2\pi)+270\exp^2(2\pi)+720\exp^3(2\pi)+936\exp^4(2\pi)}} = \sqrt[16]{21+\sqrt[4]{1+72\left(\sum_{k=0}^{\infty}\frac{1}{k!}\right)^{2\pi}+270\left(\sum_{k=0}^{\infty}\frac{1}{k!}\right)^{4\pi}+720\left(\sum_{k=0}^{\infty}\frac{1}{k!}\right)^{6\pi}+936\left(\sum_{k=0}^{\infty}\frac{1}{k!}\right)^{8\pi}}}$$

$$\sqrt[16]{21+\sqrt[4]{1+72\exp(2\pi)+270\exp^2(2\pi)+720\exp^3(2\pi)+936\exp^4(2\pi)}} = \left(21+\left(1+72\left(\frac{1}{\sum_{k=0}^{\infty}\frac{(-1)^k}{k!}}\right)^{2\pi}+270\left(\frac{1}{\sum_{k=0}^{\infty}\frac{(-1)^k}{k!}}\right)^{4\pi}+720\left(\frac{1}{\sum_{k=0}^{\infty}\frac{(-1)^k}{k!}}\right)^{6\pi}+936\left(\frac{1}{\sum_{k=0}^{\infty}\frac{(-1)^k}{k!}}\right)^{8\pi}\right)\text{^}(1/4)\right)\text{^}(1/16)$$

Integral representations:

$$\sqrt[16]{21+\sqrt[4]{1+72\exp(2\pi)+270\exp^2(2\pi)+720\exp^3(2\pi)+936\exp^4(2\pi)}} = \left(21+\left(1+72\,e^{4\int_0^{\infty}\sin(t)/t\,dt}+270\,e^{8\int_0^{\infty}\sin(t)/t\,dt}+720\,e^{12\int_0^{\infty}\sin(t)/t\,dt}+936\,e^{16\int_0^{\infty}\sin(t)/t\,dt}\right)\text{^}(1/4)\right)\text{^}(1/16)$$

$$\sqrt[16]{21+\sqrt[4]{1+72\exp(2\pi)+270\exp^2(2\pi)+720\exp^3(2\pi)+936\exp^4(2\pi)}} = \left(21+\left(1+72\,e^{4\int_0^{\infty}1/(1+t^2)\,dt}+270\,e^{8\int_0^{\infty}1/(1+t^2)\,dt}+720\,e^{12\int_0^{\infty}1/(1+t^2)\,dt}+936\,e^{16\int_0^{\infty}1/(1+t^2)\,dt}\right)\text{^}(1/4)\right)\text{^}(1/16)$$

$$\sqrt[16]{21+\sqrt[4]{1+72\exp(2\pi)+270\exp^2(2\pi)+720\exp^3(2\pi)+936\exp^4(2\pi)}} = \left(21+\left(1+72\,e^{4\int_0^{\infty}\sin^2(t)/t^2\,dt}+270\,e^{8\int_0^{\infty}\sin^2(t)/t^2\,dt}+720\,e^{12\int_0^{\infty}\sin^2(t)/t^2\,dt}+936\,e^{16\int_0^{\infty}\sin^2(t)/t^2\,dt}\right)\text{^}(1/4)\right)\text{^}(1/16)$$

We have that:

A modular form $f : \mathbb{H} \to \mathbb{C}$ of weight k for $SL(2,\mathbb{Z})$ is a function which satisfies

$$f\left(\frac{a\tau+b}{c\tau+d}\right) = (c\tau+d)^k f(\tau), \quad \text{for all} \quad \begin{pmatrix} a & b \\ c & d \end{pmatrix} \in SL(2,\mathbb{Z}). \tag{3.4}$$

We denote the space of holomorphic modular forms of weight k with subexponential growth for $\tau \to i\infty$ by $M_k(SL(2,\mathbb{Z}))$. One of the powerful features of modular forms is that the space M_k is finite dimensional for fixed k. We can similarly define modular forms for congruence subgroups such as $\Gamma_0(n)$ and $\Gamma(n)$ introduced above. We can further generalize Equation (3.4) to include modular forms with a multiplier system. These are functions which transform as in Equation (3.4), except that the right-hand side is multiplied by a phase $\varepsilon(\gamma)$ for each $\gamma \in SL(2,\mathbb{Z})$.

