On the possible mathematical connections between several Ramanujan's mathematics parameters, some equations concerning the $SO(2^{13})$ group in Bosonic String Theory, various parameters regarding Particle Physics, ϕ and $\zeta(2)$. X

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Abstract

In this paper (part X), we describe and analyze further new mathematical connections between some Ramanujan's mathematics parameters, several equations concerning the $SO(2^{13})$ group, in Bosonic String Theory, various parameters regarding Particle Physics, ϕ and $\zeta(2)$.

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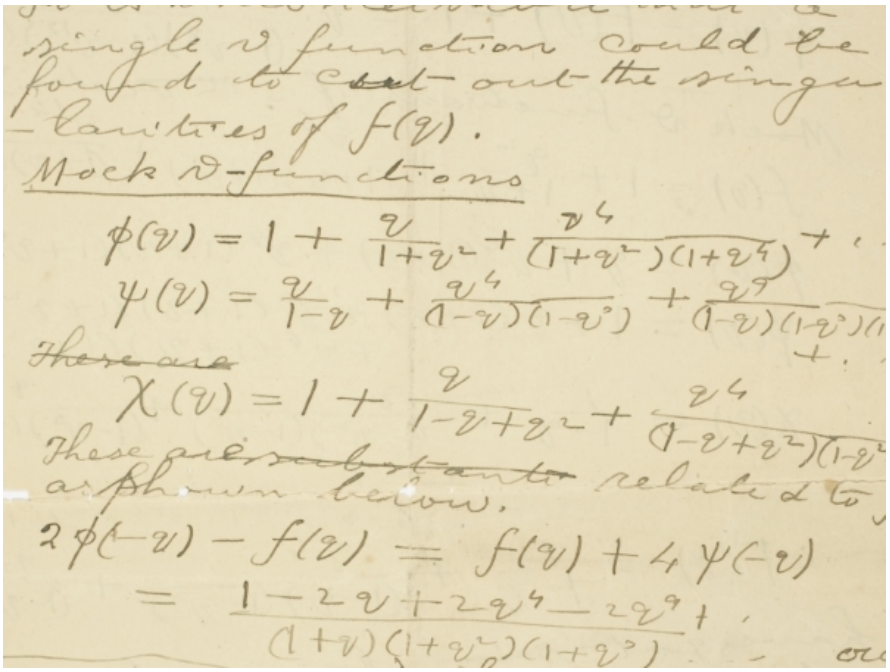

single ϑ function could be found to cut out the singularities of $f(q)$.

Mock ϑ-functions

$$\phi(q) = 1 + \frac{q}{1+q^2} + \frac{q^4}{(1+q^2)(1+q^4)} + \cdots$$

$$\psi(q) = \frac{q}{1-q} + \frac{q^4}{(1-q)(1-q^3)} + \frac{q^9}{(1-q)(1-q^3)(1\cdots} + \cdots$$

~~There are~~

$$\chi(q) = 1 + \frac{q}{1-q+q^2} + \frac{q^4}{(1-q+q^2)(1-q^2\cdots}$$

These are ~~substantia~~ related to as shown below.

$$2\phi(-q) - f(q) = f(q) + 4\psi(-q)$$

$$= \frac{1-2q+2q^4-2q^9+\cdots}{(1+q)(1+q^2)(1+q^3)\cdots}$$

https://royalsociety.org/science-events-and-lectures/2018/10/srinivasa-ramanujan/



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From:

DILATON TADPOLE FOR THE OPEN BOSONIC STRING "

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We have that:

On P_2 the eigenvectors are restricted by $v^\theta(p) = -v^\theta(-p)$ and $v^\phi(p) = v^\phi(-p)$. This also has one solution for each l and m, and the result is the same.

Eigenfunctions of the scalar laplacian on the disk correspond to eigenfunctions on the sphere which are even under reflection in $\theta \to \pi - \theta$. Such functions have zero normal derivative on the boundary. They are $\sqrt{2}Y_{lm}$ with eigenvalues $\lambda = l(l+1)$ for $l - m$ even. Thus

$$\frac{[\det'(-\nabla^2)]_{D_2}}{\{[\det'(-\nabla^2)]_{S_2}\}^{1/2}} = \frac{\Pi_l [l(l+1)]^{l+1}}{\Pi_l [l(l+1)]^{(2l+1)/2}} = \prod_l l .$$

This is divergent, but the divergence can be shown to be proportional to the length of the boundary [5]. We can absorb this divergence into our renormalization constant ρ. The finite part we are interested in is exactly the conformally invariant part, which we can evaluate using zeta-function regularization. Therefore,

$$\ln \frac{[\det'(-\nabla^2)]_{D_2}}{\{[\det'(-\nabla^2)]_{S_2}\}^{1/2}} = \sum_{l>0} \ln l = -\frac{d}{ds} \sum_{l=1}^{\infty} l^{-s} \Big|_{s=0} = -\zeta_R'(0) = \tfrac{1}{2} \ln 2\pi ,$$

so that

$$[\det'(-\nabla^2)]_{D_2} / \{[\det'(-\nabla^2)]_{S_2}\}^{1/2} = \sqrt{2\pi} .$$

This was hardly a rigorous calculation, but a more careful treatment (regulating the determinants separately) gives the same answer.

On P_2 scalar eigenfunctions have $Y_{lm}(p) = Y_{lm}(-p)$, which is satisfied for l even, m arbitrary. A similar calculation [9] gives

$$[\det'(-\nabla^2)]_{P_2} / \{[\det'(-\nabla^2)]_{S_2}\}^{1/2} = (\pi/2)^{1/2} .$$

Finally putting the pieces together we get

$$A_D(p) = (2\pi)^{26} \delta(p) \, [(3 \cdot 2^7)/\pi^{13}]^{1/2} \times \begin{cases} 2^{-13} & \text{for } D_2 , \\ -1 & \text{for } P_2 . \end{cases}$$

The total result for an open string with gauge group SO(N) is the sum of the results for P_2 and D_2, with D_2 weighed by a factor of N. Thus to this order the dilaton tadpole vanishes for $N = 2^{13}$.

In conclusion, we have computed the vacuum energy and dilaton tadpole to lowest non-trivial order for the open bosonic string. While the vacuum energy is non-zero and independent of the gauge group, the dilaton tadpole is zero for a unique choice of gauge group, SO($2^{26/2}$). It is tempting to conjecture that the same mechanism is at work in the superstring, leading to the analogous choice of gauge group, SO($2^{10/2}$). Work on this question is in progress. If this is so, then it seems fair to say that the cancellation of this contribution to the dilaton tadpole is not a consequence of supersymmetry, but is a more general consequence of some unknown principle of string theory.

From

$$\ln \frac{[\det'(-\nabla^2)]_{D_2}}{\{[\det'(-\nabla^2)]_{S_2}\}^{1/2}} = \sum_{l>0} \ln l = -\frac{d}{ds} \sum_{l=1}^{\infty} l^{-s} \Big|_{s=0} = -\zeta_R'(0) = \tfrac{1}{2} \ln 2\pi ,$$

and

$$[\det'(-\nabla^2)]_{D_2} / \{[\det'(-\nabla^2)]_{S_2}\}^{1/2} = \sqrt{2\pi}\,.$$

$$[\det'(-\nabla^2)]_{P_2} / \{[\det'(-\nabla^2)]_{S_2}\}^{1/2} = (\pi/2)^{1/2}\,.$$

we obtain:

1/2 ln (2Pi) * (2Pi)^1/2 * (Pi/2)^1/2

Input:

$$\frac{1}{2}\log(2\pi)\sqrt{2\pi}\sqrt{\frac{\pi}{2}}$$

$\log(x)$ is the natural logarithm

Exact result:

$$\frac{1}{2}\pi\log(2\pi)$$

Decimal approximation:

2.886930545016380164293345324941987164353881495061581762411...

2.8869305…

Alternate forms:

$$\frac{1}{2}\pi(\log(2)+\log(\pi))$$

$$\frac{1}{2}\pi\log(2)+\frac{1}{2}\pi\log(\pi)$$

Alternative representations:

$$\frac{1}{2}\log(2\pi)\sqrt{2\pi}\sqrt{\frac{\pi}{2}} = \frac{1}{2}\log_e(2\pi)\sqrt{\frac{\pi}{2}}\sqrt{2\pi}$$

$$\frac{1}{2}\log(2\pi)\sqrt{2\pi}\sqrt{\frac{\pi}{2}} = \frac{1}{2}\log(a)\log_a(2\pi)\sqrt{\frac{\pi}{2}}\sqrt{2\pi}$$

$$\frac{1}{2}\log(2\pi)\sqrt{2\pi}\sqrt{\frac{\pi}{2}} = -\frac{1}{2}\mathrm{Li}_1(1-2\pi)\sqrt{\frac{\pi}{2}}\sqrt{2\pi}$$

Series representations:

$$\frac{1}{2}\log(2\pi)\sqrt{2\pi}\sqrt{\frac{\pi}{2}} = \frac{1}{2}\pi\log(-1+2\pi) - \frac{1}{2}\pi\sum_{k=1}^{\infty}\frac{\left(\frac{1}{1-2\pi}\right)^k}{k}$$

$$\frac{1}{2}\log(2\pi)\sqrt{2\pi}\sqrt{\frac{\pi}{2}} = i\pi^2\left\lfloor\frac{\arg(2\pi-x)}{2\pi}\right\rfloor + \frac{1}{2}\pi\log(x) - \frac{1}{2}\pi\sum_{k=1}^{\infty}\frac{(-1)^k(2\pi-x)^k x^{-k}}{k}$$

for $x < 0$

$$\frac{1}{2}\log(2\pi)\sqrt{2\pi}\sqrt{\frac{\pi}{2}} = i\pi^2\left\lfloor\frac{\pi - \arg\left(\frac{1}{z_0}\right) - \arg(z_0)}{2\pi}\right\rfloor + \frac{1}{2}\pi\log(z_0) - \frac{1}{2}\pi\sum_{k=1}^{\infty}\frac{(-1)^k(2\pi-z_0)^k z_0^{-k}}{k}$$

Integral representations:

$$\frac{1}{2}\log(2\pi)\sqrt{2\pi}\sqrt{\frac{\pi}{2}} = \frac{\pi}{2}\int_1^{2\pi}\frac{1}{t}\,dt$$

$$\frac{1}{2}\log(2\pi)\sqrt{2\pi}\sqrt{\frac{\pi}{2}} = -\frac{i}{4}\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{(-1+2\pi)^{-s}\,\Gamma(-s)^2\,\Gamma(1+s)}{\Gamma(1-s)}\,ds \quad \text{for } -1 < \gamma < 0$$

From which:

(((1/2 ln (2Pi) * (2Pi)^1/2 * (Pi/2)^1/2)))^(5/11)

Input:

$$\left(\frac{1}{2}\log(2\pi)\sqrt{2\pi}\sqrt{\frac{\pi}{2}}\right)^{5/11}$$

$\log(x)$ is the natural logarithm

Exact result:

$$\left(\frac{1}{2}\,\pi\log(2\,\pi)\right)^{5/11}$$

Decimal approximation:

1.619158050241624392882578422075120041274799090250672689164...

1.61915805… result that is a good approximation to the value of the golden ratio 1.618033988749...

Alternate form:

$$\left(\frac{1}{2}\,\pi\,(\log(2)+\log(\pi))\right)^{5/11}$$

All values of (1/2 π log(2 π))^(5/11):

$$e^{0}\left(\frac{1}{2}\,\pi\log(2\,\pi)\right)^{5/11}\approx 1.6192 \quad \text{(real root)}$$

$$e^{(10\,i\,\pi)/11}\left(\frac{1}{2}\,\pi\log(2\,\pi)\right)^{5/11}\approx -1.5536+0.4562\,i$$

$$e^{-(2\,i\,\pi)/11}\left(\frac{1}{2}\,\pi\log(2\,\pi)\right)^{5/11}\approx 1.3621-0.8754\,i$$

$$e^{(8\,i\,\pi)/11}\left(\frac{1}{2}\,\pi\log(2\,\pi)\right)^{5/11}\approx -1.0603+1.2237\,i$$

$$e^{(18\,i\,\pi)/11}\left(\frac{1}{2}\,\pi\log(2\,\pi)\right)^{5/11}\approx 0.6726-1.4728\,i$$

Alternative representations:

$$\left(\frac{1}{2}\log(2\,\pi)\sqrt{2\,\pi}\,\sqrt{\frac{\pi}{2}}\right)^{5/11}=\left(\frac{1}{2}\log_e(2\,\pi)\sqrt{\frac{\pi}{2}}\,\sqrt{2\,\pi}\right)^{5/11}$$

$$\left(\frac{1}{2}\log(2\,\pi)\sqrt{2\,\pi}\,\sqrt{\frac{\pi}{2}}\right)^{5/11}=\left(\frac{1}{2}\log(a)\log_a(2\,\pi)\sqrt{\frac{\pi}{2}}\,\sqrt{2\,\pi}\right)^{5/11}$$

$$\left(\frac{1}{2}\log(2\pi)\sqrt{2\pi}\,\sqrt{\frac{\pi}{2}}\right)^{5/11} = \left(-\frac{1}{2}\,\mathrm{Li}_1(1-2\pi)\sqrt{\frac{\pi}{2}}\,\sqrt{2\pi}\right)^{5/11}$$

