On some Ramanujan equations: new possible mathematical connections with ϕ, $\zeta(2)$, Hausdorff dimension values, several equations of D-branes, Strings and Higher-Spins

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Abstract

In this paper we have described some Ramanujan equations and obtained new possible mathematical connections with ϕ, $\zeta(2)$, Hausdorff dimension values, several equations of D-branes, Strings and Higher-Spins

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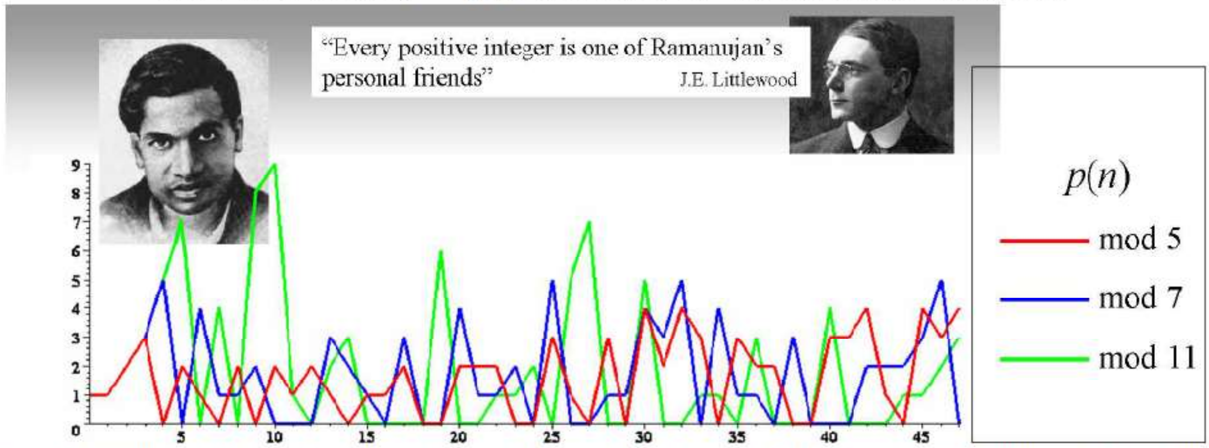
The Ramanujan Partition Congruences *Let n be a non-negative integer and let p(n) denote the number of partitions of n (that is, the number of ways to write n as a sum of positive integers). Then p(n) satisfies the congruence relations:*

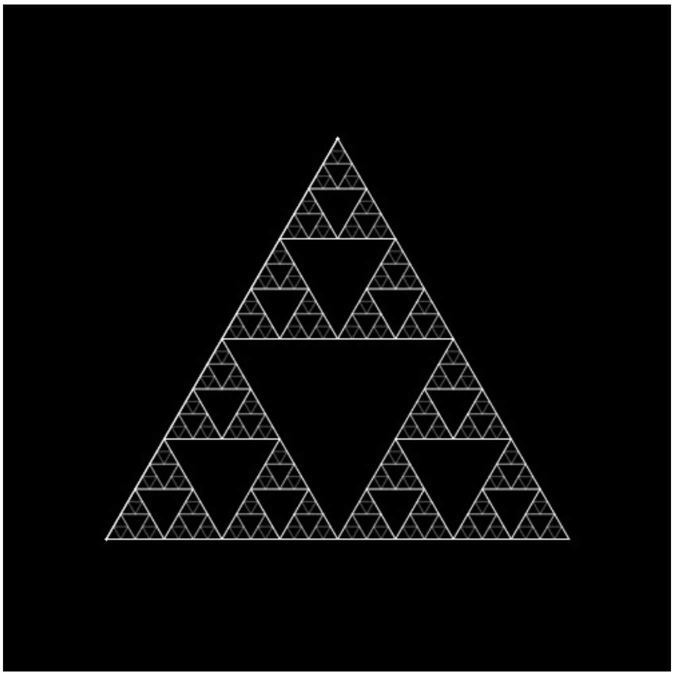
$$p(5t+4) \equiv 0 \pmod 5, \qquad p(7t+5) \equiv 0 \pmod 7, \quad \textit{and} \quad p(11t+6) \equiv 0 \pmod{11}.$$



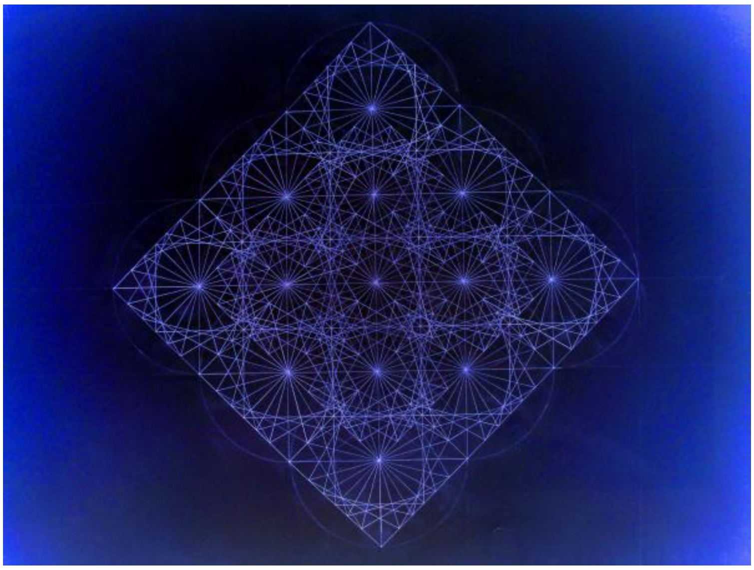
Ramanujan's congruences tell us that, in the set of values of n for which $p(n) \bmod q = 0$, when q is 5, 7 or 11, there is an infinite arithmetic progression of common difference q. Thus we see that, in the above plot, the three graphs touch the horizontal axis at intervals which appear quite irregular but are certainly constrained by this arithmetic progression property. The property extends to all primes $q \geq 5$, a deep result published in 2000 by Ken Ono, but the common differences will not generally be q: the set of values of n for which $p(n) \bmod 31 = 0$, for instance, contains an infinite arithmetic progression whose common difference is not 31 but 31×107^4, and which starts at $n = 30064597$. For $q = 3$, the situation is very different—it is not even known if the values of n for which $p(n) \bmod 3 = 0$ form an infinite set!

Ramanujan published proofs of the congruences for 5 and 7 in 1919. His proof for mod 11 remained unpublished at the time of his death in 1920 and was written up by G.H. Hardy.

https://www.theoremoftheday.org/NumberTheory/Ramanujan/TotDRamanujan.pdf



https://giphy.com/gifs/loop-oc-sierpinsky-EtFMAF8nmOmly https://proteviblog.typepad.com/.a/6a00d8341ef41d53ef016300401303970d-pi



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

From

Notes on Strings and Higher Spins
A. Sagnotti - arXiv:1112.4285v4 [hep-th] 21 Jun 2012

We have that:

$$\mathcal{A}^{(s)} = -\frac{1}{\alpha' s}\left[a\left(\frac{\alpha'}{4}(u-t)+\frac{\alpha'}{2}\sqrt{-ut}\right)+a\left(\frac{\alpha'}{4}(u-t)-\frac{\alpha'}{2}\sqrt{-ut}\right)-a_0\right]\times \quad (3.33)$$
$$\varphi_1(p_1)\,\varphi_2(p_2)\,\varphi_3(p_3)\,\varphi_4(p_4)\ ,$$

This beautiful expression has a number of interesting lessons in store. For one matter, it is a consistent four–scalar amplitude involving the exchange of infinitely many *massless* HS particles. Moreover, the detailed discussion in [53] shows that, in principle, a soft behavior at high energies can be attained working only with (infinitely many) symmetric fields, provided the coupling function tends to zero for large negative real values of its argument. In String Theory the essential singularity of $a(z)$ may be held ultimately responsible for the presence of lower Regge trajectories, since a soft behavior for the conjugate amplitude $\varphi + \bar{\varphi} \to \varphi + \bar{\varphi}$ would also demand that $a(z)$ tend to zero for large positive real arguments. Therefore, as stressed in [53], in the present setting a soft behavior for all conjugate amplitudes would require that the coupling function $a(z)$ tend to zero at infinity in the complex plane. This is a subtle condition, since Liouville's theorem would then require the presence of singularities in the finite plane, which in their turn would signal in general an extended nature for the objects involved. There is clearly more to be understood here, and other intriguing properties will show up in the ensuing discussion.