As mentioned in the previous subsection, the class number generating function is an example of a pure mock modular form of weight 3/2. We will discuss this function in some more detail in this section. As the name suggests, the generating function G of Hurwitz class numbers $H(n)$ is defined as [10, 63]:

$$\begin{aligned} G(\tau) &= \sum_{n\geq 0} H(n)\, q^n \\ &= -\frac{1}{12} + \frac{1}{3}q^3 + \frac{1}{2}q^4 + q^7 + \dots, \end{aligned} \tag{3.18}$$

where the $H(n)$ are the Hurwitz class numbers.[8] Note that the $H(n)$ vanish for $d = 1, 2$ mod 4. Using results going back to Kronecker [64], the function G can be explicitly written as the following q-series:

$$G(\tau) = -\frac{1}{2\Theta_0(\tau+\frac{1}{2})} \sum_{n\in\mathbb{Z}} \frac{n(-1)^n q^{n^2}}{1+q^{2n}} - \frac{1}{12}\Theta_0(\tau)^3. \tag{3.19}$$

From:

$$G(\tau) = -\frac{1}{2\Theta_0(\tau+\frac{1}{2})} \sum_{n\in\mathbb{Z}} \frac{n(-1)^n q^{n^2}}{1+q^{2n}} - \frac{1}{12}\Theta_0(\tau)^3. \tag{3.19}$$

for

$$\Theta_0 = \sum_{k\in\mathbb{Z}} q^{k^2}.$$

For k = 3 , we obtain Θ_0 = (535.49165)^(3^2) = 3.62054816 × 10^24

$$q = e^{2\pi i\tau}$$

$$\tau \to i\infty$$

$\tau = i * i^2 = i^3$ q = exp(2π*i*i^3) = $\exp(2\pi i i^3) = e^{2\pi} = 535.49165$; n = 2
we obtain:

$$G(\tau) = -\frac{1}{2\Theta_0(\tau+\frac{1}{2})}\sum_{n\in\mathbb{Z}}\frac{n(-1)^n q^{n^2}}{1+q^{2n}} - \frac{1}{12}\Theta_0(\tau)^3. \qquad (3.19)$$

-1/(((2*3.62054816 × 10^24)(i^3+1/2)))* [((2(-1)^2*535.49165^(2^2))) / ((1+535.49165^(2*2)))]-1/12*(3.62054816 × 10^24*(i^3)^3)

Input interpretation:

$$-\frac{\frac{2(-1)^2\times 535.49165^{2^2}}{1+535.49165^{2\times 2}}}{(2\times 3.62054816\times 10^{24})\left(i^3+\frac{1}{2}\right)} - \frac{1}{12}\left(3.62054816\times 10^{24}\,(i^3)^3\right)$$

i is the imaginary unit

Result:

$$-1.10480508...\times 10^{-25} - 3.01712347...\times 10^{23}\, i$$

Polar coordinates:

$r = 3.01712\times 10^{23}$ (radius), $\theta = -90°$ (angle)

$3.01712*10^{23}$

From which:

64*1/2*ln(((-1/(((2*3.62054816 × 10^24)(i^3+1/2)))* [((2(-1)^2*535.49165^(2^2))) / ((1+535.49165^(2*2)))]-1/12*(3.62054816 × 10^24*(i^3)^3))))-sqrt3

Input interpretation:

$$64 \times \frac{1}{2} \log\left(-\frac{\frac{2(-1)^2 \times 535.49165^{2^2}}{1+535.49165^{2\times 2}}}{(2 \times 3.62054816 \times 10^{24})\left(i^3+\frac{1}{2}\right)} - \frac{1}{12}\left(3.62054816 \times 10^{24}\,(i^3)^3\right)\right) - \sqrt{3}$$

$\log(x)$ is the natural logarithm

i is the imaginary unit

Result:

1728.308302... –
50.26548246... i

Polar coordinates:

$r = 1729.04$ (radius), $\theta = -1.6659°$ (angle)

1729.04

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)

and:

((((64*1/2*ln(((-1/(((2*3.62054816 × 10^24)(i^3+1/2)))* [((2(-1)^2*535.49165^(2^2))) / ((1+535.49165^(2*2)))]-1/12*(3.62054816 × 10^24*(i^3)^3))))-sqrt3))))^1/15

Input interpretation:

$$\sqrt[15]{64 \times \frac{1}{2} \log\left(-\frac{\frac{2(-1)^2 \times 535.49165^{2^2}}{1+535.49165^{2\times 2}}}{(2 \times 3.62054816 \times 10^{24})\left(i^3+\frac{1}{2}\right)} - \frac{1}{12}\left(3.62054816 \times 10^{24}\,(i^3)^3\right)\right) - \sqrt{3}}$$

$\log(x)$ is the natural logarithm

i is the imaginary unit

Result:

1.6438146188... –
0.0031863124240... i

Polar coordinates:

$r = 1.64382$ (radius), $\theta = -0.11106°$ (angle)

$1.64382 \approx \zeta(2) = \frac{\pi^2}{6} = 1.644934 \ldots$

2*ln(((-1/(((2*3.62054816 × 10^24)(i^3+1/2)))* [((2(-1)^2*535.49165^(2^2))) / ((1+535.49165^(2*2)))]-1/12*(3.62054816 × 10^24*(i^3)^3))))+34-Pi

Input interpretation:

$$2\log\left(-\frac{\frac{2(-1)^2\times 535.49165^{2^2}}{1+535.49165^{2\times 2}}}{(2\times 3.62054816\times 10^{24})\left(i^3+\frac{1}{2}\right)}-\frac{1}{12}\left(3.62054816\times 10^{24}\left(i^3\right)^3\right)\right)+34-\pi$$

$\log(x)$ is the natural logarithm

i is the imaginary unit

Result:

138.9859294... −
3.141592654... i

Polar coordinates:

$r = 139.021$ (radius), $\theta = -1.29487°$ (angle)

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

2*ln(((-1/(((2*3.62054816 × 10^24)(i^3+1/2)))* [((2(-1)^2*535.49165^(2^2))) / ((1+535.49165^(2*2)))]-1/12*(3.62054816 × 10^24*(i^3)^3))))+18

Input interpretation:

$$2\log\left(-\frac{\frac{2(-1)^2\times 535.49165^{2^2}}{1+535.49165^{2\times 2}}}{(2\times 3.62054816\times 10^{24})\left(i^3+\frac{1}{2}\right)}-\frac{1}{12}\left(3.62054816\times 10^{24}\left(i^3\right)^3\right)\right)+18$$

$\log(x)$ is the natural logarithm

i is the imaginary unit

Result:

126.1275220... −
3.141592654... i

Polar coordinates:

$r = 126.167$ (radius), $\theta = -1.42683°$ (angle)

126.167 result very near to the Higgs boson mass 125.18 GeV

From

Deformations of JT Gravity and Phase Transitions - *Edward Witten* - arXiv:2006.03494v1 [hep-th] 5 Jun 2020

We have that:

Clearly, $A(r_h) = 0$, so we interpret $r = r_h$ as the black hole horizon. The value of ϕ at the horizon is therefore

$$\phi_h = r_h. \tag{2.10}$$

Near $r = r_h$, we have

$$A(r) = W(r_h)(r - r_h) + \mathcal{O}((r - r_h)^2). \tag{2.11}$$

Hence the solution only has the expected Euclidean signature if $W(r_h) \geq 0$. More generally, a black hole solution with $\phi = \phi_h$ exists if and only if $A(r)$, defined in eqn. (2.9), is positive for all $r > r_h$. In other words, the condition is that

$$\int_{\phi_h}^{\phi} \mathrm{d}\phi'\, W(\phi') > 0 \quad \text{for all } \phi > \phi_h. \tag{2.12}$$