Series representations:

$$\left(\frac{1}{2}\log(2\pi)\sqrt{2\pi}\,\sqrt{\frac{\pi}{2}}\right)^{5/11} = \left(\frac{\pi}{2}\right)^{5/11}\left(\log(-1+2\pi) - \sum_{k=1}^{\infty}\frac{\left(\frac{1}{1-2\pi}\right)^k}{k}\right)^{5/11}$$

$$\left(\frac{1}{2}\log(2\pi)\sqrt{2\pi}\,\sqrt{\frac{\pi}{2}}\right)^{5/11} = \left(\frac{\pi}{2}\right)^{5/11}\left(2i\pi\left\lfloor\frac{\arg(2\pi-x)}{2\pi}\right\rfloor + \log(x) - \sum_{k=1}^{\infty}\frac{(-1)^k\,(2\pi-x)^k\,x^{-k}}{k}\right)^{5/11} \quad \text{for } x<0$$

$$\left(\frac{1}{2}\log(2\pi)\sqrt{2\pi}\,\sqrt{\frac{\pi}{2}}\right)^{5/11} = \left(\frac{\pi}{2}\right)^{5/11}\left(\log(z_0) + \left\lfloor\frac{\arg(2\pi-z_0)}{2\pi}\right\rfloor\left(\log\left(\frac{1}{z_0}\right)+\log(z_0)\right) - \sum_{k=1}^{\infty}\frac{(-1)^k\,(2\pi-z_0)^k\,z_0^{-k}}{k}\right)^{5/11}$$

Integral representations:

$$\left(\frac{1}{2}\log(2\pi)\sqrt{2\pi}\,\sqrt{\frac{\pi}{2}}\right)^{5/11} = \left(\frac{\pi}{2}\right)^{5/11}\left(\int_1^{2\pi}\frac{1}{t}\,dt\right)^{5/11}$$

$$\left(\frac{1}{2}\log(2\pi)\sqrt{2\pi}\,\sqrt{\frac{\pi}{2}}\right)^{5/11} = \frac{\left(-i\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{(-1+2\pi)^{-s}\,\Gamma(-s)^2\,\Gamma(1+s)}{\Gamma(1-s)}\,ds\right)^{5/11}}{2^{10/11}} \quad \text{for } -1<\gamma<0$$

We have also:

(2Pi)^1/2 * (Pi/2)^1/2

Input:

$$\sqrt{2\pi}\,\sqrt{\frac{\pi}{2}}$$

Exact result:

π

Decimal approximation:

3.14159265358979323846264338327950288419716939937510582097 4...

3.14159265… = π

Property:

π is a transcendental number

Series representations:

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

$$\sqrt{2\pi}\sqrt{\frac{\pi}{2}} = \sum_{k=0}^{\infty}-\frac{4(-1)^k\,1195^{-1-2k}\left(5^{1+2k}-4\times 239^{1+2k}\right)}{1+2k}$$

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

Integral representations:

$$\sqrt{2\pi}\sqrt{\frac{\pi}{2}} = 4\int_0^1\sqrt{1-t^2}\,dt$$

$$\sqrt{2\pi}\sqrt{\frac{\pi}{2}} = 2\int_0^1\frac{1}{\sqrt{1-t^2}}\,dt$$

$$\sqrt{2\pi}\sqrt{\frac{\pi}{2}} = 2\int_0^{\infty}\frac{1}{1+t^2}\,dt$$

and:

1/6((((2Pi)^1/2 * (Pi/2)^1/2)))^2

Input:

$$\frac{1}{6}\left(\sqrt{2\pi}\,\sqrt{\frac{\pi}{2}}\right)^2$$

Exact result:

$$\frac{\pi^2}{6}$$

Decimal approximation:

1.64493406684822643647241516664602518921894990120679843773 5...

$1.64493406\ldots \approx \zeta(2) = \frac{\pi^2}{6} = 1.644934\ldots$

Property:

$\frac{\pi^2}{6}$ is a transcendental number

Series representations:

$$\frac{1}{6}\left(\sqrt{2\pi}\,\sqrt{\frac{\pi}{2}}\right)^2 = \sum_{k=1}^{\infty}\frac{1}{k^2}$$

$$\frac{1}{6}\left(\sqrt{2\pi}\,\sqrt{\frac{\pi}{2}}\right)^2 = -2\sum_{k=1}^{\infty}\frac{(-1)^k}{k^2}$$

$$\frac{1}{6}\left(\sqrt{2\pi}\,\sqrt{\frac{\pi}{2}}\right)^2 = \frac{4}{3}\sum_{k=0}^{\infty}\frac{1}{(1+2k)^2}$$

Integral representations:

$$\frac{1}{6}\left(\sqrt{2\pi}\,\sqrt{\frac{\pi}{2}}\right)^2 = \frac{8}{3}\left(\int_0^1\sqrt{1-t^2}\,dt\right)^2$$

$$\frac{1}{6}\left(\sqrt{2\pi}\,\sqrt{\frac{\pi}{2}}\right)^2=\frac{2}{3}\left(\int_0^{\infty}\frac{1}{1+t^2}\,dt\right)^2$$

$$\frac{1}{6}\left(\sqrt{2\pi}\,\sqrt{\frac{\pi}{2}}\right)^2=\frac{2}{3}\left(\int_0^{1}\frac{1}{\sqrt{1-t^2}}\,dt\right)^2$$

Now, from the following expression:

$$A_D(p)=(2\pi)^{26}\,\delta(p)\,[(3\cdot 2^7)/\pi^{13}]^{1/2}\times 2^{-13}\qquad \text{for } D_2\,,$$

we obtain:

(2Pi)^26* (1/(2 sqrt(6) π^(39/2))) * [(3*2^7)/Pi^13]^0.5 * 2^(-13)

Input:

$$(2\pi)^{26}\times\frac{1}{2\sqrt{6}\;\pi^{39/2}}\times\frac{\sqrt{\frac{3\times 2^7}{\pi^{13}}}}{2^{13}}$$

Exact result:

32 768

$32768 = 2^3 * 64^2$

Series representations:

$$\frac{(2\pi)^{26}\sqrt{\frac{3\times 2^7}{\pi^{13}}}}{2^{13}\left(2\sqrt{6}\;\pi^{39/2}\right)}=\frac{32\,768\sqrt{6}\;\sqrt{\frac{1}{\pi^{13}}}\;\pi^{13/2}}{\sqrt{5}\;\sum_{k=0}^{\infty}5^{-k}\binom{\frac{1}{2}}{k}}$$

$$\frac{(2\pi)^{26}\sqrt{\frac{3\times 2^7}{\pi^{13}}}}{2^{13}\left(2\sqrt{6}\;\pi^{39/2}\right)}=\frac{32\,768\sqrt{6}\;\sqrt{\frac{1}{\pi^{13}}}\;\pi^{13/2}}{\sqrt{5}\;\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{5}\right)^k\left(-\frac{1}{2}\right)_k}{k!}}$$

$$\frac{(2\pi)^{26}\sqrt{\frac{3\times 2^7}{\pi^{13}}}}{2^{13}\left(2\sqrt{6}\ \pi^{39/2}\right)} = \frac{65536\sqrt{6}\ \sqrt{\frac{1}{\pi^{13}}}\ \pi^{13/2}\sqrt{\pi}}{\sum_{j=0}^{\infty}\text{Res}_{s=-\frac{1}{2}+j}\ 5^{-s}\,\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)}$$

From

$$A_D(p) = (2\pi)^{26}\,\delta(p)\,[(3\cdot 2^7)/\pi^{13}]^{1/2} \times 2^{-13} \quad \text{for } D_2\,,$$
$$\times -1 \quad \text{for } P_2\,.$$

we obtain:

(2Pi)^26* (1/(2 sqrt(6) π^(39/2))) * [(3*2^7)/Pi^13]^0.5 * (-1)

Input:

$$(2\pi)^{26}\times\frac{1}{2\sqrt{6}\ \pi^{39/2}}\left(\sqrt{\frac{3\times 2^7}{\pi^{13}}}\times(-1)\right)$$

Exact result:

$-268\,435\,456$

-268435456 = -(64^4 * 8 * 2)

Series representations:

$$\frac{(2\pi)^{26}\left(\sqrt{\frac{3\times 2^7}{\pi^{13}}}\ (-1)\right)}{2\sqrt{6}\ \pi^{39/2}} = -\frac{268\,435\,456\sqrt{6}\ \sqrt{\frac{1}{\pi^{13}}}\ \pi^{13/2}}{\sqrt{5}\ \sum_{k=0}^{\infty}5^{-k}\binom{\frac{1}{2}}{k}}$$

$$\frac{(2\pi)^{26}\left(\sqrt{\frac{3\times 2^7}{\pi^{13}}}\ (-1)\right)}{2\sqrt{6}\ \pi^{39/2}} = -\frac{268\,435\,456\sqrt{6}\ \sqrt{\frac{1}{\pi^{13}}}\ \pi^{13/2}}{\sqrt{5}\ \sum_{k=0}^{\infty}\frac{\left(-\frac{1}{5}\right)^k\left(-\frac{1}{2}\right)_k}{k!}}$$

$$\frac{(2\pi)^{26}\left(\sqrt{\frac{3\times 2^7}{\pi^{13}}}\ (-1)\right)}{2\sqrt{6}\ \pi^{39/2}} = -\frac{536\,870\,912\sqrt{6}\ \sqrt{\frac{1}{\pi^{13}}}\ \pi^{13/2}\sqrt{\pi}}{\sum_{j=0}^{\infty}\text{Res}_{s=-\frac{1}{2}+j}\ 5^{-s}\,\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)}$$

Dividing the two results, we obtain:

(((((2Pi)^26* (1/(2 sqrt(6) π^(39/2))) * [(3*2^7)/Pi^13]^0.5 * (-1))))) / -(((((2Pi)^26* (1/(2 sqrt(6) π^(39/2))) * [(3*2^7)/Pi^13]^0.5 * 2^(-13)))))

Input:

$$-\frac{(2\pi)^{26}\times\frac{1}{2\sqrt{6}\,\pi^{39/2}}\left(\sqrt{\frac{3\times 2^7}{\pi^{13}}}\times(-1)\right)}{(2\pi)^{26}\times\frac{1}{2\sqrt{6}\,\pi^{39/2}}\times\frac{\sqrt{\frac{3\times 2^7}{\pi^{13}}}}{2^{13}}}$$

Exact result:

8192

$8192 = 2 * 64^2$

From which:

integrate(((((((((2Pi)^26* (1/(2 sqrt(6) π^(39/2))) * [(3*2^7)/Pi^13]^0.5 * (-1))))) / -(((((2Pi)^26* (1/(2 sqrt(6) π^(39/2))) * [(3*2^7)/Pi^13]^0.5 * 2^(-13)))))))))x, 0..1

Definite integral:

$$\int_0^1 \frac{\left((2\pi)^{26}\left(\sqrt{\frac{3\times 2^7}{\pi^{13}}}\,(-1)\right)\right)x}{\frac{\left(2\sqrt{6}\,\pi^{39/2}\right)\left(-\left((2\pi)^{26}\sqrt{\frac{3\times 2^7}{\pi^{13}}}\right)\right)}{\left(2\sqrt{6}\,\pi^{39/2}\right)2^{13}}}\,dx = 4096$$

$4096 = 64^2$

and

sqrt(((integrate(((((((((2Pi)^26* (1/(2 sqrt(6) π^(39/2))) * [(3*2^7)/Pi^13]^0.5 * (-1))))) / -(((((2Pi)^26* (1/(2 sqrt(6) π^(39/2))) * [(3*2^7)/Pi^13]^0.5 * 2^(-13)))))))))x, 0..1)))

Input:

$$\sqrt{\int_0^1 -\frac{(2\pi)^{26}\times\frac{1}{2\sqrt{6}\,\pi^{39/2}}\left(\sqrt{\frac{3\times 2^7}{\pi^{13}}}\times(-1)\right)}{(2\pi)^{26}\times\frac{1}{2\sqrt{6}\,\pi^{39/2}}\times\frac{\sqrt{\frac{3\times 2^7}{\pi^{13}}}}{2^{13}}}\,x\,dx}$$

Result:

64

64

Computation result:

$$\sqrt{\int_0^1 \frac{\left((2\pi)^{26}\left(\sqrt{\frac{3\times 2^7}{\pi^{13}}}\,(-1)\right)\right)x}{\frac{\left(2\sqrt{6}\,\pi^{39/2}\right)\left(-\left((2\pi)^{26}\sqrt{\frac{3\times 2^7}{\pi^{13}}}\right)\right)}{\left(2\sqrt{6}\,\pi^{39/2}\right)2^{13}}}\,dx} = 64$$

From which:

27 sqrt[(((integrate(((((((((2Pi)^26* (1/(2 sqrt(6) π^(39/2))) * [(3*2^7)/Pi^13]^0.5 * (-1))))) / -(((((2Pi)^26* (1/(2 sqrt(6) π^(39/2))) * [(3*2^7)/Pi^13]^0.5 * 2^(-13)))))))))x, 0..1)))]+1

Input:

$$27\sqrt{\int_0^1 -\frac{(2\pi)^{26}\times\frac{1}{2\sqrt{6}\,\pi^{39/2}}\left(\sqrt{\frac{3\times 2^7}{\pi^{13}}}\times(-1)\right)}{(2\pi)^{26}\times\frac{1}{2\sqrt{6}\,\pi^{39/2}}\times\frac{\sqrt{\frac{3\times 2^7}{\pi^{13}}}}{2^{13}}}\,x\,dx}+1$$

Result:

1729

1729

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)

Computation result:

$$27\sqrt{\int_0^1 \frac{\left((2\pi)^{26}\left(\sqrt{\frac{3\times 2^7}{\pi^{13}}}\,(-1)\right)\right)x}{\frac{\left(2\sqrt{6}\,\pi^{39/2}\right)\left(-\left((2\pi)^{26}\sqrt{\frac{3\times 2^7}{\pi^{13}}}\right)\right)}{\left(2\sqrt{6}\,\pi^{39/2}\right)2^{13}}}\,dx\;+1}=1729$$