For:

$$M^2 = -p^2 = \frac{s-1}{\alpha'}$$

$\alpha' = 1.0662$; $s = 2$; $t = 3$; $u = 5$; $\varphi = 8$; $a_0 = 1$; $a = 2$ we obtain:

-x^2 = (2-1)/(1.0662)

Complex solutions:

$x = -0.968458\, i$

$x = 0.968458\, i$

$p_1 = 0.968458i$

-x^2 = (3-1)/(1.0662)

Complex solutions:

$x = -1.36961\, i$

$x = 1.36961\, i$

$p_2 = 1.36961i$

-x^2 = (5-1)/(1.0662)

Complex solutions:

$x = -1.93692\, i$

$x = 1.93692\, i$

$p_3 = 1.93692i$

-x^2 = (8-1)/(1.0662)

Complex solutions:

$x = -2.5623\,i$

$x = 2.5623\,i$

$p_4 = 2.5623i$

For:

$p_1 = 0.968458i$ $p_2 = 1.36961i$ $p_3 = 1.93692i$ $p_4 = 2.5623i$

$\alpha' = 1.0662$; $s = 2$; $t = 3$; $u = 5$; $\varphi = 8$; $a_0 = 1$; $a = 2$

we obtain:

$$\mathcal{A}^{(s)} = -\frac{1}{\alpha' s}\left[a\left(\frac{\alpha'}{4}(u-t)+\frac{\alpha'}{2}\sqrt{-ut}\right)+a\left(\frac{\alpha'}{4}(u-t)-\frac{\alpha'}{2}\sqrt{-ut}\right)-a_0\right]\times \varphi_1(p_1)\,\varphi_2(p_2)\,\varphi_3(p_3)\,\varphi_4(p_4)\;, \quad (3.33)$$

-1/(2*1.0662)*[2((1.0662/4(5-3)+1.0662/2*sqrt(-5*3)))+2(((((1.0662/4(5-3)-1.0662/2*sqrt(-5*3)))-1)))]*8*0.968458*8*1.36961*8*1.93692*8*2.5623

Input interpretation:

$$-\frac{1}{2\times 1.0662}\left(2\left(\frac{1.0662}{4}(5-3)+\frac{1.0662}{2}\sqrt{-5\times 3}\right)+2\left(\left(\frac{1.0662}{4}(5-3)-\frac{1.0662}{2}\sqrt{-5\times 3}\right)-1\right)\right)\times 8\times 0.968458\times 8\times 1.36961\times 8\times 1.93692\times 8\times 2.5623$$

Result:

−1674.16642752366618088583419245920090039392234102419808666...

-1674.1664275….

From which, we obtain:

-(((golden ratio-1/(2*1.0662)*[2((1.0662/4(5-3)+1.0662/2*sqrt(-5*3)))+2(((((1.0662/4(5-3)-1.0662/2*sqrt(-5*3)))-1)))]*8*0.968458*8*1.36961*8*1.93692*8*2.5623)))

Input interpretation:

$$-\left(\phi + \frac{1}{2\times 1.0662}\left(2\left(\frac{1.0662}{4}(5-3) + \frac{1.0662}{2}\sqrt{-5\times 3}\right) + 2\left(\left(\frac{1.0662}{4}(5-3) - \frac{1.0662}{2}\sqrt{-5\times 3}\right) - 1\right)\right) \times 8\times 8\times 1.36961\times 8\times 1.93692\times 8\times 2.5623\times(-0.968458)\right)$$

ϕ is the golden ratio

Result:

1672.55...

1672.55…. result very near to the rest mass of Omega baryon 1672.45

Series representations:

$$-\left(\phi - \frac{1}{2\times 1.0662}\left(2\left(\frac{1}{4}\times 1.0662(5-3) + \frac{1}{2}\times 1.0662\sqrt{-5\times 3}\right) + 2\left(\left(\frac{1}{4}\times 1.0662(5-3) - \frac{1}{2}\times 1.0662\sqrt{-5\times 3}\right) - 1\right)\right) 8 (0.968458\times 8\times 1.36961\times 8\times 1.93692\times 8\times 2.5623)\right) = 1674.17 - \phi$$

$$-\left(\phi - \frac{1}{2\times 1.0662}\left(2\left(\frac{1}{4}\times 1.0662(5-3) + \frac{1}{2}\times 1.0662\sqrt{-5\times 3}\right) + 2\left(\left(\frac{1}{4}\times 1.0662(5-3) - \frac{1}{2}\times 1.0662\sqrt{-5\times 3}\right) - 1\right)\right) 8 (0.968458\times 8\times 1.36961\times 8\times 1.93692\times 8\times 2.5623)\right) = 1674.17 - \phi \text{ for } (x \in \mathbb{R} \text{ and } x < 0)$$

$$-\left(\phi - \frac{1}{2\times 1.0662}\left(2\left(\frac{1}{4}\times 1.0662(5-3) + \frac{1}{2}\times 1.0662\sqrt{-5\times 3}\right) + 2\left(\left(\frac{1}{4}\times 1.0662(5-3) - \frac{1}{2}\times 1.0662\sqrt{-5\times 3}\right) - 1\right)\right) 8 (0.968458\times 8\times 1.36961\times 8\times 1.93692\times 8\times 2.5623)\right) = 1674.17 - \phi \text{ for } (\text{not } (z_0 \in \mathbb{R} \text{ and } -\infty < z_0 \le 0))$$

$\mathbb{R}$ is the set of real numbers

(((-(-1/(2*1.0662)*[2((1.0662/4(5-3)+1.0662/2*sqrt(-5*3)))+2(((((1.0662/4(5-3)-1.0662/2*sqrt(-5*3)))-1)))]*8*0.968458*8*1.36961*8*1.93692*8*2.5623))))^1/15+4/10^3

Input interpretation:

$$\left(-\left(-\frac{1}{2\times 1.0662}\left(2\left(\frac{1.0662}{4}(5-3)+\frac{1.0662}{2}\sqrt{-5\times 3}\right)+2\left(\left(\frac{1.0662}{4}(5-3)-\frac{1.0662}{2}\sqrt{-5\times 3}\right)-1\right)\right)\times 8\times 0.968458\times 8\times 1.36961\times 8\times 1.93692\times 8\times 2.5623\right)\right)\text{^}(1/15)+\frac{4}{10^3}$$

Result:

1.64429...