Setting $y = \sqrt{r - r_h} = \sqrt{r - \phi_h}$, we find that the line element near $y = 0$ is

$$ds^2 = \frac{4}{W(\phi_h)}\left(dy^2 + \frac{W(\phi_h)^2}{4}y^2 dt^2\right). \tag{2.13}$$

This is smooth at $y = 0$ if and only if t has period $4\pi/W(\phi_h)$. This determines the temperature:

$$\beta = \frac{4\pi}{W(\phi_h)}, \quad T = \frac{W(\phi_h)}{4\pi}. \tag{2.14}$$

As explained in the introduction, we want $W(\phi) \sim 2\phi$ for $\phi \to +\infty$ so as to get a theory that reduces to JT gravity for $r \to \infty$. More specifically, we will assume that for large ϕ, $|W(\phi) - 2\phi| < 1/\phi^{1+\epsilon}$. In this case, the behavior of $A(r)$ for large r is

$$A(r) = r^2 - b + \mathcal{O}(r^{-\epsilon}), \tag{2.15}$$

where b is a constant that we will see is a multiple of the energy. For JT gravity ($W(\phi) = 2\phi$ exactly, not just asymptotically), the formula $A(r) = r^2 - b$ is exact. In general, a solution with the behavior of eqn. (2.15) is asymptotic at infinity to an asymptotically AdS_2 solution of JT gravity. To keep things simple, we will also assume that $\lim_{\phi\to\infty} W'(\phi) = 2$, thus excluding small-scale oscillations in $W(\phi)$ at large ϕ.

From eqn. (2.9) and the definition of b, we see that under a change in $\phi_h = r_h$,

$$db = W(\phi_h)d\phi_h = 4\pi T d\phi_h. \tag{2.16}$$

It is natural to guess that as in conventional black hole thermodynamics, this will be the first law of thermodynamics $dE = TdS$, with ϕ_h a linear function of the entropy S and b a linear function of the energy E. To confirm this interpretation, we will evaluate the action for the solution. This action is interpreted as a classical approximation to $-\log Z = \beta F = \beta E - S$, where Z is the partition function and $F = E - TS$ is the free energy. To evaluate the action, as in [4], we put a cutoff on r, at some very large value $r = r_\infty$, and we include a Gibbons-Hawking-York surface term in the action:

$$I_{\rm GHY} = -\int_{r=r_\infty} dt\sqrt{h}\phi(K-1) = -\beta\sqrt{A(r_\infty)}(K-1). \tag{2.17}$$

Here $h = A(r_\infty)$ is the induced metric of the boundary, and K is the extrinsic curvature of the boundary, explicitly $K = A'(r_\infty)/2\sqrt{A(r_\infty)}$. With $\phi(r) = r$ and $A(r) \sim r^2 - b$, we find that the surface term in the action is

$$I_{\rm GHY} = -\frac{\beta b}{2}. \tag{2.18}$$

Remembering that $\phi = r$ and $W = A'$, the bulk action is

$$\begin{aligned} I_b &= -\frac{\beta}{2}\int_{r_h}^{r_\infty} dr\,(-rA'' + A') = -\frac{\beta}{2}\int_{r_h}^{r_\infty} dr\left(\frac{d}{dr}(-rA' + 2A)\right) \\ &= -\frac{\beta}{2}\left[-rA' + 2A\right]_{r_h}^{r_\infty} = -\frac{\beta}{2}(-2b + r_h W(r_h)) = \beta b - 2\pi\phi_h. \end{aligned} \tag{2.19}$$

We take the data of SMBH87 , thence:

SMBH87 mass = M = 13.12806e+39 ; charge = Q = 1.12496e+15

T = 9.34606E-18 K; r = 1.94973E13 m

From (2.14), we have that:

$$\beta = \frac{4\pi}{W(\phi_h)}, \quad T = \frac{W(\phi_h)}{4\pi}.$$

$W(\phi_h) = 4\pi T; \quad \beta = \frac{4\pi}{4\pi T} = \frac{1}{T};$

$\beta = 1.069969591464210587 \times 10^{17}$; $\phi_h = r_h = r = 1.94973E13$

and

$$E = \frac{b}{2}, \qquad S = 2\pi\phi_h + S_0,$$

M = 13.12806e+39 ; from $E = mc^2$, we obtain:

E = (13.12806e+39) *299792458^2 =

= 1179891191176766618697840000000000000000000000000000000000 =

= $1.17989119117676661869784 \times 10^{57}$

Thence:

b = $2.35978238235353323739567999999999999998725096833725 70 \times 10^{57}$

The effective density is equal to 0.422850 Kg/m^3

From

$$I_b = -\frac{\beta}{2}\int_{r_h}^{r\infty} \mathrm{d}r\left(-rA'' + A'\right) = -\frac{\beta}{2}\int_{r_h}^{r\infty} \mathrm{d}r\left(\frac{\mathrm{d}}{\mathrm{d}r}\left(-rA' + 2A\right)\right)$$
$$= -\frac{\beta}{2}\left[-rA' + 2A\right]_{r_h}^{r\infty} = -\frac{\beta}{2}\left(-2b + r_h W(r_h)\right) = \beta b - 2\pi\phi_h.$$

we obtain:

(1.069969591464210587 × 10^17)*
(2.35978238235353323739567999999999999998725096833725 70 × 10^57) –
2*Pi*(1.94973E13)

Input interpretation:

$$1.069969591464210587 \times 10^{17} \times 2.359782382353533237395679999999999999987250968337257 0 \times 10^{57} - 2\pi \times 1.94973 \times 10^{13}$$

Result:

$2.524895391591251540... \times 10^{74}$

$2.5248953915912515 40*10^{74}$

$2.524895391591251540 \times 10^{74}$ that we consider as the volume of bulk.

We obtain also:

ln((((1.06996959146 × 10^17)* (2.35978238235 × 10^57) – 2*Pi*(1.94973e+13))))-34+2

Input interpretation:

$$\log(1.06996959146 \times 10^{17} \times 2.35978238235 \times 10^{57} - 2\pi \times 1.94973 \times 10^{13}) - 34 + 2$$

$\log(x)$ is the natural logarithm

Result:

139.3174965144...

139.3174965144… result practically equal to the rest mass of Pion meson 139.57 MeV

ln((((1.06996959146 × 10^17)* (2.35978238235 × 10^57) – 2*Pi*(1.94973e+13))))-47+1

Input interpretation:

$$\log(1.06996959146 \times 10^{17} \times 2.35978238235 \times 10^{57} - 2\pi \times 1.94973 \times 10^{13}) - 47 + 1$$

$\log(x)$ is the natural logarithm

Result:

125.3174965144...

125.3174965144… result very near to the Higgs boson mass 125.18 GeV

(2*5)ln((((1.06996959146 × 10^17)* (2.35978238235 × 10^57) – 2*Pi*(1.94973e+13))))+2*8

Input interpretation:

$$(2\times5)\log(1.06996959146\times10^{17}\times2.35978238235\times10^{57}-2\pi\times1.94973\times10^{13})+2\times8$$

$\log(x)$ is the natural logarithm

Result:

1729.174965144...

1729.174965144…

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)

(((((2*5)ln((((1.06996959146 × 10^17)* (2.35978238235 × 10^57) – 2*Pi*(1.94973e+13))))+2*8))))^1/15

Input interpretation:

$$((2\times5)\log(1.06996959146\times10^{17}\times2.35978238235\times10^{57}-2\pi\times1.94973\times10^{13})+2\times8)\,\hat{}\,(1/15)$$

$\log(x)$ is the natural logarithm

Result:

1.6438263178864...

1.6438263178864…. $\approx \zeta(2) = \frac{\pi^2}{6} = 1.644934$ ...