From:

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Vacuum energy and dilaton tadpole for the unoriented closed bosonic string

Benjamin Grinstein and Mark B. Wise - California Institute of Technology, Pasadena, California 91125 - (Received 25 August 1986)

According to Eq. (1) the contribution of P_2 to the vacuum energy density is

$$\mathscr{E}_{\rm vac} = -\frac{1}{\pi^2}\left[\frac{3}{16\pi}\right]^{3/2}$$

$$\times\lambda^{-1}(\det' P^\dagger P)^{1/2}[\det'(-\nabla^2)]^{-13}\,. \qquad (34)$$

Performing the functional integral with a single insertion of the dilaton vertex operator gives

$$A_D(p) = -(2\pi)^{26}\delta(p)\frac{\sqrt{24}}{2\pi^3}\left[\frac{3}{16\pi}\right]^{3/2}\lambda^{-1}\kappa_D(\det' P^\dagger P)^{1/2}[\det'(-\nabla^2)]^{-13}$$

$$\times \int_{\text{unit disk}} d^2z \lim_{z'\to z}\left[\frac{\partial}{\partial z}\frac{\partial}{\partial \bar{z}'}+\frac{\partial}{\partial \bar{z}}\frac{\partial}{\partial z'}\right]\ln|1+\bar{z}z'|^2 \tag{44}$$

$$= -(2\pi)^{26}\delta(p)\frac{\sqrt{24}}{2\pi^2}\left[\frac{3}{16\pi}\right]^{3/2}\lambda^{-1}\kappa_D(\det' P^\dagger P)^{1/2}[\det'(-\nabla^2)]^{-13}\,. \tag{45}$$

$$A_D(p) = -\left[\frac{384}{\pi^{13}}\right]^{1/2}(2\pi)^{26}\delta(p)\,.$$

Dividing the eq. (45) with eq. (34), we obtain:

[-(2Pi)^26 * ((sqrt(24)/(2Pi^2))) * (3/(16Pi))^1.5] / [(-1/(Pi^2))*(3/(16Pi))^1.5]

Input:

$$\frac{-(2\pi)^{26}\left(\frac{\sqrt{24}}{2\pi^2}\left(\frac{3}{16\pi}\right)^{1.5}\right)}{-\frac{\left(\frac{3}{16\pi}\right)^{1.5}}{\pi^2}}$$

Result:

$1.38596\ldots \times 10^{21}$

1.38596…*10^21

Series representations:

$$\frac{-\left((2\pi)^{26}\left(\sqrt{24}\left(\frac{3}{16\pi}\right)^{1.5}\right)\right)}{-\frac{\left(\frac{3}{16\pi}\right)^{1.5}(2\pi^2)}{\pi^2}} = \frac{3.35544\times 10^7\sqrt{23}\sum_{k=0}^{\infty}23^{-k}\binom{\frac{1}{2}}{k}}{\left(\frac{1}{\pi}\right)^{26}}$$

$$\frac{-\left((2\pi)^{26}\left(\sqrt{24}\left(\frac{3}{16\pi}\right)^{1.5}\right)\right)}{-\frac{\left(\frac{3}{16\pi}\right)^{1.5}(2\pi^2)}{\pi^2}} = \frac{3.35544\times 10^7\sqrt{23}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{23}\right)^k\left(-\frac{1}{2}\right)_k}{k!}}{\left(\frac{1}{\pi}\right)^{26}}$$

$$\frac{-\left((2\pi)^{26}\left(\sqrt{24}\left(\frac{3}{16\pi}\right)^{1.5}\right)\right)}{-\frac{\left(\frac{3}{16\pi}\right)^{1.5}(2\pi^2)}{\pi^2}} = \frac{1.67772\times 10^7\sum_{j=0}^{\infty}\text{Res}_{s=-\frac{1}{2}+j}\,23^{-s}\,\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)}{\left(\frac{1}{\pi}\right)^{26}\sqrt{\pi}}$$

We dividing eq. (46) with eq. (45), we obtain:

[-(384/(PI^13))^0.5*(2Pi)^26] / [-(2Pi)^26 * ((sqrt(24)/(2Pi^2))) * (3/(16Pi))^1.5]

Input:

$$\frac{-\sqrt{\frac{384}{\pi^{13}}}\,(2\pi)^{26}}{-(2\pi)^{26}\left(\frac{\sqrt{24}}{2\pi^2}\left(\frac{3}{16\pi}\right)^{1.5}\right)}$$

Result:

3.17789...

3.17789…

Series representations:

$$\frac{-\left(\sqrt{\frac{384}{\pi^{13}}}\,(2\pi)^{26}\right)}{-\frac{(2\pi)^{26}\left(\sqrt{24}\left(\frac{3}{16\pi}\right)^{1.5}\right)}{2\pi^2}} = \frac{482.718\sqrt{\frac{1}{\pi^{13}}}}{\left(\frac{1}{\pi}\right)^{3.5}\sqrt{23}\sum_{k=0}^{\infty}23^{-k}\binom{\frac{1}{2}}{k}}$$

$$\frac{-\left(\sqrt{\frac{384}{\pi^{13}}}\,(2\pi)^{26}\right)}{-\frac{(2\pi)^{26}\left(\sqrt{24}\left(\frac{3}{16\pi}\right)^{1.5}\right)}{2\pi^2}} = \frac{482.718\sqrt{\frac{1}{\pi^{13}}}}{\left(\frac{1}{\pi}\right)^{3.5}\sqrt{23}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{23}\right)^k\left(-\frac{1}{2}\right)_k}{k!}}$$

$$\frac{-\left(\sqrt{\frac{384}{\pi^{13}}}\,(2\pi)^{26}\right)}{-\frac{(2\pi)^{26}\left(\sqrt{24}\left(\frac{3}{16\pi}\right)^{1.5}\right)}{2\pi^2}} = \frac{965.436\sqrt{\frac{1}{\pi^{13}}}\sqrt{\pi}}{\left(\frac{1}{\pi}\right)^{3.5}\sum_{j=0}^{\infty}\operatorname{Res}_{s=-\frac{1}{2}+j}23^{-s}\,\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)}$$

From which:

1+1/(((1/2(((([-(384/(PI^13))^0.5*(2Pi)^26] / [-(2Pi)^26 * ((sqrt(24)/(2Pi^2))) * (3/(16Pi))^1.5])))))))

Input:

$$1+\frac{1}{\frac{1}{2}\times\frac{-\sqrt{\frac{384}{\pi^{13}}}\,(2\pi)^{26}}{-(2\pi)^{26}\left(\frac{\sqrt{24}}{2\pi^2}\left(\frac{3}{16\pi}\right)^{1.5}\right)}}$$

Result:

1.629348983169734585513368380272429304539309345390403675250...

1.6293489…

Performing the ln of the previous expression

$$\frac{-(2\pi)^{26}\left(\frac{\sqrt{24}}{2\pi^2}\left(\frac{3}{16\pi}\right)^{1.5}\right)}{-\frac{\left(\frac{3}{16\pi}\right)^{1.5}}{\pi^2}}$$

we obtain:

ln((([-(2Pi)^26 * ((sqrt(24)/(2Pi^2))) * (3/(16Pi))^1.5] / [(-1/(Pi^2))*(3/(16Pi))^1.5])))

Input:

$$\log\left(\frac{-(2\pi)^{26}\left(\frac{\sqrt{24}}{2\pi^2}\left(\frac{3}{16\pi}\right)^{1.5}\right)}{-\frac{\left(\frac{3}{16\pi}\right)^{1.5}}{\pi^2}}\right)$$

$\log(x)$ is the natural logarithm

Result:

48.68068...

48.68068….

Alternative representations:

$$\log\left(\frac{-\left((2\pi)^{26}\left(\sqrt{24}\left(\frac{3}{16\pi}\right)^{1.5}\right)\right)}{-\frac{\left(\frac{3}{16\pi}\right)^{1.5}(2\pi^2)}{\pi^2}}\right)=\log_e\left(-\frac{(2\pi)^{26}\left(\frac{3}{16\pi}\right)^{1.5}\sqrt{24}}{\frac{(2\pi^2)\left(-\left(\frac{3}{16\pi}\right)^{1.5}\right)}{\pi^2}}\right)$$

$$\log\left(\frac{-\left((2\pi)^{26}\left(\sqrt{24}\,\left(\frac{3}{16\pi}\right)^{1.5}\right)\right)}{-\frac{\left(\frac{3}{16\pi}\right)^{1.5}(2\pi^2)}{\pi^2}}\right) = \log(a)\log_a\left(-\frac{(2\pi)^{26}\left(\frac{3}{16\pi}\right)^{1.5}\sqrt{24}}{\frac{(2\pi^2)\left(-\left(\frac{3}{16\pi}\right)^{1.5}\right)}{\pi^2}}\right)$$

$$\log\left(\frac{-\left((2\pi)^{26}\left(\sqrt{24}\,\left(\frac{3}{16\pi}\right)^{1.5}\right)\right)}{-\frac{\left(\frac{3}{16\pi}\right)^{1.5}(2\pi^2)}{\pi^2}}\right) = -\mathrm{Li}_1\left(1+\frac{(2\pi)^{26}\left(\frac{3}{16\pi}\right)^{1.5}\sqrt{24}}{\frac{(2\pi^2)\left(-\left(\frac{3}{16\pi}\right)^{1.5}\right)}{\pi^2}}\right)$$

Series representations:

$$\log\left(\frac{-\left((2\pi)^{26}\left(\sqrt{24}\,\left(\frac{3}{16\pi}\right)^{1.5}\right)\right)}{-\frac{\left(\frac{3}{16\pi}\right)^{1.5}(2\pi^2)}{\pi^2}}\right) = \log\left(\frac{3.35544\times10^7\sqrt{23}\,\sum_{k=0}^{\infty}23^{-k}\binom{\frac{1}{2}}{k}}{\left(\frac{1}{\pi}\right)^{26}}\right)$$

$$\log\left(\frac{-\left((2\pi)^{26}\left(\sqrt{24}\,\left(\frac{3}{16\pi}\right)^{1.5}\right)\right)}{-\frac{\left(\frac{3}{16\pi}\right)^{1.5}(2\pi^2)}{\pi^2}}\right) =$$

$$\log\left(-1+\frac{3.35544\times10^7\sqrt{24}}{\left(\frac{1}{\pi}\right)^{26}}\right)-\sum_{k=1}^{\infty}\frac{(-1)^k\left(-1+\frac{3.35544\times10^7\sqrt{24}}{\left(\frac{1}{\pi}\right)^{26}}\right)^{-k}}{k}$$

$$\log\left(\frac{-\left((2\pi)^{26}\left(\sqrt{24}\,\left(\frac{3}{16\pi}\right)^{1.5}\right)\right)}{-\frac{\left(\frac{3}{16\pi}\right)^{1.5}(2\pi^2)}{\pi^2}}\right) = \log\left(\frac{3.35544\times10^7\sqrt{23}\,\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{23}\right)^k\left(-\frac{1}{2}\right)_k}{k!}}{\left(\frac{1}{\pi}\right)^{26}}\right)$$

Integral representations:

$$\log\left(\frac{-\left((2\pi)^{26}\left(\sqrt{24}\,\left(\frac{3}{16\pi}\right)^{1.5}\right)\right)}{-\frac{\left(\frac{3}{16\pi}\right)^{1.5}(2\pi^2)}{\pi^2}}\right) = \int_1^{\frac{3.35544\times10^7\sqrt{24}}{\left(\frac{1}{\pi}\right)^{26}}}\frac{1}{t}\,dt$$

$$\log\left(\frac{-\left((2\pi)^{26}\left(\sqrt{24}\,\left(\frac{3}{16\pi}\right)^{1.5}\right)\right)}{-\frac{\left(\frac{3}{16\pi}\right)^{1.5}(2\pi^2)}{\pi^2}}\right) = \frac{1}{2i\pi}\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{\Gamma(-s)^2\,\Gamma(1+s)\left(-1+\frac{3.35544\times10^7\sqrt{24}}{\left(\frac{1}{\pi}\right)^{26}}\right)^{-s}}{\Gamma(1-s)}\,ds$$

for $-1<\gamma<0$

From the formula of coefficients of the '5th order' mock theta function $\psi_1(q)$:
(A053261 OEIS Sequence)

sqrt(golden ratio) * exp(Pi*sqrt(n/15)) / (2*5^(1/4)*sqrt(n)) for n = 72 , we obtain:

sqrt(golden ratio) * exp(Pi*sqrt(72/15)) / (2*5^(1/4)*sqrt(72))

Input:

$$\sqrt{\phi} \times \frac{\exp\left(\pi \sqrt{\frac{72}{15}}\right)}{2 \sqrt[4]{5} \sqrt{72}}$$

ϕ is the golden ratio

Exact result:

$$\frac{e^{2\sqrt{6/5}\,\pi}\sqrt{\phi}}{12\sqrt{2}\sqrt[4]{5}}$$

Decimal approximation:

48.893812063644712060727960770582650855750816940814051370 06...

48.893812….