1.64429…

(((-(-1/(2*1.0662)*[2((1.0662/4(5-3)+1.0662/2*sqrt(-5*3)))+2(((((1.0662/4(5-3)-1.0662/2*sqrt(-5*3)))-1)))]*8*0.968458*8*1.36961*8*1.93692*8*2.5623))))+55

Input interpretation:

$$-\left(-\frac{1}{2\times 1.0662}\left(2\left(\frac{1.0662}{4}(5-3)+\frac{1.0662}{2}\sqrt{-5\times 3}\right)+2\left(\left(\frac{1.0662}{4}(5-3)-\frac{1.0662}{2}\sqrt{-5\times 3}\right)-1\right)\right)\times 8\times 0.968458\times 8\times 1.36961\times 8\times 1.93692\times 8\times 2.5623\right)+55$$

Result:

1729.1664275236661808858341924592009003939223410241980866 62...

1729.1664275236…

(((((((-(-1/(2*1.0662)*[2((1.0662/4(5-3)+1.0662/2*sqrt(-5*3)))+2(((((1.0662/4(5-3)-1.0662/2*sqrt(-5*3)))-1)))]*8*0.968458*8*1.36961*8*1.93692*8*2.5623))))+55))))^1/15-(21+5)1/10^3

Input interpretation:

$$\left(-\left(-\frac{1}{2\times 1.0662}\left(2\left(\frac{1.0662}{4}(5-3)+\frac{1.0662}{2}\sqrt{-5\times 3}\right)+2\left(\left(\frac{1.0662}{4}(5-3)-\frac{1.0662}{2}\sqrt{-5\times 3}\right)-1\right)\right)\times 8\times 0.968458\times 8\times 1.36961\times 8\times 1.93692\times 8\times 2.5623\right)+55\right)\hat{}\,(1/15)-(21+5)\times\frac{1}{10^3}$$

Result:

1.617825776803853976783841673392792431460232738864514207253...

1.6178257768…

(((((((-(-1/(2*1.0662)*[2((1.0662/4(5-3)+1.0662/2*sqrt(-5*3)))+2(((((1.0662/4(5-3)-1.0662/2*sqrt(-5*3)))-1)))]*8*0.968458*8*1.36961*8*1.93692*8*2.5623))))+55))))^1/14+29/10^3

Input interpretation:

$$\left(-\left(-\frac{1}{2\times 1.0662}\left(2\left(\frac{1.0662}{4}(5-3)+\frac{1.0662}{2}\sqrt{-5\times 3}\right)+2\left(\left(\frac{1.0662}{4}(5-3)-\frac{1.0662}{2}\sqrt{-5\times 3}\right)-1\right)\right)\times 8\times 0.968458\times 8\times 1.36961\times 8\times 1.93692\times 8\times 2.5623\right)+55\right)\hat{}\,(1/14)+\frac{29}{10^3}$$

Result:

1.732232975878483506463432770405230571280784640563850540659...

1.732232975878...

Now, we have that:

$$-p_1^2=\frac{n_1-1}{\alpha'}\,,\qquad -p_2^2=\frac{n_2-1}{\alpha'}\,,\qquad -p_3^2=\frac{n_3-1}{\alpha'}\,,\qquad (3.40)$$

For $n_1 = 2$; $n_2 = 3$; $n_3 = 4$; $\alpha' = 1.0662$ and (3.40), we obtain:

sqrt(1/1.0662) sqrt(2/1.0662) sqrt(3/1.0662)

$-p_1 = -0.968458$ $-p_2 = -1.36961$ $-p_3 = -1.67742$ thence:

$p_1 = 0.968458$; $p_2 = 1.36961$; $p_3 = 1.67742$;

for 3.1756941904857.....= $\xi(T)$ we obtain:

$\xi_1 = 10.08503358$; $\xi_2 = 32.02698257$; $\xi_3 = 101.70790247$

now:

y_i denote the locations of the punctures along the real axis and $y_{ij} = y_i - y_j$.

For $y_1 = 1.5$; $y_2 = 2.5$; $y_3 = 3.5$;   we obtain:

$y_{12} = -1$; $y_{13} = -2$; $y_{23} = -1$

Now, we have that:

$$\left|\frac{y_{12}y_{13}}{y_{23}}\right|^{n_1}\left|\frac{y_{12}y_{23}}{y_{13}}\right|^{n_2}\left|\frac{y_{13}y_{23}}{y_{12}}\right|^{n_3} \times \exp\left[\sum_{i \neq j}^{3}\left(\frac{1}{2}\frac{\xi_i \cdot \xi_j}{y_{ij}^2} + \sqrt{2\alpha'}\,\frac{\xi_i \cdot p_j}{y_{ij}}\right)\right] . \qquad (3.41)$$

For: $y_{12} = -1$; $y_{13} = -2$; $y_{23} = -1$; $n_1 = 2$; $n_2 = 3$; $n_3 = 4$; $\alpha' = 1.0662$

$\xi_1 = 10.08503358$; $\xi_2 = 32.02698257$; $\xi_3 = 101.70790247$

$p_1 = 0.968458$; $p_2 = 1.36961$; $p_3 = 1.67742$;

$$\exp\left\{\sqrt{\frac{\alpha'}{2}}\left[\xi_1 \cdot p_{23}\left\langle\frac{y_{23}}{y_{12}y_{13}}\right\rangle + \xi_2 \cdot p_{31}\left\langle\frac{y_{13}}{y_{12}y_{23}}\right\rangle + \xi_3 \cdot p_{12}\left\langle\frac{y_{12}}{y_{13}y_{23}}\right\rangle\right] + \left[\xi_1 \cdot \xi_2 + \xi_1 \cdot \xi_3 + \xi_2 \cdot \xi_3\right]\right\} . \qquad (3.42)$$

exp[(((((sqrt(1.0662/2)*((((10.08503*(1.36961-1.67742)*(-1/2)+32.02698*(1.67742-0.968458)*(-2)+101.707902*(0.968458-1.36961)*(-1/2))))+(10.08503*32.02698+10.08503*101.707902+32.02698*101.707902)))))]

Input interpretation:

$$\exp\left(\sqrt{\frac{1.0662}{2}}\left(\left(\frac{1}{2}\times 10.08503\,(1.36961-1.67742)\times(-1)+32.02698\,(1.67742-0.968458)\times(-2)+\frac{1}{2}\times 101.707902\,(0.968458-1.36961)\times(-1)\right)+(10.08503\times 32.02698+10.08503\times 101.707902+32.02698\times 101.707902)\right)\right)$$

Result:

$1.36574\ldots \times 10^{1453}$

$1.36574\ldots*10^{1453}$

4 * -1/8 * 16 (1.36574 × 10^1453) = scientific notation

Input interpretation:

scientific notation	$\frac{4}{8}\times(-1)\times 16\,(1.36574\times 10^{1453})$

Result:

$-1.09259\ldots\times 10^{1454}$

$-1.09259\ldots*10^{1454}$

$-109.259\ldots\times 10^{1452}$

From the inverse formula:

1/(((4 * -1/8 * 16 (1.36574 × 10^1453)))) = scientific notation

we obtain:

Input interpretation:

scientific notation	$\frac{1}{\frac{4}{8}\times(-1)\times 16\,(1.36574\times 10^{1453})}$

Result:

$-9.15255\ldots \times 10^{-1455}$

-9.15255…*10^-1455

$-9.15255\ldots \times 10^{-1455}$

We observe that, from the Ramanujan formula for the calculation of golden ratio, we obtain:

((((1/(((1/32(-1+sqrt(5))^5+5*(e^((-sqrt(5)*Pi))^5)))-(-9.15254733697482683380438443627630442×10^-1455)))^1/5

Input interpretation:

$$\sqrt[5]{\frac{1}{\left(\frac{1}{32}\left(-1+\sqrt{5}\right)^5+5\,e^{\left(-\sqrt{5}\,\pi\right)^5}\right)--\frac{9.15254733697482683380438443627630442}{10^{1455}}}}$$

Result:

1.6180339887498948482045868343656381177203091798057628621354...