For M = δ * V, we have that:

(2.524895391591251540 × 10^74 * 0.422850)

Input interpretation:

$2.524895391591251540 \times 10^{74} \times 0.422850$

Result:

106 765 201 633 436 071 368 900 000 000 000 000 000 000 000 000 000 000 000 000 ·
000 000 000 000 000

Scientific notation:

$1.067652016334360713689 \times 10^{74}$

$1.0676520163\ldots*10^{74}$ = Bulk Mass

Considering this mass and inserting the value in the Hawking Radiation Calculator, we obtain:

Mass = 1.06765E74

Radius = 1.58564E47

Temperature = 1.14921E-51

From the Ramanujan-Nardelli mock formula, we obtain:

sqrt[[[[1/(((((((4*1.962364415e+19)/(5*0.0864055^2)))*1/(1.06765e+74)* sqrt[[-((((1.14921e-51 * 4*Pi*(1.58564e+47)^3-(1.58564e+47)^2))))) / ((6.67*10^-11))]]]]]

Input interpretation:

$$\sqrt{\left(1 \Big/ \left(\frac{4 \times 1.962364415 \times 10^{19}}{5 \times 0.0864055^2} \times \frac{1}{1.06765 \times 10^{74}} \sqrt{-\frac{1.14921 \times 10^{-51} \times 4\pi (1.58564 \times 10^{47})^3 - (1.58564 \times 10^{47})^2}{6.67 \times 10^{-11}}}\right)\right)}$$

Result:

1.618076627502556975492899173962049134489784696737784273918...

1.6180766275025569…..

and:

1/ sqrt[[[[1/(((((((4*1.962364415e+19)/(5*0.0864055^2)))*1/(1.06765e+74)* sqrt[[-((((1.14921e-51 * 4*Pi*(1.58564e+47)^3-(1.58564e+47)^2))))) / ((6.67*10^-11))]]]]]

Input interpretation:

$$\frac{1}{\sqrt{\frac{4\times 1.962364415\times 10^{19}}{5\times 0.0864055^2}\times\frac{1}{1.06765\times 10^{74}}\sqrt{\frac{1}{-\frac{1.14921\times 10^{-51}\times 4\pi\left(1.58564\times 10^{47}\right)^3-\left(1.58564\times 10^{47}\right)^2}{6.67\times 10^{-11}}}}}}$$

Result:

0.6180177026247910152698936749681513133323730744487327896 49...

0.618017702624…

From the result, we obtain also:

(2.524895391591251540 × 10^74)14258*2^2*5

Where 14258 is a number that concern the Ramanujan taxicab numbers (

Input interpretation:

$$2.524895391591251540\times 10^{74}\times 14258\times 2^2\times 5$$

Result:

71 999 916 986 616 128 914 640 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000

Scientific notation:

$7.199991698661612891464\times 10^{79}$

7.1999916986…*10^{79} result very near to the value of volumetric heat of Planck 7.340723 × 10^{79} J/m^3·K

Indeed:

$$c_{VP}=\frac{E_P}{l_P^3\Theta_P}=\frac{k_B}{l_P^3}=\sqrt{\frac{c^9k_B^2}{64\pi^3\hbar^3G^3}}$$

sqrt(((((299792458^9*(1.380649e-23)^2)) / (((64*Pi^3*(1.054571e-34)^3*(6.6743e-11)^3))))))

$$\sqrt{\frac{299\,792\,458^{9}\,(1.380649\times10^{-23})^{2}}{64\,\pi^{3}\,(1.054571\times10^{-34})^{3}\,(6.6743\times10^{-11})^{3}}}$$

$7.34073\ldots\times10^{79}$

7.34073…*10^79

Observations

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

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

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

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

From Wikipedia

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

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

Note that:

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

Hence

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

so that

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

Hence

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

Thence:

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

And

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

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

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

All the results of the most important connections are signed in blue throughout the drafting of the paper. We highlight as in the development of the various equations we use always the constants π, ϕ, 1/ϕ, the Fibonacci and Lucas numbers, linked to the

golden ratio, that play a fundamental role in the development, and therefore, in the final results of the analyzed expressions.

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

The beginning of the sequence is thus:

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

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

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

The sequence of Lucas numbers is:

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

All Fibonacci-like integer sequences appear in shifted form as a row of the Wythoff array; the Fibonacci sequence itself is the first row and the Lucas sequence is the

second row. Also like all Fibonacci-like integer sequences, the ratio between two consecutive Lucas numbers converges to the golden ratio.

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

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

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

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

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

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

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