Property:

$\frac{e^{2\sqrt{6/5}\,\pi}\sqrt{\phi}}{12\sqrt{2}\sqrt[4]{5}}$ is a transcendental number

Alternate forms:

$$\frac{1}{24}\sqrt{1+\frac{1}{\sqrt{5}}}\;e^{2\sqrt{6/5}\,\pi}$$

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

$$\frac{\sqrt{1+\sqrt{5}}\;\;e^{2\sqrt{6/5}\,\pi}}{24\sqrt[4]{5}}$$

Series representations:

$$\frac{\sqrt{\phi}\;\exp\left(\pi\sqrt{\frac{72}{15}}\right)}{2\sqrt[4]{5}\;\sqrt{72}}=\frac{\exp\left(\pi\sqrt{z_0}\;\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(\frac{24}{5}-z_0\right)^k z_0^{-k}}{k!}\right)\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(\phi-z_0)^k z_0^{-k}}{k!}}{2\sqrt[4]{5}\;\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(72-z_0)^k z_0^{-k}}{k!}}$$

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

$$\frac{\sqrt{\phi}\;\exp\left(\pi\sqrt{\frac{72}{15}}\right)}{2\sqrt[4]{5}\;\sqrt{72}}=$$
$$\left(\exp\left(i\pi\left\lfloor\frac{\arg(\phi-x)}{2\pi}\right\rfloor\right)\exp\left(\pi\exp\left(i\pi\left\lfloor\frac{\arg\left(\frac{24}{5}-x\right)}{2\pi}\right\rfloor\right)\sqrt{x}\;\sum_{k=0}^{\infty}\frac{(-1)^k\left(\frac{24}{5}-x\right)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)\right.$$
$$\left.\sum_{k=0}^{\infty}\frac{(-1)^k(\phi-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)\Big/$$
$$\left(2\sqrt[4]{5}\;\exp\left(i\pi\left\lfloor\frac{\arg(72-x)}{2\pi}\right\rfloor\right)\sum_{k=0}^{\infty}\frac{(-1)^k(72-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)\quad\text{for}\ (x\in\mathbb{R}\ \text{and}\ x<0)$$

$$\frac{\sqrt{\phi}\;\exp\left(\pi\sqrt{\frac{72}{15}}\right)}{2\sqrt[4]{5}\;\sqrt{72}}=$$
$$\left(\exp\left(\pi\left(\frac{1}{z_0}\right)^{1/2\left\lfloor\arg\left(\frac{24}{5}-z_0\right)/(2\pi)\right\rfloor}z_0^{1/2\left(1+\left\lfloor\arg\left(\frac{24}{5}-z_0\right)/(2\pi)\right\rfloor\right)}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(\frac{24}{5}-z_0\right)^k z_0^{-k}}{k!}\right)\right.$$
$$\left(\frac{1}{z_0}\right)^{-1/2\lfloor\arg(72-z_0)/(2\pi)\rfloor+1/2\lfloor\arg(\phi-z_0)/(2\pi)\rfloor}z_0^{-1/2\lfloor\arg(72-z_0)/(2\pi)\rfloor+1/2\lfloor\arg(\phi-z_0)/(2\pi)\rfloor}$$
$$\left.\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(\phi-z_0)^k z_0^{-k}}{k!}\right)\Big/\left(2\sqrt[4]{5}\;\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(72-z_0)^k z_0^{-k}}{k!}\right)$$

We note that the two results: 48.68068…. and 48.893812…. are very near and are equal about to 49, that is the sum of p(5) + p(10) = 7 + 42 = 49 , i.e. the sum of the number of partitions of 5 and 10.

We have also:

1/2((((((((([-(2Pi)^26 * ((sqrt(24)/(2Pi^2))) * (3/(16Pi))^1.5] / [(-1/(Pi^2))*(3/(16Pi))^1.5])))))^1/5 - e^(2Pi))))))+e^(-1/π)

Input:

$$\frac{1}{2}\left(\sqrt[5]{\frac{-(2\pi)^{26}\left(\frac{\sqrt{24}}{2\pi^2}\left(\frac{3}{16\pi}\right)^{1.5}\right)}{-\frac{\left(\frac{3}{16\pi}\right)^{1.5}}{\pi^2}}}-e^{2\pi}\right)+e^{-1/\pi}$$

Result:

8192.01...

8192.01… ≈ 8192 = 2 * 64^2

Series representations:

$$\frac{1}{2}\left(\sqrt[5]{-\frac{(2\pi)^{26}\left(\sqrt{24}\left(\frac{3}{16\pi}\right)^{1.5}\right)}{\frac{(2\pi^2)\left(-\left(\frac{3}{16\pi}\right)^{1.5}\right)}{\pi^2}}}-e^{2\pi}\right)+e^{-1/\pi}=e^{-1/\pi}-\frac{e^{2\pi}}{2}+16.\sqrt[5]{\frac{\sqrt{23}\ \sum_{k=0}^{\infty}23^{-k}\binom{\frac{1}{2}}{k}}{\left(\frac{1}{\pi}\right)^{26}}}$$

$$\frac{1}{2}\left(\sqrt[5]{-\frac{(2\pi)^{26}\left(\sqrt{24}\left(\frac{3}{16\pi}\right)^{1.5}\right)}{\frac{(2\pi^2)\left(-\left(\frac{3}{16\pi}\right)^{1.5}\right)}{\pi^2}}}-e^{2\pi}\right)+e^{-1/\pi}=$$

$$e^{-1/\pi}-\frac{e^{2\pi}}{2}+16.\sqrt[5]{\frac{\sqrt{23}\ \sum_{k=0}^{\infty}\frac{\left(-\frac{1}{23}\right)^k\left(-\frac{1}{2}\right)_k}{k!}}{\left(\frac{1}{\pi}\right)^{26}}}$$

$$\frac{1}{2}\left(\sqrt[5]{-\frac{(2\pi)^{26}\left(\sqrt{24}\left(\frac{3}{16\pi}\right)^{1.5}\right)}{\frac{(2\pi^2)\left(-\left(\frac{3}{16\pi}\right)^{1.5}\right)}{\pi^2}}}-e^{2\pi}\right)+e^{-1/\pi}=$$

$$e^{-1/\pi}-\frac{e^{2\pi}}{2}+13.9288\sqrt[5]{\frac{\sum_{j=0}^{\infty}\text{Res}_{s=-\frac{1}{2}+j}\ 23^{-s}\,\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)}{\left(\frac{1}{\pi}\right)^{26}\sqrt{\pi}}}$$

From which:

[(((integrate((((1/2((((((((([-(2Pi)^26 ((sqrt(24)/(2Pi^2))) (3/(16Pi))^1.5]/[(-1/(Pi^2))*(3/(16Pi))^1.5])))))^1/5 - e^(2Pi))))))+e^(-1/π)))))x, 0..1)))]

Definite integral:

$$\int_0^1\left(\frac{1}{2}\left(\sqrt[5]{-\frac{(2\pi)^{26}\sqrt{24}\left(\frac{3}{16\pi}\right)^{1.5}}{\frac{(2\pi^2)\left(-\left(\frac{3}{16\pi}\right)^{1.5}\right)}{\pi^2}}}-e^{2\pi}\right)+e^{-1/\pi}\right)x\,dx=4096.$$

$4096 = 64^2$

sqrt(((integrate((((1/2((((((((([-(2Pi)^26 * ((sqrt(24)/(2Pi^2))) * (3/(16Pi))^1.5] / [(-1/(Pi^2))*(3/(16Pi))^1.5])))))^1/5 - e^(2Pi))))))+e^(-1/π)))))x, 0..1)))

Input:

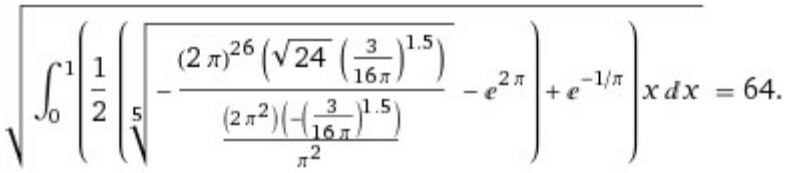
$$\sqrt{\int_0^1\left(\frac{1}{2}\left(\sqrt[5]{\frac{-(2\pi)^{26}\left(\frac{\sqrt{24}}{2\pi^2}\left(\frac{3}{16\pi}\right)^{1.5}\right)}{-\frac{\left(\frac{3}{16\pi}\right)^{1.5}}{\pi^2}}}-e^{2\pi}\right)+e^{-1/\pi}\right)x\,dx}$$

Result:

64.

64

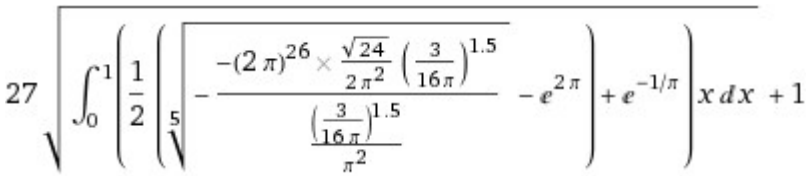
Computation result:



and:

27 sqrt[(((integrate((((1/2((((((((([-(2Pi)^26 ((sqrt(24)/(2Pi^2))) (3/(16Pi))^1.5]/[(-1/(Pi^2))*(3/(16Pi))^1.5])))^1/5 - e^(2Pi))))))+e^(-1/π)))))x, 0..1)))]+1

Input:

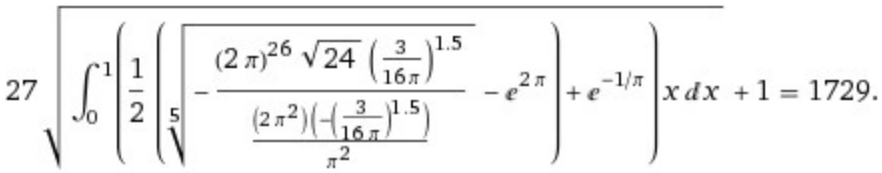


Result:

1729.
1729

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)

Computation result:



Now, we have that:

In particular the three- and four-point tachyon scattering amplitudes are

$$Q_S = 2^{13}\left(\frac{3}{16\pi}\right)^3 (\det{}'P^{\dagger}P)^{1/2}[\det{}'(-\nabla^2)]^{-13}$$

$$a_4(p_1,p_2,p_3,p_4) = \pi\lambda^{-2}(\kappa_T\epsilon^2)^4 Q_S \frac{\Gamma(3-(t+s)/8\pi)\Gamma(t/8\pi-1)\Gamma(s/8\pi-1)}{\Gamma((s+t)/8\pi-2)\Gamma(2-t/8\pi)\Gamma(2-s/8\pi)}$$

For s = 1 and t = 3, we obtain:

Pi* (2^13) * (3/(16Pi))^3 * (((gamma (3-4/(8Pi)) gamma (3/(8Pi)-1) gamma (1/(8Pi)-1)))) / ((gamma (4/(8Pi)-2) gamma (2-3/(8Pi)) gamma (2-1/(8Pi))))

Input:

$$\pi \times 2^{13}\left(\frac{3}{16\,\pi}\right)^3 \times \frac{\Gamma\left(3-\frac{4}{8\,\pi}\right)\Gamma\left(\frac{3}{8\,\pi}-1\right)\Gamma\left(\frac{1}{8\,\pi}-1\right)}{\Gamma\left(\frac{4}{8\,\pi}-2\right)\Gamma\left(2-\frac{3}{8\,\pi}\right)\Gamma\left(2-\frac{1}{8\,\pi}\right)}$$

$\Gamma(x)$ is the gamma function

Exact result:

$$\frac{54\,\Gamma\left(3-\frac{1}{2\,\pi}\right)\Gamma\left(-1+\frac{1}{8\,\pi}\right)\Gamma\left(-1+\frac{3}{8\,\pi}\right)}{\pi^2\,\Gamma\left(2-\frac{3}{8\,\pi}\right)\Gamma\left(2-\frac{1}{8\,\pi}\right)\Gamma\left(-2+\frac{1}{2\,\pi}\right)}$$

Decimal approximation:

615.486129466193658445574637126837627913402173613638841519 9...

615.4861294…

Alternative representations:

$$\frac{\left(\pi\,2^{13}\left(\frac{3}{16\pi}\right)^3\right)\Gamma\left(3-\frac{4}{8\,\pi}\right)\left(\Gamma\left(\frac{3}{8\,\pi}-1\right)\Gamma\left(\frac{1}{8\,\pi}-1\right)\right)}{\Gamma\left(\frac{4}{8\,\pi}-2\right)\Gamma\left(2-\frac{3}{8\,\pi}\right)\Gamma\left(2-\frac{1}{8\,\pi}\right)} =$$

$$\frac{\pi\left(2-\frac{4}{8\,\pi}\right)!\left(-2+\frac{1}{8\,\pi}\right)!\left(-2+\frac{3}{8\,\pi}\right)!\,2^{13}\left(\frac{3}{16\pi}\right)^3}{\left(1-\frac{3}{8\,\pi}\right)!\left(1-\frac{1}{8\,\pi}\right)!\left(-3+\frac{4}{8\,\pi}\right)!}$$

$$\frac{\left(\pi\, 2^{13}\left(\frac{3}{16\pi}\right)^3\right)\Gamma\left(3-\frac{4}{8\pi}\right)\left(\Gamma\left(\frac{3}{8\pi}-1\right)\Gamma\left(\frac{1}{8\pi}-1\right)\right)}{\Gamma\left(\frac{4}{8\pi}-2\right)\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)} =$$
$$\left(\pi\, 2^{13}\exp\left(-\log G\left(3-\frac{4}{8\pi}\right)+\log G\left(4-\frac{4}{8\pi}\right)\right)\right.$$
$$\exp\left(-\log G\left(-1+\frac{1}{8\pi}\right)+\log G\left(\frac{1}{8\pi}\right)\right)e^{\log G\left(\frac{3}{8\pi}\right)-\log G\left(-1+\frac{3}{8\pi}\right)}\left(\frac{3}{16\pi}\right)^3\Big)\Big/$$
$$\left(\exp\left(-\log G\left(2-\frac{3}{8\pi}\right)+\log G\left(3-\frac{3}{8\pi}\right)\right)\exp\left(-\log G\left(2-\frac{1}{8\pi}\right)+\log G\left(3-\frac{1}{8\pi}\right)\right)\right.$$
$$\left.\left.\exp\left(-\log G\left(-2+\frac{4}{8\pi}\right)+\log G\left(-1+\frac{4}{8\pi}\right)\right)\right)\right)$$

$$\frac{\left(\pi\, 2^{13}\left(\frac{3}{16\pi}\right)^3\right)\Gamma\left(3-\frac{4}{8\pi}\right)\left(\Gamma\left(\frac{3}{8\pi}-1\right)\Gamma\left(\frac{1}{8\pi}-1\right)\right)}{\Gamma\left(\frac{4}{8\pi}-2\right)\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)} = \frac{\pi\,(1)_{2-\frac{4}{8\pi}}\,(1)_{-2+\frac{1}{8\pi}}\,(1)_{-2+\frac{3}{8\pi}}\,2^{13}\left(\frac{3}{16\pi}\right)^3}{(1)_{1-\frac{3}{8\pi}}\,(1)_{1-\frac{1}{8\pi}}\,(1)_{-3+\frac{4}{8\pi}}}$$

from which:

1/5* Pi* (2^13) * (3/(16Pi))^3 * (((gamma (3-4/(8Pi)) gamma (3/(8Pi)-1) gamma (1/(8Pi)-1)))) / ((gamma (4/(8Pi)-2) gamma (2-3/(8Pi)) gamma (2-1/(8Pi)))) +2

Input:

$$\frac{1}{5}\,\pi\times 2^{13}\left(\frac{3}{16\,\pi}\right)^3\times\frac{\Gamma\left(3-\frac{4}{8\pi}\right)\Gamma\left(\frac{3}{8\pi}-1\right)\Gamma\left(\frac{1}{8\pi}-1\right)}{\Gamma\left(\frac{4}{8\pi}-2\right)\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)}+2$$

$\Gamma(x)$ is the gamma function

Exact result:

$$2+\frac{54\,\Gamma\left(3-\frac{1}{2\pi}\right)\Gamma\left(-1+\frac{1}{8\pi}\right)\Gamma\left(-1+\frac{3}{8\pi}\right)}{5\,\pi^2\,\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)\Gamma\left(-2+\frac{1}{2\pi}\right)}$$

Decimal approximation:

125.097225893238731689114927425367525582680434722727768303 9...

125.097225… result very near to the Higgs boson mass 125.18 GeV

Alternate form:

$$\frac{2\left(27\,\Gamma\left(3-\frac{1}{2\pi}\right)\Gamma\left(-1+\frac{1}{8\pi}\right)\Gamma\left(-1+\frac{3}{8\pi}\right)+5\pi^2\,\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)\Gamma\left(-2+\frac{1}{2\pi}\right)\right)}{5\pi^2\,\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)\Gamma\left(-2+\frac{1}{2\pi}\right)}$$

Alternative representations:

$$\frac{(\pi 2^{13})\left(\frac{3}{16\pi}\right)^3\left(\Gamma\left(3-\frac{4}{8\pi}\right)\Gamma\left(\frac{3}{8\pi}-1\right)\Gamma\left(\frac{1}{8\pi}-1\right)\right)}{5\left(\Gamma\left(\frac{4}{8\pi}-2\right)\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)\right)}+2=$$
$$2+\frac{\pi\left(2-\frac{4}{8\pi}\right)!\left(-2+\frac{1}{8\pi}\right)!\left(-2+\frac{3}{8\pi}\right)!\,2^{13}\left(\frac{3}{16\pi}\right)^3}{5\left(\left(1-\frac{3}{8\pi}\right)!\left(1-\frac{1}{8\pi}\right)!\left(-3+\frac{4}{8\pi}\right)!\right)}$$

$$\frac{(\pi 2^{13})\left(\frac{3}{16\pi}\right)^3\left(\Gamma\left(3-\frac{4}{8\pi}\right)\Gamma\left(\frac{3}{8\pi}-1\right)\Gamma\left(\frac{1}{8\pi}-1\right)\right)}{5\left(\Gamma\left(\frac{4}{8\pi}-2\right)\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)\right)}+2=$$
$$2+\left(\pi 2^{13}\exp\left(-\log G\left(3-\frac{4}{8\pi}\right)+\log G\left(4-\frac{4}{8\pi}\right)\right)\right.$$
$$\left.\exp\left(-\log G\left(-1+\frac{1}{8\pi}\right)+\log G\left(\frac{1}{8\pi}\right)\right)e^{\log G\left(\frac{3}{8\pi}\right)-\log G\left(-1+\frac{3}{8\pi}\right)}\left(\frac{3}{16\pi}\right)^3\right)\Big/$$
$$\left(5\left(\exp\left(-\log G\left(2-\frac{3}{8\pi}\right)+\log G\left(3-\frac{3}{8\pi}\right)\right)\exp\left(-\log G\left(2-\frac{1}{8\pi}\right)+\log G\left(3-\frac{1}{8\pi}\right)\right)\right.\right.$$
$$\left.\left.\exp\left(-\log G\left(-2+\frac{4}{8\pi}\right)+\log G\left(-1+\frac{4}{8\pi}\right)\right)\right)\right)$$

$$\frac{(\pi 2^{13})\left(\frac{3}{16\pi}\right)^3\left(\Gamma\left(3-\frac{4}{8\pi}\right)\Gamma\left(\frac{3}{8\pi}-1\right)\Gamma\left(\frac{1}{8\pi}-1\right)\right)}{5\left(\Gamma\left(\frac{4}{8\pi}-2\right)\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)\right)}+2=$$
$$2+\frac{\pi\,(1)_{2-\frac{4}{8\pi}}\,(1)_{-2+\frac{1}{8\pi}}\,(1)_{-2+\frac{3}{8\pi}}\,2^{13}\left(\frac{3}{16\pi}\right)^3}{5\left((1)_{1-\frac{3}{8\pi}}\,(1)_{1-\frac{1}{8\pi}}\,(1)_{-3+\frac{4}{8\pi}}\right)}$$

1/5* Pi* (2^13) * (3/(16Pi))^3 * (((gamma (3-4/(8Pi)) gamma (3/(8Pi)-1) gamma (1/(8Pi)-1)))) / ((gamma (4/(8Pi)-2) gamma (2-3/(8Pi)) gamma (2-1/(8Pi)))) +16

Input:

$$\frac{1}{5}\,\pi\times 2^{13}\left(\frac{3}{16\,\pi}\right)^3\times\frac{\Gamma\left(3-\frac{4}{8\,\pi}\right)\Gamma\left(\frac{3}{8\,\pi}-1\right)\Gamma\left(\frac{1}{8\,\pi}-1\right)}{\Gamma\left(\frac{4}{8\,\pi}-2\right)\Gamma\left(2-\frac{3}{8\,\pi}\right)\Gamma\left(2-\frac{1}{8\,\pi}\right)}+16$$

$\Gamma(x)$ is the gamma function

Exact result:

$$16+\frac{54\,\Gamma\left(3-\frac{1}{2\,\pi}\right)\Gamma\left(-1+\frac{1}{8\,\pi}\right)\Gamma\left(-1+\frac{3}{8\,\pi}\right)}{5\,\pi^2\,\Gamma\left(2-\frac{3}{8\,\pi}\right)\Gamma\left(2-\frac{1}{8\,\pi}\right)\Gamma\left(-2+\frac{1}{2\,\pi}\right)}$$

Decimal approximation:

139.097225893238731689114927425367525558268043472272776830 39...

139.0972258… result practically equal to the rest mass of Pion meson 139.57 MeV

Alternate form:

$$\frac{2\left(27\,\Gamma\left(3-\frac{1}{2\,\pi}\right)\Gamma\left(-1+\frac{1}{8\,\pi}\right)\Gamma\left(-1+\frac{3}{8\,\pi}\right)+40\,\pi^2\,\Gamma\left(2-\frac{3}{8\,\pi}\right)\Gamma\left(2-\frac{1}{8\,\pi}\right)\Gamma\left(-2+\frac{1}{2\,\pi}\right)\right)}{5\,\pi^2\,\Gamma\left(2-\frac{3}{8\,\pi}\right)\Gamma\left(2-\frac{1}{8\,\pi}\right)\Gamma\left(-2+\frac{1}{2\,\pi}\right)}$$

Alternative representations:

$$\frac{(\pi\,2^{13})\left(\frac{3}{16\pi}\right)^3\left(\Gamma\left(3-\frac{4}{8\,\pi}\right)\Gamma\left(\frac{3}{8\,\pi}-1\right)\Gamma\left(\frac{1}{8\,\pi}-1\right)\right)}{5\left(\Gamma\left(\frac{4}{8\,\pi}-2\right)\Gamma\left(2-\frac{3}{8\,\pi}\right)\Gamma\left(2-\frac{1}{8\,\pi}\right)\right)}+16=$$

$$16+\frac{\pi\left(2-\frac{4}{8\,\pi}\right)!\left(-2+\frac{1}{8\,\pi}\right)!\left(-2+\frac{3}{8\,\pi}\right)!\,2^{13}\left(\frac{3}{16\pi}\right)^3}{5\left(\left(1-\frac{3}{8\,\pi}\right)!\left(1-\frac{1}{8\,\pi}\right)!\left(-3+\frac{4}{8\,\pi}\right)!\right)}$$

$$\frac{(\pi 2^{13})\left(\frac{3}{16\pi}\right)^3\left(\Gamma\left(3-\frac{4}{8\pi}\right)\Gamma\left(\frac{3}{8\pi}-1\right)\Gamma\left(\frac{1}{8\pi}-1\right)\right)}{5\left(\Gamma\left(\frac{4}{8\pi}-2\right)\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)\right)}+16=$$
$$16+\left(\pi 2^{13}\exp\left(-\log G\left(3-\frac{4}{8\pi}\right)+\log G\left(4-\frac{4}{8\pi}\right)\right)\right.$$
$$\left.\exp\left(-\log G\left(-1+\frac{1}{8\pi}\right)+\log G\left(\frac{1}{8\pi}\right)\right)e^{\log G\left(\frac{3}{8\pi}\right)-\log G\left(-1+\frac{3}{8\pi}\right)}\left(\frac{3}{16\pi}\right)^3\right)\Big/$$
$$\left(5\left(\exp\left(-\log G\left(2-\frac{3}{8\pi}\right)+\log G\left(3-\frac{3}{8\pi}\right)\right)\exp\left(-\log G\left(2-\frac{1}{8\pi}\right)+\log G\left(3-\frac{1}{8\pi}\right)\right)\right.\right.$$
$$\left.\left.\exp\left(-\log G\left(-2+\frac{4}{8\pi}\right)+\log G\left(-1+\frac{4}{8\pi}\right)\right)\right)\right)$$

$$\frac{(\pi 2^{13})\left(\frac{3}{16\pi}\right)^3\left(\Gamma\left(3-\frac{4}{8\pi}\right)\Gamma\left(\frac{3}{8\pi}-1\right)\Gamma\left(\frac{1}{8\pi}-1\right)\right)}{5\left(\Gamma\left(\frac{4}{8\pi}-2\right)\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)\right)}+16=$$
$$16+\frac{\pi\,(1)_{2-\frac{4}{8\pi}}\,(1)_{-2+\frac{1}{8\pi}}\,(1)_{-2+\frac{3}{8\pi}}\,2^{13}\left(\frac{3}{16\pi}\right)^3}{5\left((1)_{1-\frac{3}{8\pi}}\,(1)_{1-\frac{1}{8\pi}}\,(1)_{-3+\frac{4}{8\pi}}\right)}$$

27*1/2((((1/5* Pi* (2^13) * (3/(16Pi))^3 * (((gamma (3-4/(8Pi)) gamma (3/(8Pi)-1) gamma (1/(8Pi)-1)))) / ((gamma (4/(8Pi)-2) gamma (2-3/(8Pi)) gamma (2-1/(8Pi)))) +5))))

Input:

$$27\times\frac{1}{2}\left(\frac{1}{5}\pi\times 2^{13}\left(\frac{3}{16\pi}\right)^3\times\frac{\Gamma\left(3-\frac{4}{8\pi}\right)\Gamma\left(\frac{3}{8\pi}-1\right)\Gamma\left(\frac{1}{8\pi}-1\right)}{\Gamma\left(\frac{4}{8\pi}-2\right)\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)}+5\right)$$

$\Gamma(x)$ is the gamma function

Exact result:

$$\frac{27}{2}\left(5+\frac{54\,\Gamma\left(3-\frac{1}{2\pi}\right)\Gamma\left(-1+\frac{1}{8\pi}\right)\Gamma\left(-1+\frac{3}{8\pi}\right)}{5\,\pi^2\,\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)\Gamma\left(-2+\frac{1}{2\pi}\right)}\right)$$

Decimal approximation:

1729.312549558722877803051520242461595366185868756824872103...