1.6180339887…. = golden ratio

All 5th roots of 11.0901699437...

1.61803398874989484820458683436563811772030917980576286213544862270526046281890244970720720418939113748475408807538689175212663386222353693179318006076672635443338908659593958290563832266131992829026788067520876689250171169620703222104321626954862629631361443814975870122034080588795445474924618569536486444924104432077134494704956584678850987433944221254487706647809158846074998871240076521705751797883416625624940758906970400028121042762177111777805315317141011704666599146697987317613560067087480710131795236894275219484353056783002287856997829778347845878228911097625003026961561700250464338243776486102838312683303724292675263116533924731671112115881863851331620384005222165791286675294654906811317159934323597349498509040947621322298101726107059611645629909816290555208524790352406020172799747175342777592778625619432082750513121815628551222480939471234145170223735805772786160086883829523045926478780178899219902707769038953219681986151437803149

741106926088674296226757560523172777520353613936210767389376455606060592165894667595519004005559089502295309423124823552122124154440064703405657347976639723949499465845788730396230903750339938562102423690251386804145779956981224457471780341731264532204163972321340444494873023154176768937521030687378803441700939544096279558986787232095124268935573097045095956844017555198819218020640529055189349475926007348522821010881946445442223188913192946896220023014437702699230078030852611807545192887705021096809646467519162189552444934868919322 8 e^0 ≈ 1.6180 (real, principal root)

A beautiful and highly precise golden ratio

$$\sqrt[5]{\frac{1}{\left(\frac{1}{32}\left(-1+\sqrt{5}\right)^5+5\,e^{\left(-\sqrt{5}\,\pi\right)^5}\right)+\frac{9.15254733697482683380438443627630442}{10^{1455}}}} =$$

$$= 1.6180339887498948482045868343656381177203091798057628621 35\ldots$$

Now, for $1/\sqrt{2} = \xi(T)$ $n_1 = 2$; $n_2 = 3$; $n_3 = 4$;

we obtain:

$\xi_1 = 0.5$; $\xi_2 = 0.35355339$; $\xi_3 = 0.25$

Now, from:

$$\exp\left\{\sqrt{\frac{\alpha'}{2}}\left[\xi_1\cdot p_{23}\left\langle\frac{y_{23}}{y_{12}y_{13}}\right\rangle+\xi_2\cdot p_{31}\left\langle\frac{y_{13}}{y_{12}y_{23}}\right\rangle+\xi_3\cdot p_{12}\left\langle\frac{y_{12}}{y_{13}y_{23}}\right\rangle\right]+\left[\xi_1\cdot\xi_2+\xi_1\cdot\xi_3+\xi_2\cdot\xi_3\right]\right\}. \quad (3.42)$$

We obtain:

exp[(((((sqrt(1.0662/2)*((((0.5*(1.36961-1.67742)*(-1/2)+0.35355339*(1.67742-0.968458)*(-2)+0.25*(0.968458-1.36961)*(-1/2))))+(0.5*0.35355339+0.5*0.25+0.35355339*0.25)))))]

Input interpretation:

$$\exp\left(\sqrt{\frac{1.0662}{2}}\left(\left(\frac{1}{2}\times 0.5\,(1.36961-1.67742)\times(-1)+0.35355339\,(1.67742-0.968458)\times(-2)+\frac{1}{2}\times 0.25\,(0.968458-1.36961)\times(-1)\right)+(0.5\times 0.35355339+0.5\times 0.25+0.35355339\times 0.25)\right)\right)$$

Result:

1.0117135421999498229627754763529897071760480448427036 23567...

1.0117135421999.....

Thence:

(4 * -1/8 * 16)*exp[(((sqrt(1.0662/2)*((((0.5*(1.36961-1.67742)*(-1/2)+0.35355339*(1.67742-0.968458)*(-2)+0.25*(0.968458-1.36961)*(-1/2))))+(0.5*0.35355339+0.5*0.25+0.35355339*0.25)))))]

Input interpretation:

$$\left(\frac{4}{8}\times(-1)\times 16\right)\exp\left(\sqrt{\frac{1.0662}{2}}\left(\left(\frac{1}{2}\times 0.5\,(1.36961-1.67742)\times(-1)+0.35355339\,(1.67742-0.968458)\times(-2)+\frac{1}{2}\times 0.25\,(0.968458-1.36961)\times(-1)\right)+(0.5\times 0.35355339+0.5\times 0.25+0.35355339\times 0.25)\right)\right)$$

Result:

−8.09371...

-8.09371...

From which:

-1/5* (4 * -1/8 * 16)*exp[(((sqrt(1.0662/2)*(((((0.5*(1.36961-1.67742)*(-1/2)+0.35355339*(1.67742-0.968458)*(-2)+0.25*(0.968458-1.36961)*(-1/2))))+(0.5*0.35355339+0.5*0.25+0.35355339*0.25)))))]

Input interpretation:

$$-\frac{1}{5}\left(\frac{4}{8}\times(-1)\times 16\right)\exp\left(\sqrt{\frac{1.0662}{2}}\left(\left(\frac{1}{2}\times 0.5\,(1.36961-1.67742)\times(-1)+0.35355339\,(1.67742-0.968458)\times(-2)+\frac{1}{2}\times 0.25\,(0.968458-1.36961)\times(-1)\right)+(0.5\times 0.35355339+0.5\times 0.25+0.35355339\times 0.25)\right)\right)$$

Result:

1.618741667519919716740440762164783531481676871748325797708...

1.6187416675199…..

Series representations:

$$\frac{1}{8\times 5}\left((4\,(-1)\,16)\exp\left(\sqrt{\frac{1.0662}{2}}\left(\left(\frac{1}{2}\times 0.5\,(1.36961-1.67742)\,(-1)+0.353553\,(1.67742-0.968458)\,(-2)+\frac{1}{2}\times 0.25\,(0.968458-1.36961)\,(-1)\right)+(0.5\times 0.353553+0.5\times 0.25+0.353553\times 0.25)\right)\right)\right)(-1)=\frac{8}{5}\exp\left(0.0159497\sum_{k=0}^{\infty}\frac{(-1)^k\,(-0.4669)^k\,\left(-\frac{1}{2}\right)_k}{k!}\right)$$

$$\frac{1}{8\times 5}\left((4(-1)16)\exp\left(\sqrt{\frac{1.0662}{2}}\left(\left(\frac{1}{2}\times 0.5(1.36961-1.67742)(-1)+0.353553(1.67742-0.968458)(-2)+\frac{1}{2}\times 0.25(0.968458-1.36961)(-1)\right)+(0.5\times 0.353553+0.5\times 0.25+0.353553\times 0.25)\right)\right)\right)(-1) =$$

$$\frac{8}{5}\exp\left(-\frac{0.00797485\sum_{j=0}^{\infty}\operatorname{Res}_{s=-j}(-0.4669)^{-s}\,\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)}{\sqrt{\pi}}\right)$$

$$\frac{1}{8\times 5}\left((4(-1)16)\exp\left(\sqrt{\frac{1.0662}{2}}\left(\left(\frac{1}{2}\times 0.5(1.36961-1.67742)(-1)+0.353553(1.67742-0.968458)(-2)+\frac{1}{2}\times 0.25(0.968458-1.36961)(-1)\right)+(0.5\times 0.353553+0.5\times 0.25+0.353553\times 0.25)\right)\right)\right)(-1) =$$

$$\frac{8}{5}\exp\left(0.0159497\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(0.5331-z_0)^k z_0^{-k}}{k!}\right)$$