1729.312549…

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

Alternate forms:

$$\frac{135}{2}+\frac{729\,\Gamma\left(3-\frac{1}{2\pi}\right)\Gamma\left(-1+\frac{1}{8\pi}\right)\Gamma\left(-1+\frac{3}{8\pi}\right)}{5\pi^2\,\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)\Gamma\left(-2+\frac{1}{2\pi}\right)}$$

$$\frac{27\left(54\,\Gamma\left(3-\frac{1}{2\pi}\right)\Gamma\left(-1+\frac{1}{8\pi}\right)\Gamma\left(-1+\frac{3}{8\pi}\right)+25\pi^2\,\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)\Gamma\left(-2+\frac{1}{2\pi}\right)\right)}{10\pi^2\,\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)\Gamma\left(-2+\frac{1}{2\pi}\right)}$$

Alternative representations:

$$\frac{27}{2}\left(\frac{\pi\,2^{13}\left(\left(\frac{3}{16\pi}\right)^3\left(\Gamma\left(3-\frac{4}{8\pi}\right)\Gamma\left(\frac{3}{8\pi}-1\right)\Gamma\left(\frac{1}{8\pi}-1\right)\right)\right)}{5\left(\Gamma\left(\frac{4}{8\pi}-2\right)\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)\right)}+5\right)=$$
$$\frac{27}{2}\left(5+\frac{\pi\left(2-\frac{4}{8\pi}\right)!\left(-2+\frac{1}{8\pi}\right)!\left(-2+\frac{3}{8\pi}\right)!\,2^{13}\left(\frac{3}{16\pi}\right)^3}{5\left(\left(1-\frac{3}{8\pi}\right)!\left(1-\frac{1}{8\pi}\right)!\left(-3+\frac{4}{8\pi}\right)!\right)}\right)$$

$$\frac{27}{2}\left(\frac{\pi\,2^{13}\left(\left(\frac{3}{16\pi}\right)^3\left(\Gamma\left(3-\frac{4}{8\pi}\right)\Gamma\left(\frac{3}{8\pi}-1\right)\Gamma\left(\frac{1}{8\pi}-1\right)\right)\right)}{5\left(\Gamma\left(\frac{4}{8\pi}-2\right)\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)\right)}+5\right)=$$
$$\frac{27}{2}\left(5+\left(\pi\,2^{13}\exp\left(-\log G\left(3-\frac{4}{8\pi}\right)+\log G\left(4-\frac{4}{8\pi}\right)\right)\right.\right.$$
$$\left.\exp\left(-\log G\left(-1+\frac{1}{8\pi}\right)+\log G\left(\frac{1}{8\pi}\right)\right)e^{\log G\left(\frac{3}{8\pi}\right)-\log G\left(-1+\frac{3}{8\pi}\right)}\left(\frac{3}{16\pi}\right)^3\right)\Big/$$
$$\left(5\left(\exp\left(-\log G\left(2-\frac{3}{8\pi}\right)+\log G\left(3-\frac{3}{8\pi}\right)\right)\exp\left(-\log G\left(2-\frac{1}{8\pi}\right)+\log G\left(3-\frac{1}{8\pi}\right)\right)\right.\right.$$
$$\left.\left.\left.\exp\left(-\log G\left(-2+\frac{4}{8\pi}\right)+\log G\left(-1+\frac{4}{8\pi}\right)\right)\right)\right)\right)$$

$$\frac{27}{2}\left(\frac{\pi\, 2^{13}\left(\left(\frac{3}{16\pi}\right)^3\left(\Gamma\left(3-\frac{4}{8\pi}\right)\Gamma\left(\frac{3}{8\pi}-1\right)\Gamma\left(\frac{1}{8\pi}-1\right)\right)\right)}{5\left(\Gamma\left(\frac{4}{8\pi}-2\right)\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)\right)}+5\right)=$$
$$\frac{27}{2}\left(5+\frac{\pi\,(1)_{2-\frac{4}{8\pi}}\,(1)_{-2+\frac{1}{8\pi}}\,(1)_{-2+\frac{3}{8\pi}}\,2^{13}\left(\frac{3}{16\pi}\right)^3}{5\left((1)_{1-\frac{3}{8\pi}}\,(1)_{1-\frac{1}{8\pi}}\,(1)_{-3+\frac{4}{8\pi}}\right)}\right)$$

From

$$\frac{27}{2}\left(5+\frac{54\,\Gamma\left(3-\frac{1}{2\pi}\right)\Gamma\left(-1+\frac{1}{8\pi}\right)\Gamma\left(-1+\frac{3}{8\pi}\right)}{5\,\pi^2\,\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)\Gamma\left(-2+\frac{1}{2\pi}\right)}\right)$$

we obtain:

(((27/2 (5 + (54 Γ(3 - 1/(2 π)) Γ(-1 + 1/(8 π)) Γ(-1 + 3/(8 π)))/(5 π^2 Γ(2 - 3/(8 π)) Γ(2 - 1/(8 π)) Γ(-2 + 1/(2 π)))))))^1/15

Input:

$$\sqrt[15]{\frac{27}{2}\left(5+\frac{54\,\Gamma\left(3-\frac{1}{2\pi}\right)\Gamma\left(-1+\frac{1}{8\pi}\right)\Gamma\left(-1+\frac{3}{8\pi}\right)}{5\,\pi^2\,\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)\Gamma\left(-2+\frac{1}{2\pi}\right)}\right)}$$

$\Gamma(x)$ is the gamma function

Exact result:

$$\frac{\sqrt[5]{3}}{\sqrt[15]{5+\frac{54\,\Gamma\left(3-\frac{1}{2\pi}\right)\Gamma\left(-1+\frac{1}{8\pi}\right)\Gamma\left(-1+\frac{3}{8\pi}\right)}{5\,\pi^2\,\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)\Gamma\left(-2+\frac{1}{2\pi}\right)}}}$$

Decimal approximation:

1.643835037130762158746380986255034194329382122107825488823...

$1.64383503\ldots \approx \zeta(2) = \frac{\pi^2}{6} = 1.644934\ldots$

Alternate forms:

$$\frac{\sqrt[5]{3}}{\pi^{2/15}\sqrt[15]{\frac{10\,\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)\Gamma\left(-2+\frac{1}{2\pi}\right)}{54\,\Gamma\left(3-\frac{1}{2\pi}\right)\Gamma\left(-1+\frac{1}{8\pi}\right)\Gamma\left(-1+\frac{3}{8\pi}\right)+25\pi^2\,\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)\Gamma\left(-2+\frac{1}{2\pi}\right)}}}$$

$$\frac{5\sqrt[5]{3}}{\sqrt[15]{2}\left(5+\frac{54\,\Gamma\left(3-\frac{1}{2\pi}\right)\Gamma\left(-1+\frac{1}{8\pi}\right)\Gamma\left(-1+\frac{3}{8\pi}\right)}{5\pi^2\,\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)\Gamma\left(-2+\frac{1}{2\pi}\right)}\right)^{14/15}}+\frac{27\times 2^{14/15}\sqrt[5]{3}\;\Gamma\left(3-\frac{1}{2\pi}\right)\Gamma\left(-1+\frac{1}{8\pi}\right)\Gamma\left(-1+\frac{3}{8\pi}\right)}{5\pi^2\,\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)\left(5+\frac{54\,\Gamma\left(3-\frac{1}{2\pi}\right)\Gamma\left(-1+\frac{1}{8\pi}\right)\Gamma\left(-1+\frac{3}{8\pi}\right)}{5\pi^2\,\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)\Gamma\left(-2+\frac{1}{2\pi}\right)}\right)^{14/15}\Gamma\left(-2+\frac{1}{2\pi}\right)}$$

$$\left(\sqrt[5]{3}\right)\Big/\left(\pi^{2/15}\left(\left(10\,(6\pi-1)\,(8\pi-3)\,(8\pi-1)\left(-\frac{4\pi-1}{2\pi}\right)!\,\frac{16\pi-3}{8\pi}!\,\frac{16\pi-1}{8\pi}!\right)\Big/\left(162\,\frac{6\pi-1}{2\pi}!\left(-\frac{8\pi-3}{8\pi}\right)!\left(-\frac{8\pi-1}{8\pi}\right)!-4104\,\pi\,\frac{6\pi-1}{2\pi}!\left(-\frac{8\pi-3}{8\pi}\right)!\left(-\frac{8\pi-1}{8\pi}\right)!-6400\,\pi^4\left(-\frac{4\pi-1}{2\pi}\right)!\,\frac{16\pi-3}{8\pi}!\,\frac{16\pi-1}{8\pi}!+9600\,\pi^5\left(-\frac{4\pi-1}{2\pi}\right)!\,\frac{16\pi-3}{8\pi}!\,\frac{16\pi-1}{8\pi}!-3\pi^2\left(25\left(-\frac{4\pi-1}{2\pi}\right)!\,\frac{16\pi-3}{8\pi}!\,\frac{16\pi-1}{8\pi}!-9216\,\frac{6\pi-1}{2\pi}!\left(-\frac{8\pi-3}{8\pi}\right)!\left(-\frac{8\pi-1}{8\pi}\right)!\right)+2\pi^3\left(625\left(-\frac{4\pi-1}{2\pi}\right)!\,\frac{16\pi-3}{8\pi}!\,\frac{16\pi-1}{8\pi}!-27648\,\frac{6\pi-1}{2\pi}!\left(-\frac{8\pi-3}{8\pi}\right)!\left(-\frac{8\pi-1}{8\pi}\right)!\right)\right)\right)\text{^ }(1/15)\right)$$

n! is the factorial function

All 15th roots of 27/2 (5 + (54 Γ(3 - 1/(2 π)) Γ(-1 + 1/(8 π)) Γ(-1 + 3/(8 π)))/(5 π^2 Γ(2 - 3/(8 π)) Γ(2 - 1/(8 π)) Γ(-2 + 1/(2 π)))):

$$\frac{\sqrt[5]{3}\;e^0}{\sqrt[15]{\frac{2}{5+\frac{54\,\Gamma\left(3-\frac{1}{2\pi}\right)\Gamma\left(-1+\frac{1}{8\pi}\right)\Gamma\left(-1+\frac{3}{8\pi}\right)}{5\pi^2\,\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)\Gamma\left(-2+\frac{1}{2\pi}\right)}}}}\approx 1.6438\ \text{(real, principal root)}$$

$$\frac{\sqrt[5]{3}\ e^{(2\,i\,\pi)/15}}{\sqrt[15]{5+\frac{54\,\Gamma\left(3-\frac{1}{2\,\pi}\right)\Gamma\left(-1+\frac{1}{8\,\pi}\right)\Gamma\left(-1+\frac{3}{8\,\pi}\right)}{5\,\pi^2\,\Gamma\left(2-\frac{3}{8\,\pi}\right)\Gamma\left(2-\frac{1}{8\,\pi}\right)\Gamma\left(-2+\frac{1}{2\,\pi}\right)}}} \approx 1.5017 + 0.6686\,i$$

$$\frac{\sqrt[5]{3}\ e^{(4\,i\,\pi)/15}}{\sqrt[15]{5+\frac{54\,\Gamma\left(3-\frac{1}{2\,\pi}\right)\Gamma\left(-1+\frac{1}{8\,\pi}\right)\Gamma\left(-1+\frac{3}{8\,\pi}\right)}{5\,\pi^2\,\Gamma\left(2-\frac{3}{8\,\pi}\right)\Gamma\left(2-\frac{1}{8\,\pi}\right)\Gamma\left(-2+\frac{1}{2\,\pi}\right)}}} \approx 1.0999 + 1.2216\,i$$

$$\frac{\sqrt[5]{3}\ e^{(2\,i\,\pi)/5}}{\sqrt[15]{5+\frac{54\,\Gamma\left(3-\frac{1}{2\,\pi}\right)\Gamma\left(-1+\frac{1}{8\,\pi}\right)\Gamma\left(-1+\frac{3}{8\,\pi}\right)}{5\,\pi^2\,\Gamma\left(2-\frac{3}{8\,\pi}\right)\Gamma\left(2-\frac{1}{8\,\pi}\right)\Gamma\left(-2+\frac{1}{2\,\pi}\right)}}} \approx 0.5080 + 1.5634\,i$$

$$\frac{\sqrt[5]{3}\ e^{(8\,i\,\pi)/15}}{\sqrt[15]{5+\frac{54\,\Gamma\left(3-\frac{1}{2\,\pi}\right)\Gamma\left(-1+\frac{1}{8\,\pi}\right)\Gamma\left(-1+\frac{3}{8\,\pi}\right)}{5\,\pi^2\,\Gamma\left(2-\frac{3}{8\,\pi}\right)\Gamma\left(2-\frac{1}{8\,\pi}\right)\Gamma\left(-2+\frac{1}{2\,\pi}\right)}}} \approx -0.1718 + 1.6348\,i$$

Alternative representations:

$$\sqrt[15]{\frac{1}{2}\left(5+\frac{54\,\Gamma\left(3-\frac{1}{2\,\pi}\right)\Gamma\left(-1+\frac{1}{8\,\pi}\right)\Gamma\left(-1+\frac{3}{8\,\pi}\right)}{5\,\pi^2\,\Gamma\left(2-\frac{3}{8\,\pi}\right)\Gamma\left(2-\frac{1}{8\,\pi}\right)\Gamma\left(-2+\frac{1}{2\,\pi}\right)}\right)27} = \sqrt[15]{\frac{27}{2}\left(5+\frac{54\left(2-\frac{1}{2\,\pi}\right)!\left(-2+\frac{1}{8\,\pi}\right)!\left(-2+\frac{3}{8\,\pi}\right)!}{5\left(-3+\frac{1}{2\,\pi}\right)!\left(1-\frac{3}{8\,\pi}\right)!\left(1-\frac{1}{8\,\pi}\right)!\,\pi^2}\right)}$$

$$\sqrt[15]{\frac{1}{2}\left(5+\frac{54\,\Gamma\left(3-\frac{1}{2\,\pi}\right)\Gamma\left(-1+\frac{1}{8\,\pi}\right)\Gamma\left(-1+\frac{3}{8\,\pi}\right)}{5\,\pi^2\,\Gamma\left(2-\frac{3}{8\,\pi}\right)\Gamma\left(2-\frac{1}{8\,\pi}\right)\Gamma\left(-2+\frac{1}{2\,\pi}\right)}\right)27} = \sqrt[15]{\frac{27}{2}\left(5+\frac{54\,(1)_{2-\frac{1}{2\,\pi}}\,(1)_{-2+\frac{1}{8\,\pi}}\,(1)_{-2+\frac{3}{8\,\pi}}}{5\,(1)_{-3+\frac{1}{2\,\pi}}\,(1)_{1-\frac{3}{8\,\pi}}\,(1)_{1-\frac{1}{8\,\pi}}\,\pi^2}\right)}$$

$$\sqrt[15]{\frac{1}{2}\left(5+\frac{54\,\Gamma\left(3-\frac{1}{2\pi}\right)\Gamma\left(-1+\frac{1}{8\pi}\right)\Gamma\left(-1+\frac{3}{8\pi}\right)}{5\pi^2\,\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)\Gamma\left(-2+\frac{1}{2\pi}\right)}\right)}27 = \sqrt[15]{\frac{27}{2}\left(5+\frac{54\,e^{\log\Gamma(3-1/(2\pi))}\,e^{\log\Gamma(-1+1/(8\pi))}\,e^{\log\Gamma(-1+3/(8\pi))}}{5\,e^{\log\Gamma(-2+1/(2\pi))}\,e^{\log\Gamma(2-3/(8\pi))}\,e^{\log\Gamma(2-1/(8\pi))}\,\pi^2}\right)}$$

In conclusion:

615.486129466 * 1/((((Pi* (3/(16Pi))^3 * (((gamma (3-4/(8Pi)) gamma (3/(8Pi)-1) gamma (1/(8Pi)-1)))) / ((gamma (4/(8Pi)-2) gamma (2-3/(8Pi)) gamma (2-1/(8Pi))))))))

Input interpretation:

$$615.486129466\times\frac{1}{\pi\left(\frac{3}{16\pi}\right)^3\times\frac{\Gamma\left(3-\frac{4}{8\pi}\right)\Gamma\left(\frac{3}{8\pi}-1\right)\Gamma\left(\frac{1}{8\pi}-1\right)}{\Gamma\left(\frac{4}{8\pi}-2\right)\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)}}$$

$\Gamma(x)$ is the gamma function

Result:

8192.00000000...