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

and:

27*(((((4 * -1/8 *16)*exp[(((sqrt(1.0662/2)*((((0.5*(1.36961-1.67742)*(-1/2)+0.353553*(1.67742-0.968458)*(-2)+0.25*(0.968458-1.36961)*(-1/2))))+(0.5*0.353553+0.5*0.25+0.353553*0.25)))))]))))^2-29-11

Input interpretation:

$$27\left(\left(\frac{4}{8}\times(-1)\times16\right)\exp\left(\sqrt{\frac{1.0662}{2}}\left(\left(\frac{1}{2}\times0.5\,(1.36961-1.67742)\times(-1)+0.353553\,(1.67742-0.968458)\times(-2)+\frac{1}{2}\times0.25\,(0.968458-1.36961)\times(-1)\right)+(0.5\times0.353553+0.5\times0.25+0.353553\times0.25)\right)\right)\right)^2-29-11$$

Result:

1728.72…

1728.72…

Series representations:

$$27\left(\frac{1}{8}\exp\left(\sqrt{\frac{1.0662}{2}}\left(\left(\frac{1}{2}\times0.5\,(1.36961-1.67742)(-1)+0.353553\,(1.67742-0.968458)(-2)+\frac{1}{2}\times0.25\,(0.968458-1.36961)(-1)\right)+(0.5\times0.353553+0.5\times0.25+0.353553\times0.25)\right)\right)4(-16)\right)^2-29-11=-40+1728\exp^2\left(0.01595\sum_{k=0}^{\infty}\frac{(-1)^k(-0.4669)^k\left(-\frac{1}{2}\right)_k}{k!}\right)$$

$$27\left(\frac{1}{8}\exp\left(\sqrt{\frac{1.0662}{2}}\left(\left(\frac{1}{2}\times0.5\,(1.36961-1.67742)(-1)+0.353553\,(1.67742-0.968458)(-2)+\frac{1}{2}\times0.25\,(0.968458-1.36961)(-1)\right)+(0.5\times0.353553+0.5\times0.25+0.353553\times0.25)\right)\right)4(-16)\right)^2-29-11=-40+1728\exp^2\left(-\frac{0.00797498\sum_{j=0}^{\infty}\operatorname{Res}_{s=-j}(-0.4669)^{-s}\,\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)}{\sqrt{\pi}}\right)$$

$$27\left(\frac{1}{8}\exp\left(\sqrt{\frac{1.0662}{2}}\left(\left(\frac{1}{2}\times 0.5\,(1.36961-1.67742)(-1)+0.353553\,(1.67742-0.968458)(-2)+\frac{1}{2}\times 0.25\,(0.968458-1.36961)(-1)\right)+(0.5\times 0.353553+0.5\times 0.25+0.353553\times 0.25)\right)\right)4(-16)\right)^2-29-11=-40+1728\exp^2\left(0.01595\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(0.5331-z_0)^k z_0^{-k}}{k!}\right)$$

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

We have also:

2*(((((4 * -1/8 *16)exp[(((sqrt(1.0662/2)((((0.5(1.36961-1.67742)(-1/2)+0.353553(1.67742-0.968458)(-2)+0.25(0.968458-1.36961)(-1/2))))+(0.5*0.353553+0.5*0.25+0.353553*0.25)))))]))))^2+8+1/golden ratio

Input interpretation:

$$2\left(\left(\frac{4}{8}\times(-1)\times 16\right)\exp\left(\sqrt{\frac{1.0662}{2}}\left(\left(\frac{1}{2}\times 0.5\,(1.36961-1.67742)\times(-1)+0.353553\,(1.67742-0.968458)\times(-2)+\frac{1}{2}\times 0.25\,(0.968458-1.36961)\times(-1)\right)+(0.5\times 0.353553+0.5\times 0.25+0.353553\times 0.25)\right)\right)\right)^2+8+\frac{1}{\phi}$$

ϕ is the golden ratio

Result:

139.634...

139.634…

Series representations:

$$2\left(\frac{1}{8}\exp\left(\sqrt{\frac{1.0662}{2}}\left(\left(\frac{1}{2}\times 0.5\,(1.36961-1.67742)\,(-1)+0.353553\,(1.67742-0.968458)\,(-2)+\frac{1}{2}\times 0.25\,(0.968458-1.36961)\,(-1)\right)+(0.5\times 0.353553+0.5\times 0.25+0.353553\times 0.25)\right)\right)4\,(-16)\right)^2+8+\frac{1}{\phi}=8+\frac{1}{\phi}+128\exp^2\left(0.01595\sum_{k=0}^{\infty}\frac{(-1)^k\,(-0.4669)^k\left(-\frac{1}{2}\right)_k}{k!}\right)$$

$$2\left(\frac{1}{8}\exp\left(\sqrt{\frac{1.0662}{2}}\left(\left(\frac{1}{2}\times 0.5\,(1.36961-1.67742)\,(-1)+0.353553\,(1.67742-0.968458)\,(-2)+\frac{1}{2}\times 0.25\,(0.968458-1.36961)\,(-1)\right)+(0.5\times 0.353553+0.5\times 0.25+0.353553\times 0.25)\right)\right)4\,(-16)\right)^2+8+\frac{1}{\phi}=8+\frac{1}{\phi}+128\exp^2\left(-\frac{0.00797498\sum_{j=0}^{\infty}\operatorname{Res}_{s=-j}\,(-0.4669)^{-s}\,\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)}{\sqrt{\pi}}\right)$$

$$2\left(\frac{1}{8}\exp\left(\sqrt{\frac{1.0662}{2}}\left(\left(\frac{1}{2}\times 0.5\,(1.36961-1.67742)\,(-1)+0.353553\,(1.67742-0.968458)\,(-2)+\frac{1}{2}\times 0.25\,(0.968458-1.36961)\,(-1)\right)+(0.5\times 0.353553+0.5\times 0.25+0.353553\times 0.25)\right)\right)4\,(-16)\right)^2+8+\frac{1}{\phi}=8+\frac{1}{\phi}+128\exp^2\left(0.01595\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\,(0.5331-z_0)^k\,z_0^{-k}}{k!}\right)$$

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

2*(((((4 * -1/8 *16)exp[(((sqrt(1.0662/2)((((0.5(1.36961-1.67742)(-1/2)+0.353553(1.67742-0.968458)(-2)+0.25(0.968458-1.36961)(-1/2))))+(0.5*0.353553+0.5*0.25+0.353553*0.25))))))])))^2-5-1/golden ratio

Input interpretation:

$$2\left(\left(\frac{4}{8}\times(-1)\times 16\right)\exp\left(\sqrt{\frac{1.0662}{2}}\left(\left(\frac{1}{2}\times 0.5\,(1.36961-1.67742)\times(-1)+0.353553\,(1.67742-0.968458)\times(-2)+\frac{1}{2}\times 0.25\,(0.968458-1.36961)\times(-1)\right)+(0.5\times 0.353553+0.5\times 0.25+0.353553\times 0.25)\right)\right)\right)^2-5-\frac{1}{\phi}$$

ϕ is the golden ratio

Result:

125.398…

125.398…

Series representations:

$$2\left(\frac{1}{8}\exp\left(\sqrt{\frac{1.0662}{2}}\left(\left(\frac{1}{2}\times 0.5\,(1.36961-1.67742)(-1)+0.353553\,(1.67742-0.968458)(-2)+\frac{1}{2}\times 0.25\,(0.968458-1.36961)(-1)\right)+(0.5\times 0.353553+0.5\times 0.25+0.353553\times 0.25)\right)\right)4(-16)\right)^2-5-\frac{1}{\phi}=-5-\frac{1}{\phi}+128\exp^2\left(0.01595\sum_{k=0}^{\infty}\frac{(-1)^k(-0.4669)^k\left(-\frac{1}{2}\right)_k}{k!}\right)$$

$$2\left(\frac{1}{8}\exp\left(\sqrt{\frac{1.0662}{2}}\left(\left(\frac{1}{2}\times 0.5\,(1.36961-1.67742)(-1)+0.353553\,(1.67742-0.968458)(-2)+\frac{1}{2}\times 0.25\,(0.968458-1.36961)(-1)\right)+(0.5\times 0.353553+0.5\times 0.25+0.353553\times 0.25)\right)\right)4(-16)\right)^2-5-\frac{1}{\phi}=-5-\frac{1}{\phi}+128\exp^2\left(-\frac{0.00797498\sum_{j=0}^{\infty}\operatorname{Res}_{s=-j}(-0.4669)^{-s}\,\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)}{\sqrt{\pi}}\right)$$

$$2\left(\frac{1}{8}\exp\left(\sqrt{\frac{1.0662}{2}}\left(\left(\frac{1}{2}\times 0.5\,(1.36961-1.67742)(-1)+0.353553\,(1.67742-0.968458)(-2)+\frac{1}{2}\times 0.25\,(0.968458-1.36961)(-1)\right)+(0.5\times 0.353553+0.5\times 0.25+0.353553\times 0.25)\right)\right)4(-16)\right)^2-5-\frac{1}{\phi}=-5-\frac{1}{\phi}+128\exp^2\left(0.01595\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(0.5331-z_0)^k\,z_0^{-k}}{k!}\right)$$

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

And also:

(89+21+2^0.5)27(((((-8)exp[(((sqrt(1.0662/2)((((0.5(1.36961-1.67742)(-1/2)+0.353553(1.67742-0.968458)(-2)+0.25(0.968458-1.36961)(-1/2))))+(0.5*0.353553+0.5*0.25+0.353553*0.25)))))]))))^2-13^2-7

Input interpretation:

$$\left(89+21+\sqrt{2}\right)\times 27\left(-8\exp\left(\sqrt{\frac{1.0662}{2}}\left(\left(\frac{1}{2}\times 0.5\,(1.36961-1.67742)\times(-1)+0.353553\,(1.67742-0.968458)\times(-2)+\frac{1}{2}\times 0.25\,(0.968458-1.36961)\times(-1)\right)+(0.5\times 0.353553+0.5\times 0.25+0.353553\times 0.25)\right)\right)\right)^2-13^2-7$$

Result:

196884.52201517956545980755931343372002157382387875202518 90...

196884.522015….

196884 is a fundamental number of the following j-invariant

$$j(\tau) = q^{-1} + 744 + 196884q + 21493760q^2 + 864299970q^3 + 20245856256q^4 + \cdots$$

(In mathematics, Felix Klein's j-invariant or j function, regarded as a function of a complex variable τ, is a modular function of weight zero for SL(2, Z) defined on the upper half plane of complex numbers. Several remarkable properties of j have to do with its q expansion (Fourier series expansion), written as a Laurent series in terms of $q = e^{2\pi i\tau}$ (the square of the nome), which begins:

$$j(\tau) = q^{-1} + 744 + 196884q + 21493760q^2 + 864299970q^3 + 20245856256q^4 + \cdots$$

Note that j has a simple pole at the cusp, so its q-expansion has no terms below q^{-1}.

All the Fourier coefficients are integers, which results in several almost integers, notably Ramanujan's constant:

$$e^{\pi\sqrt{163}} \approx 640320^3 + 744.$$

The asymptotic formula for the coefficient of q^n is given by

$$\frac{e^{4\pi\sqrt{n}}}{\sqrt{2}\,n^{3/4}},$$

as can be proved by the Hardy–Littlewood circle method)

Series representations:

$$\left(89+21+\sqrt{2}\right)27\left(-8\exp\left(\sqrt{\frac{1.0662}{2}}\left(\left(\frac{1}{2}(0.5(1.36961-1.67742))(-1)+0.353553(1.67742-0.968458)(-2)+\frac{1}{2}(0.25(0.968458-1.36961))(-1)\right)+(0.5\times 0.353553+0.5\times 0.25+0.353553\times 0.25)\right)\right)^2-13^2-7=-176+1728\left(110+\sqrt{2}\right)\exp^2\left(0.01595\sum_{k=0}^{\infty}\frac{(-1)^k(-0.4669)^k\left(-\frac{1}{2}\right)_k}{k!}\right)$$

$$\left(89+21+\sqrt{2}\right)27\left(-8\exp\left(\sqrt{\frac{1.0662}{2}}\left(\left(\frac{1}{2}(0.5(1.36961-1.67742))(-1)+0.353553(1.67742-0.968458)(-2)+\frac{1}{2}(0.25(0.968458-1.36961))(-1)\right)+(0.5\times 0.353553+0.5\times 0.25+0.353553\times 0.25)\right)\right)^2-13^2-7=-176+1728\left(110+\sqrt{2}\right)\exp^2\left(-\frac{0.00797498\sum_{j=0}^{\infty}\operatorname{Res}_{s=-j}(-0.4669)^{-s}\,\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)}{\sqrt{\pi}}\right)$$

$$\left(89+21+\sqrt{2}\right)27 \left(-8\exp\left(\sqrt{\frac{1.0662}{2}}\left(\left(\frac{1}{2}(0.5(1.36961-1.67742))(-1)+0.353553(1.67742-0.968458)(-2)+\frac{1}{2}(0.25(0.968458-1.36961))(-1)\right)+(0.5\times 0.353553+0.5\times 0.25+0.353553\times 0.25)\right)\right)\right)^2 -$$

$$13^2-7=-176+1728\left(110+\sqrt{2}\right)\exp^2\left(0.01595\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(0.5331-z_0)^k z_0^{-k}}{k!}\right)$$

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

Now, we know that:

sqrt((det(4+5))) = Sqrt[Det[{9}]]

Input interpretation:

$\sqrt{|(4+5)|} = \sqrt{|(9)|}$

$|m|$ is the determinant

Result:

True

From

Highly Effective Actions

John H. Schwarz - arXiv:1311.0305v2 [hep-th] 22 Nov 2013

We have that:

normalization. The metric becomes

$$ds^2 = g_{MN}dx^M dx^N = R^2\left(c_3\,\phi^2 dx\cdot dx + \phi^{-2}d\phi\cdot d\phi\right). \quad (3)$$

where $x^M = (x^\mu, \phi^I)$, $g_{\mu\nu} = c_3 R^2\phi^2\eta_{\mu\nu}$, $g_{IJ} = R^2\phi^{\ -2}\delta_{IJ}$. In these coordinates $\phi = \infty$ is the boundary of AdS and $\phi = 0$ is the Poincaré-patch horizon.