$8192 = 2 * 64^2$

Alternative representations:

$$\frac{615.4861294660000}{\frac{\pi\left(\frac{3}{16\pi}\right)^3\left(\Gamma\left(3-\frac{4}{8\pi}\right)\Gamma\left(\frac{3}{8\pi}-1\right)\Gamma\left(\frac{1}{8\pi}-1\right)\right)}{\Gamma\left(\frac{4}{8\pi}-2\right)\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)}} = \frac{615.4861294660000}{\frac{\pi\left(2-\frac{4}{8\pi}\right)!\left(-2+\frac{1}{8\pi}\right)!\left(-2+\frac{3}{8\pi}\right)!\left(\frac{3}{16\pi}\right)^3}{\left(1-\frac{3}{8\pi}\right)!\left(1-\frac{1}{8\pi}\right)!\left(-3+\frac{4}{8\pi}\right)!}}$$

$$\frac{615.4861294660000}{\frac{\pi\left(\frac{3}{16\pi}\right)^3\left(\Gamma\left(3-\frac{4}{8\pi}\right)\Gamma\left(\frac{3}{8\pi}-1\right)\Gamma\left(\frac{1}{8\pi}-1\right)\right)}{\Gamma\left(\frac{4}{8\pi}-2\right)\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)}} = \frac{615.4861294660000}{\frac{\pi\,{}^{(1)}2-\frac{4}{8\pi}\,{}^{(1)}-2+\frac{1}{8\pi}\,{}^{(1)}-2+\frac{3}{8\pi}\left(\frac{3}{16\pi}\right)^3}{{}^{(1)}1-\frac{3}{8\pi}\,{}^{(1)}1-\frac{1}{8\pi}\,{}^{(1)}-3+\frac{4}{8\pi}}}$$

$$\frac{615.4861294660000}{\frac{\pi\left(\frac{3}{16\pi}\right)^3\left(\Gamma\left(3-\frac{4}{8\pi}\right)\Gamma\left(\frac{3}{8\pi}-1\right)\Gamma\left(\frac{1}{8\pi}-1\right)\right)}{\Gamma\left(\frac{4}{8\pi}-2\right)\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)}} = \frac{615.4861294660000}{\frac{\pi\,e^{\log\Gamma(3-4/(8\pi))}\,e^{\log\Gamma(-1+1/(8\pi))}\,e^{\log\Gamma(-1+3/(8\pi))}\left(\frac{3}{16\pi}\right)^3}{e^{\log\Gamma(2-3/(8\pi))}\,e^{\log\Gamma(2-1/(8\pi))}\,e^{\log\Gamma(-2+4/(8\pi))}}}$$

and:

615.486129466 * 1/(((2(Pi* (3/(16Pi))^3 * (((gamma (3-4/(8Pi)) gamma (3/(8Pi)-1) gamma (1/(8Pi)-1)))) / ((gamma (4/(8Pi)-2) gamma (2-3/(8Pi)) gamma (2-1/(8Pi))))))))

Input interpretation:

$$615.486129466 \times \frac{1}{2\left(\pi\left(\frac{3}{16\pi}\right)^3 \times \frac{\Gamma\left(3-\frac{4}{8\pi}\right)\Gamma\left(\frac{3}{8\pi}-1\right)\Gamma\left(\frac{1}{8\pi}-1\right)}{\Gamma\left(\frac{4}{8\pi}-2\right)\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)}\right)}$$

$\Gamma(x)$ is the gamma function

Result:

4096.00000000...

$4096 = 64^2$

Alternative representations:

$$\frac{615.4861294660000}{\frac{2\left(\pi\left(\frac{3}{16\pi}\right)^3\left(\Gamma\left(3-\frac{4}{8\pi}\right)\Gamma\left(\frac{3}{8\pi}-1\right)\Gamma\left(\frac{1}{8\pi}-1\right)\right)\right)}{\Gamma\left(\frac{4}{8\pi}-2\right)\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)}} = \frac{615.4861294660000}{\frac{2\pi\left(2-\frac{4}{8\pi}\right)!\left(-2+\frac{1}{8\pi}\right)!\left(-2+\frac{3}{8\pi}\right)!\left(\frac{3}{16\pi}\right)^3}{\left(1-\frac{3}{8\pi}\right)!\left(1-\frac{1}{8\pi}\right)!\left(-3+\frac{4}{8\pi}\right)!}}$$

$$\frac{615.4861294660000}{\frac{2\left(\pi\left(\frac{3}{16\pi}\right)^3\left(\Gamma\left(3-\frac{4}{8\pi}\right)\Gamma\left(\frac{3}{8\pi}-1\right)\Gamma\left(\frac{1}{8\pi}-1\right)\right)\right)}{\Gamma\left(\frac{4}{8\pi}-2\right)\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)}} = \frac{615.4861294660000}{\frac{2\pi\,(1)_{2-\frac{4}{8\pi}}\,(1)_{-2+\frac{1}{8\pi}}\,(1)_{-2+\frac{3}{8\pi}}\left(\frac{3}{16\pi}\right)^3}{(1)_{1-\frac{3}{8\pi}}\,(1)_{1-\frac{1}{8\pi}}\,(1)_{-3+\frac{4}{8\pi}}}}$$

$$\frac{615.4861294660000}{\frac{2\left(\pi\left(\frac{3}{16\pi}\right)^3\left(\Gamma\left(3-\frac{4}{8\pi}\right)\Gamma\left(\frac{3}{8\pi}-1\right)\Gamma\left(\frac{1}{8\pi}-1\right)\right)\right)}{\Gamma\left(\frac{4}{8\pi}-2\right)\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)}} = \frac{615.4861294660000}{\frac{2\pi\, e^{\log\Gamma(3-4/(8\pi))}\, e^{\log\Gamma(-1+1/(8\pi))}\, e^{\log\Gamma(-1+3/(8\pi))}\left(\frac{3}{16\pi}\right)^3}{e^{\log\Gamma(2-3/(8\pi))}\, e^{\log\Gamma(2-1/(8\pi))}\, e^{\log\Gamma(-2+4/(8\pi))}}}$$

sqrt[615.486129466 * 1/(((2(Pi* (3/(16Pi))^3 * (((gamma (3-4/(8Pi)) gamma (3/(8Pi)-1) gamma (1/(8Pi)-1)))) / ((gamma (4/(8Pi)-2) gamma (2-3/(8Pi)) gamma (2-1/(8Pi))))))))]

Input interpretation:

$$\sqrt{615.486129466 \times \frac{1}{2\left(\pi\left(\frac{3}{16\pi}\right)^3 \times \frac{\Gamma\left(3-\frac{4}{8\pi}\right)\Gamma\left(\frac{3}{8\pi}-1\right)\Gamma\left(\frac{1}{8\pi}-1\right)}{\Gamma\left(\frac{4}{8\pi}-2\right)\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)}\right)}}$$

$\Gamma(x)$ is the gamma function

Result:

64.0000000000...

64

All 2nd roots of 4096.00000000:

$64.0000000000\, e^{0} \approx 64.000$ (real, principal root)

$64.0000000000\, e^{i\pi} \approx -64.000$ (real root)

Alternative representations:

$$\sqrt{\frac{615.4861294660000}{\frac{2\left(\pi\left(\frac{3}{16\pi}\right)^3\left(\Gamma\left(3-\frac{4}{8\pi}\right)\Gamma\left(\frac{3}{8\pi}-1\right)\Gamma\left(\frac{1}{8\pi}-1\right)\right)\right)}{\Gamma\left(\frac{4}{8\pi}-2\right)\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)}}} = \sqrt{\frac{615.4861294660000}{\frac{2\pi\left(2-\frac{4}{8\pi}\right)!\left(-2+\frac{1}{8\pi}\right)!\left(-2+\frac{3}{8\pi}\right)!\left(\frac{3}{16\pi}\right)^3}{\left(1-\frac{3}{8\pi}\right)!\left(1-\frac{1}{8\pi}\right)!\left(-3+\frac{4}{8\pi}\right)!}}}$$

$$\sqrt{\frac{615.4861294660000}{\frac{2\left(\pi\left(\frac{3}{16\pi}\right)^3\left(\Gamma\left(3-\frac{4}{8\pi}\right)\Gamma\left(\frac{3}{8\pi}-1\right)\Gamma\left(\frac{1}{8\pi}-1\right)\right)\right)}{\Gamma\left(\frac{4}{8\pi}-2\right)\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)}}} = \sqrt{\frac{615.4861294660000}{\frac{2\pi\,(1)_{2-\frac{4}{8\pi}}\,(1)_{-2+\frac{1}{8\pi}}\,(1)_{-2+\frac{3}{8\pi}}\left(\frac{3}{16\pi}\right)^3}{(1)_{1-\frac{3}{8\pi}}\,(1)_{1-\frac{1}{8\pi}}\,(1)_{-3+\frac{4}{8\pi}}}}}$$

$$\sqrt{\frac{615.4861294660000}{\frac{2\left(\pi\left(\frac{3}{16\pi}\right)^3\left(\Gamma\left(3-\frac{4}{8\pi}\right)\Gamma\left(\frac{3}{8\pi}-1\right)\Gamma\left(\frac{1}{8\pi}-1\right)\right)\right)}{\Gamma\left(\frac{4}{8\pi}-2\right)\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)}}} = \sqrt{\frac{615.4861294660000}{\frac{2\pi\, e^{\log\Gamma(3-4/(8\pi))}\, e^{\log\Gamma(-1+1/(8\pi))}\, e^{\log\Gamma(-1+3/(8\pi))}\left(\frac{3}{16\pi}\right)^3}{e^{\log\Gamma(2-3/(8\pi))}\, e^{\log\Gamma(2-1/(8\pi))}\, e^{\log\Gamma(-2+4/(8\pi))}}}}$$

Series representations:

$$\sqrt{\frac{615.4861294660000}{2\left(\pi\left(\frac{3}{16\pi}\right)^3\left(\Gamma\left(3-\frac{4}{8\pi}\right)\Gamma\left(\frac{3}{8\pi}-1\right)\Gamma\left(\frac{1}{8\pi}-1\right)\right)\right)}{\Gamma\left(\frac{4}{8\pi}-2\right)\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)}}} =$$

$$\sqrt{-1+\frac{46\,685.76270912474\,\pi^2\,\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)\Gamma\left(-2+\frac{1}{2\pi}\right)}{\Gamma\left(3-\frac{1}{2\pi}\right)\Gamma\left(-1+\frac{1}{8\pi}\right)\Gamma\left(-1+\frac{3}{8\pi}\right)}}$$

$$\sum_{k=0}^{\infty}\binom{\frac{1}{2}}{k}\left(-1+\frac{46\,685.76270912474\,\pi^2\,\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)\Gamma\left(-2+\frac{1}{2\pi}\right)}{\Gamma\left(3-\frac{1}{2\pi}\right)\Gamma\left(-1+\frac{1}{8\pi}\right)\Gamma\left(-1+\frac{3}{8\pi}\right)}\right)^{-k}$$

$$\sqrt{\frac{615.4861294660000}{2\left(\pi\left(\frac{3}{16\pi}\right)^3\left(\Gamma\left(3-\frac{4}{8\pi}\right)\Gamma\left(\frac{3}{8\pi}-1\right)\Gamma\left(\frac{1}{8\pi}-1\right)\right)\right)}{\Gamma\left(\frac{4}{8\pi}-2\right)\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)}}} =$$

$$\sqrt{-1+\frac{46\,685.76270912474\,\pi^2\,\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)\Gamma\left(-2+\frac{1}{2\pi}\right)}{\Gamma\left(3-\frac{1}{2\pi}\right)\Gamma\left(-1+\frac{1}{8\pi}\right)\Gamma\left(-1+\frac{3}{8\pi}\right)}}$$

$$\sum_{k=0}^{\infty}\frac{(-1)^k\left(-1+\frac{46685.76270912474\,\pi^2\,\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)\Gamma\left(-2+\frac{1}{2\pi}\right)}{\Gamma\left(3-\frac{1}{2\pi}\right)\Gamma\left(-1+\frac{1}{8\pi}\right)\Gamma\left(-1+\frac{3}{8\pi}\right)}\right)^{-k}\left(-\frac{1}{2}\right)_k}{k!}$$

$$\sqrt{\frac{615.4861294660000}{2\left(\pi\left(\frac{3}{16\pi}\right)^3\left(\Gamma\left(3-\frac{4}{8\pi}\right)\Gamma\left(\frac{3}{8\pi}-1\right)\Gamma\left(\frac{1}{8\pi}-1\right)\right)\right)}{\Gamma\left(\frac{4}{8\pi}-2\right)\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)}}} =$$

$$\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(\frac{46685.76270912474\,\pi^2\,\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)\Gamma\left(-2+\frac{1}{2\pi}\right)}{\Gamma\left(3-\frac{1}{2\pi}\right)\Gamma\left(-1+\frac{1}{8\pi}\right)\Gamma\left(-1+\frac{3}{8\pi}\right)}-z_0\right)^k z_0^{-k}}{k!}$$

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

27*sqrt[615.486129466 * 1/(((2(Pi* (3/(16Pi))^3 * (((gamma (3-4/(8Pi)) gamma (3/(8Pi)-1) gamma (1/(8Pi)-1)))) / ((gamma (4/(8Pi)-2) gamma (2-3/(8Pi)) gamma (2-1/(8Pi))))))))]+1

Input interpretation:

$$27\sqrt{615.486129466\times\frac{1}{2\left(\pi\left(\frac{3}{16\pi}\right)^3\times\frac{\Gamma\left(3-\frac{4}{8\pi}\right)\Gamma\left(\frac{3}{8\pi}-1\right)\Gamma\left(\frac{1}{8\pi}-1\right)}{\Gamma\left(\frac{4}{8\pi}-2\right)\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)}\right)}}+1$$

$\Gamma(x)$ is the gamma function

Result:

1729.00000000...

1729

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)

Note that:

64 * 27 = 1728

Alternative representations:

$$27\sqrt{\frac{615.4861294660000}{2\left(\pi\left(\frac{3}{16\pi}\right)^3\left(\Gamma\left(3-\frac{4}{8\pi}\right)\Gamma\left(\frac{3}{8\pi}-1\right)\Gamma\left(\frac{1}{8\pi}-1\right)\right)\right)}{\Gamma\left(\frac{4}{8\pi}-2\right)\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)}}+1=1+27\sqrt{\frac{615.4861294660000}{2\pi\left(2-\frac{4}{8\pi}\right)!\left(-2+\frac{1}{8\pi}\right)!\left(-2+\frac{3}{8\pi}\right)!\left(\frac{3}{16\pi}\right)^3}{\left(1-\frac{3}{8\pi}\right)!\left(1-\frac{1}{8\pi}\right)!\left(-3+\frac{4}{8\pi}\right)!}}}$$

$$27\sqrt{\frac{615.4861294660000}{2\left(\pi\left(\frac{3}{16\pi}\right)^3\left(\Gamma\left(3-\frac{4}{8\pi}\right)\Gamma\left(\frac{3}{8\pi}-1\right)\Gamma\left(\frac{1}{8\pi}-1\right)\right)\right)}{\Gamma\left(\frac{4}{8\pi}-2\right)\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)}}+1=$$

$$1+27\sqrt{\frac{615.4861294660000}{2\pi\,{}^{(1)}_{2-\frac{4}{8\pi}}\,{}^{(1)}_{-2+\frac{1}{8\pi}}\,{}^{(1)}_{-2+\frac{3}{8\pi}}\left(\frac{3}{16\pi}\right)^3}{{}^{(1)}_{1-\frac{3}{8\pi}}\,{}^{(1)}_{1-\frac{1}{8\pi}}\,{}^{(1)}_{-3+\frac{4}{8\pi}}}}$$

$$27\sqrt{\frac{615.4861294660000}{2\left(\pi\left(\frac{3}{16\pi}\right)^3\left(\Gamma\left(3-\frac{4}{8\pi}\right)\Gamma\left(\frac{3}{8\pi}-1\right)\Gamma\left(\frac{1}{8\pi}-1\right)\right)\right)}{\Gamma\left(\frac{4}{8\pi}-2\right)\Gamma\left(2-\frac{3}{8\pi}\right)\Gamma\left(2-\frac{1}{8\pi}\right)}}+1=$$

$$1+27\sqrt{\frac{615.4861294660000}{2\pi\,e^{\log\Gamma(3-4/(8\pi))}\,e^{\log\Gamma(-1+1/(8\pi))}\,e^{\log\Gamma(-1+3/(8\pi))}\left(\frac{3}{16\pi}\right)^3}{e^{\log\Gamma(2-3/(8\pi))}\,e^{\log\Gamma(2-1/(8\pi))}\,e^{\log\Gamma(-2+4/(8\pi))}}}$$

Series representations:

$$27\sqrt{\frac{615.4861294660000}{\frac{2\left(\pi\left(\frac{3}{16\,\pi}\right)^3\left(\Gamma\left(3-\frac{4}{8\,\pi}\right)\Gamma\left(\frac{3}{8\,\pi}-1\right)\Gamma\left(\frac{1}{8\,\pi}-1\right)\right)\right)}{\Gamma\left(\frac{4}{8\,\pi}-2\right)\Gamma\left(2-\frac{3}{8\,\pi}\right)\Gamma\left(2-\frac{1}{8\,\pi}\right)}}}+1=$$

$$1+27\sqrt{-1+\frac{46\,685.76270912474\,\pi^2\,\Gamma\left(2-\frac{3}{8\,\pi}\right)\Gamma\left(2-\frac{1}{8\,\pi}\right)\Gamma\left(-2+\frac{1}{2\,\pi}\right)}{\Gamma\left(3-\frac{1}{2\,\pi}\right)\Gamma\left(-1+\frac{1}{8\,\pi}\right)\Gamma\left(-1+\frac{3}{8\,\pi}\right)}}$$

$$\sum_{k=0}^{\infty}\binom{\frac{1}{2}}{k}\left(-1+\frac{46\,685.76270912474\,\pi^2\,\Gamma\left(2-\frac{3}{8\,\pi}\right)\Gamma\left(2-\frac{1}{8\,\pi}\right)\Gamma\left(-2+\frac{1}{2\,\pi}\right)}{\Gamma\left(3-\frac{1}{2\,\pi}\right)\Gamma\left(-1+\frac{1}{8\,\pi}\right)\Gamma\left(-1+\frac{3}{8\,\pi}\right)}\right)^{-k}$$

$$27\sqrt{\frac{615.4861294660000}{\frac{2\left(\pi\left(\frac{3}{16\,\pi}\right)^3\left(\Gamma\left(3-\frac{4}{8\,\pi}\right)\Gamma\left(\frac{3}{8\,\pi}-1\right)\Gamma\left(\frac{1}{8\,\pi}-1\right)\right)\right)}{\Gamma\left(\frac{4}{8\,\pi}-2\right)\Gamma\left(2-\frac{3}{8\,\pi}\right)\Gamma\left(2-\frac{1}{8\,\pi}\right)}}}+1=$$

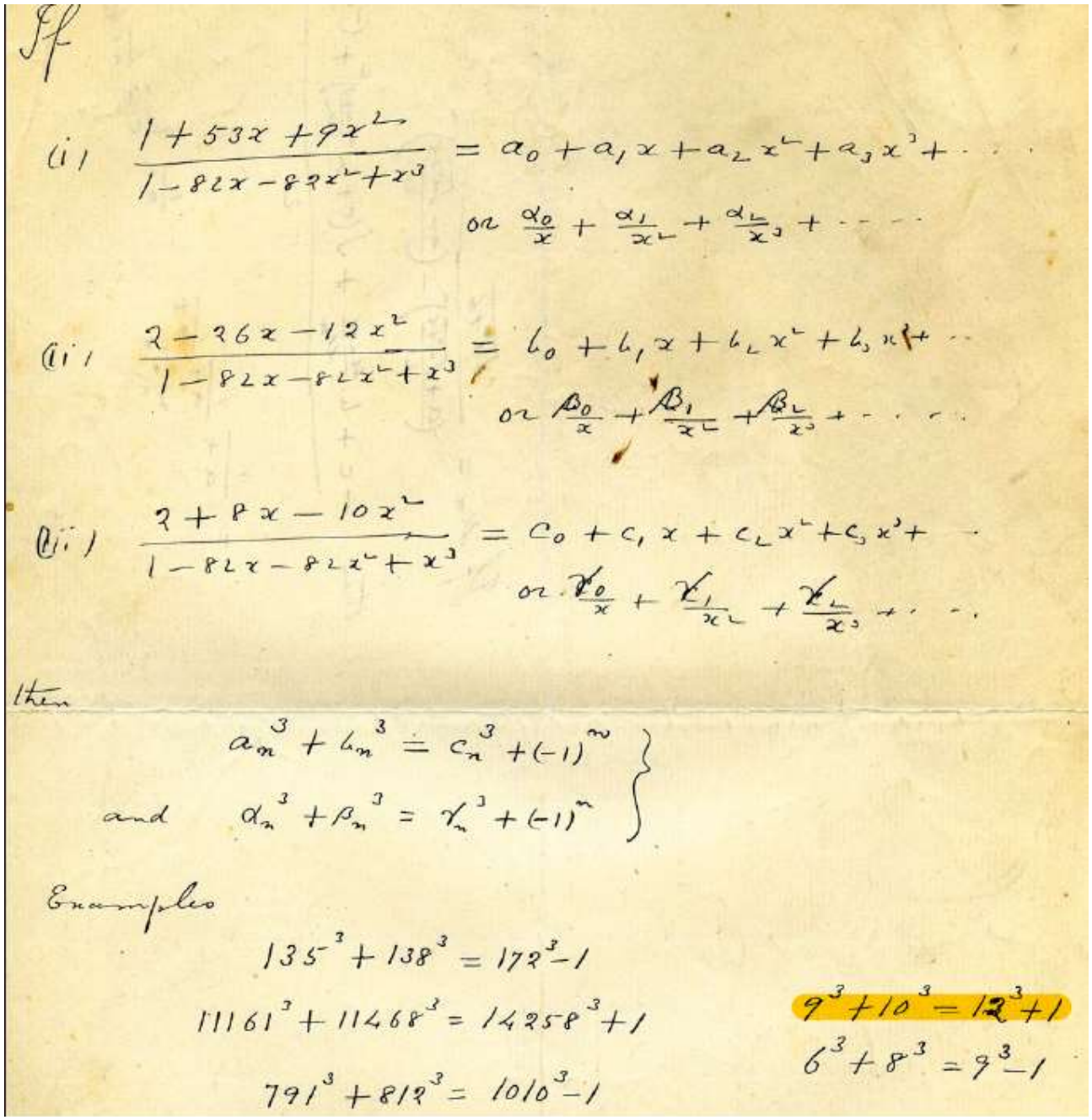
$$1+27\sqrt{-1+\frac{46\,685.76270912474\,\pi^2\,\Gamma\left(2-\frac{3}{8\,\pi}\right)\Gamma\left(2-\frac{1}{8\,\pi}\right)\Gamma\left(-2+\frac{1}{2\,\pi}\right)}{\Gamma\left(3-\frac{1}{2\,\pi}\right)\Gamma\left(-1+\frac{1}{8\,\pi}\right)\Gamma\left(-1+\frac{3}{8\,\pi}\right)}}$$

$$\sum_{k=0}^{\infty}\frac{(-1)^k\left(-1+\frac{46\,685.76270912474\,\pi^2\,\Gamma\left(2-\frac{3}{8\,\pi}\right)\Gamma\left(2-\frac{1}{8\,\pi}\right)\Gamma\left(-2+\frac{1}{2\,\pi}\right)}{\Gamma\left(3-\frac{1}{2\,\pi}\right)\Gamma\left(-1+\frac{1}{8\,\pi}\right)\Gamma\left(-1+\frac{3}{8\,\pi}\right)}\right)^{-k}\left(-\frac{1}{2}\right)_k}{k!}$$

$$27\sqrt{\frac{615.4861294660000}{\frac{2\left(\pi\left(\frac{3}{16\,\pi}\right)^3\left(\Gamma\left(3-\frac{4}{8\,\pi}\right)\Gamma\left(\frac{3}{8\,\pi}-1\right)\Gamma\left(\frac{1}{8\,\pi}-1\right)\right)\right)}{\Gamma\left(\frac{4}{8\,\pi}-2\right)\Gamma\left(2-\frac{3}{8\,\pi}\right)\Gamma\left(2-\frac{1}{8\,\pi}\right)}}}+1=$$

$$1+27\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(\frac{46\,685.76270912474\,\pi^2\,\Gamma\left(2-\frac{3}{8\,\pi}\right)\Gamma\left(2-\frac{1}{8\,\pi}\right)\Gamma\left(-2+\frac{1}{2\,\pi}\right)}{\Gamma\left(3-\frac{1}{2\,\pi}\right)\Gamma\left(-1+\frac{1}{8\,\pi}\right)\Gamma\left(-1+\frac{3}{8\,\pi}\right)}-z_0\right)^k z_0^{-k}}{k!}$$

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



Ramanujan's manuscript. The representations of 1729 as the sum of two cubes appear in the bottom right corner. The equation expressing the near counter examples to Fermat's last theorem appears further up: $\alpha^3 + \beta^3 = \gamma^3 + (-1)^n$. Image courtesy Trinity College library. Click here to see a larger image.

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

DILATON TADPOLE FOR THE OPEN BOSONIC STRING "
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