We have the following M2-brane action:

$$S = S_1 + S_2 = -\frac{\sqrt{2N}}{\pi} c_2^{3/2} \int \phi^6 \left[\sqrt{-\det\left(\eta_{\mu\nu} + \frac{\partial_\mu \phi^I \partial_\nu \phi^I}{c_2 \phi^6}\right)} - 1 \right] d^3x.$$

(42)

Or:

$$S = S_1 + S_2 = -\frac{\sqrt{2kN}}{\pi} c_2^{3/2} \int \Phi^6 \left[\sqrt{-\det\left(\eta_{\mu\nu} + \frac{\mathrm{Re}\left[D_\mu \Phi^A D_\nu \overline{\Phi}_A\right]}{c_2 \Phi^6}\right)} - 1 \right] d^3x.$$

(50)

Now, we take the following Ramanujan expression: (from: "**Modular equations and approximations to π**" – *Srinivasa Ramanujan* - Quarterly Journal of Mathematics, XLV, 1914, 350 – 372)

$$G_{445} = \sqrt{(2+\sqrt{5})} \left(\frac{21+\sqrt{445}}{2}\right)^{\frac{1}{4}} \sqrt{\left\{\left(\frac{13+\sqrt{89}}{8}\right) + \sqrt{\left(\frac{5+\sqrt{89}}{8}\right)}\right\}},$$

That is:

sqrt(2+5^0.5) (1/2(21+sqrt445))^0.25 [sqrt(((((13+89^0.5)/8)+((5+89^0.5)/8)^1/2)))]

Input:

$$\sqrt{2+\sqrt{5}} \left(\frac{1}{2}\left(21+\sqrt{445}\right)\right)^{0.25} \sqrt{\frac{1}{8}\left(13+\sqrt{89}\right)+\sqrt{\frac{1}{8}\left(5+\sqrt{89}\right)}}$$

Result:

8.97787...

8.97787...

If we place:

$$\left(-\frac{\sqrt{2N}}{\pi}c_2^{3/2}\right)=\left(\sqrt{(2+\sqrt{5})}\left(\frac{21+\sqrt{445}}{2}\right)^{\frac{1}{4}}\right)$$

And:

$$\left\{\left[\sqrt{-\det\left(\eta_{\mu\nu}+\frac{\partial_\mu\phi^I\partial_\nu\phi^I}{c_2\phi^6}\right)}-1\right]\right\}=\left[\sqrt{\left\{\left(\frac{13+\sqrt{89}}{8}\right)+\sqrt{\left(\frac{5+\sqrt{89}}{8}\right)}\right\}}\right]$$

For $\phi = 3$

We have:

(-1/Pi) * sqrt(2+5^0.5) (1/2(21+sqrt445))^0.25 integrate[3^6 * sqrt(((((13+89^0.5)/8)+((5+89^0.5)/8)^1/2)))] d^3x

Input:

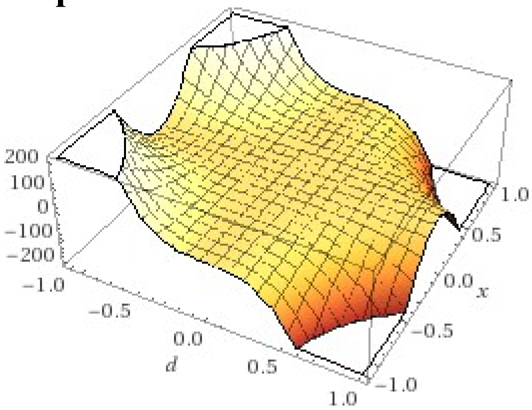
$$-\frac{\sqrt{2+\sqrt{5}}}{\pi}\left(\frac{1}{2}\left(21+\sqrt{445}\right)\right)^{0.25}\int\left(3^6\sqrt{\frac{1}{8}\left(13+\sqrt{89}\right)+\sqrt{\frac{1}{8}\left(5+\sqrt{89}\right)}}\right)d^3\,x\,dx$$

Result:

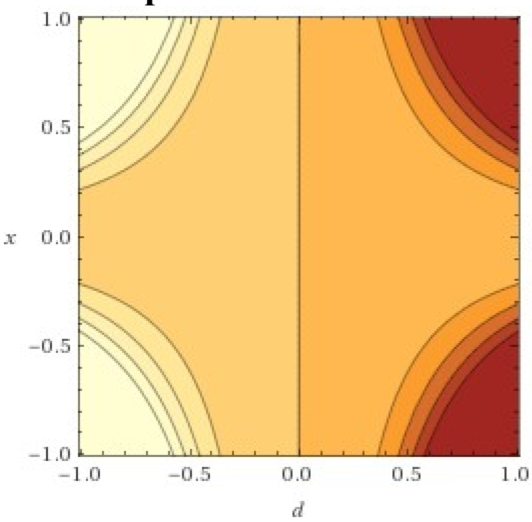
$-1041.65\,d^3\,x^2$

$-1041.65\,d^3x^2$

3D plot:



Contour plot:



Alternate form assuming d and x are real:

$0 - 1041.65\, d^3\, x^2$

Indefinite integral assuming all variables are real:

$-347.216\, d^3\, x^3 + \text{constant}$

Thence, we obtain:

$$S = S_1 + S_2 = -\frac{\sqrt{2}N}{\pi} c_2^{3/2} \int \phi^6 \left[\sqrt{-\det\left(\eta_{\mu\nu} + \frac{\partial_\mu \phi^I \partial_\nu \phi^I}{c_2 \phi^6}\right)} - 1\right] d^3x.$$

⇒

$$-\frac{\sqrt{2+\sqrt{5}}}{\pi}\left(\frac{1}{2}\left(21+\sqrt{445}\right)\right)^{0.25} \int\left(3^6 \sqrt{\frac{1}{8}\left(13+\sqrt{89}\right)+\sqrt{\frac{1}{8}\left(5+\sqrt{89}\right)}}\right) d^3\, x\, dx$$

⇒

$= -1041.65\, d^3\, x^2$

From which for $d^3x^2 = 1$:

-1041.65 + 29-7

Input interpretation:

$-1041.65 + 29 - 7$

Result:

-1019.65

-1019.65 result practically equal to the rest mass of Phi meson 1019.445

We have also:

((((-1/Pi) * sqrt(2+5^0.5) (1/2(21+sqrt445))^0.25 integrate[3^6 * sqrt(((((13+89^0.5)/8)+((5+89^0.5)/8)^1/2)))] d^3x)))^1/14

Input:

$$\left(-\frac{\sqrt{2+\sqrt{5}}}{\pi}\left(\frac{1}{2}\left(21+\sqrt{445}\right)\right)^{0.25}\int\left(3^6\sqrt{\frac{1}{8}\left(13+\sqrt{89}\right)+\sqrt{\frac{1}{8}\left(5+\sqrt{89}\right)}}\right)d^3\,x\,dx\right)\hat{}\,(1/14)$$

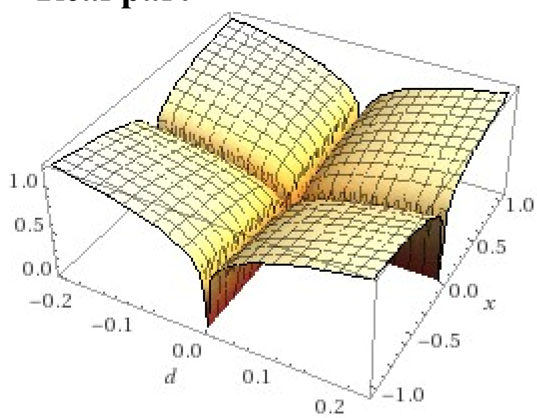
Result:

$1.64267\sqrt[14]{-d^3\,x^2}$

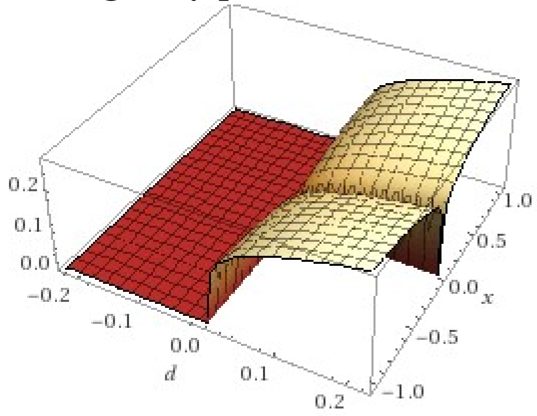
$1.64267\sqrt[14]{-d^3x^2}$

3D plots:

Real part

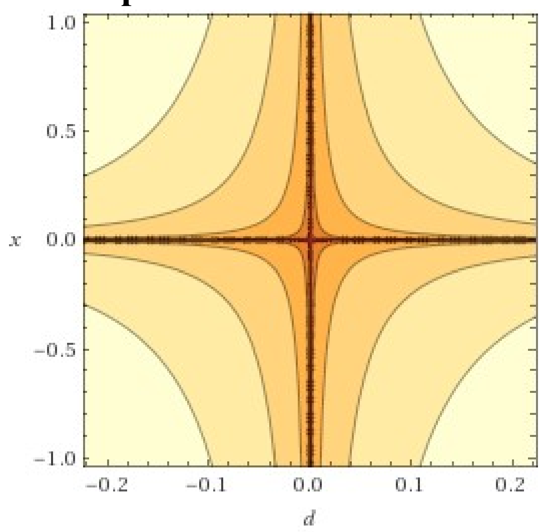


Imaginary part

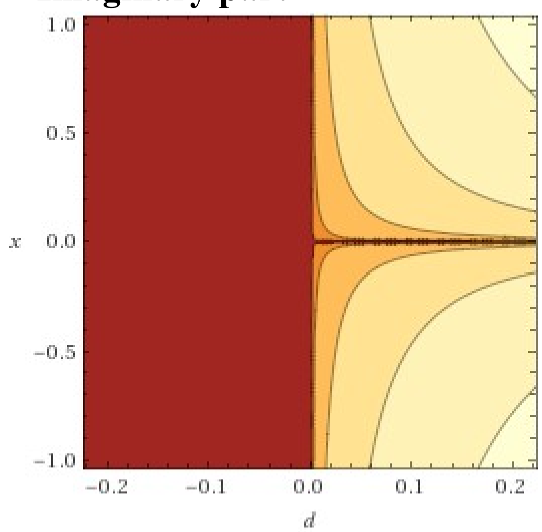


Contour plots:

Real part



Imaginary part



Alternate form assuming d and x are positive:

$(1.60149 + 0.365529\, i)\, d^{3/14} \sqrt[7]{x}$

Series expansion of the integral at x = 0:

$1.64267 \sqrt[14]{-d^3 x^2} + O(x^9)$

(generalized Puiseux series)

Series expansion of the integral at x = ∞:

$1.64267 \sqrt[14]{-d^3 x^2} + O\left(\left(\frac{1}{x}\right)^9\right)$

(generalized Puiseux series)

Indefinite integral assuming all variables are real:

$1.43734\, x \sqrt[14]{-d^3 x^2}$ + constant

From

$1.64267 \sqrt[14]{-d^3 x^2}$

for $-d^3x^2 = 1$, we obtain:

Input interpretation:

$1.64267 \sqrt[14]{1}$

Result:

1.64267

1.64267

And:

1.64267 (1)^(1/14) - 24/10^3

Input interpretation:

$1.64267 \sqrt[14]{1} - \frac{24}{10^3}$

Result:

1.61867

1.61867

From the Ramanujan equation, we have also:

(1/Pi) * sqrt(2+5^0.5) (1/2(21+sqrt445))^0.25 [3^6 * sqrt(((((13+89^0.5)/8)+((5+89^0.5)/8)^1/2)))]+29

Input:

$$\left(\frac{1}{\pi}\sqrt{2+\sqrt{5}}\right)\left(\frac{1}{2}\left(21+\sqrt{445}\right)\right)^{0.25}\left(3^6\sqrt{\frac{1}{8}\left(13+\sqrt{89}\right)+\sqrt{\frac{1}{8}\left(5+\sqrt{89}\right)}}\right)+29$$

Result:

2112.295893853245430978590043362107201707418689932981155914...

2112.29589385….. result practically equal to the rest mass of strange D meson 2112.1

Series representations:

$$\frac{\left(\left(\frac{1}{2}\left(21+\sqrt{445}\right)\right)^{0.25}\left(3^6\sqrt{\frac{1}{8}\left(13+\sqrt{89}\right)+\sqrt{\frac{1}{8}\left(5+\sqrt{89}\right)}}\right)\right)\sqrt{2+\sqrt{5}}}{\pi}+29 =$$
$$\frac{1}{\pi}613.013\left(0.0473073\,\pi+\sqrt{1+\sqrt{5}}\,\sqrt{-1+\frac{1}{2}\sqrt{\frac{1}{2}\left(5+\sqrt{89}\right)}+\frac{1}{8}\left(13+\sqrt{89}\right)}\left(21+\sqrt{444}\sum_{k=0}^{\infty}444^{-k}\binom{\frac{1}{2}}{k}\right)^{0.25}\sum_{k_1=0}^{\infty}\sum_{k_2=0}^{\infty}\left(1+\sqrt{5}\right)^{-k_1}\left(-1+\frac{1}{2}\sqrt{\frac{1}{2}\left(5+\sqrt{89}\right)}+\frac{1}{8}\left(13+\sqrt{89}\right)\right)^{-k_2}\binom{\frac{1}{2}}{k_1}\binom{\frac{1}{2}}{k_2}\right)$$

$$\frac{\left(\left(\frac{1}{2}\left(21+\sqrt{445}\right)\right)^{0.25}\left(3^6\sqrt{\frac{1}{8}\left(13+\sqrt{89}\right)+\sqrt{\frac{1}{8}\left(5+\sqrt{89}\right)}}\right)\right)\sqrt{2+\sqrt{5}}}{\pi}+29 =$$
$$\frac{1}{\pi}613.013\left(0.0473073\,\pi+\sqrt{1+\sqrt{5}}\,\sqrt{-1+\frac{1}{2}\sqrt{\frac{1}{2}\left(5+\sqrt{89}\right)}+\frac{1}{8}\left(13+\sqrt{89}\right)}\left(21+\sqrt{444}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{444}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)^{0.25}\sum_{k_1=0}^{\infty}\sum_{k_2=0}^{\infty}\frac{1}{k_1!\,k_2!}(-1)^{k_1+k_2}\left(1+\sqrt{5}\right)^{-k_1}\left(-1+\frac{1}{2}\sqrt{\frac{1}{2}\left(5+\sqrt{89}\right)}+\frac{1}{8}\left(13+\sqrt{89}\right)\right)^{-k_2}\left(-\frac{1}{2}\right)_{k_1}\left(-\frac{1}{2}\right)_{k_2}\right)$$

$$\frac{\left(\left(\frac{1}{2}\left(21+\sqrt{445}\right)\right)^{0.25}\left(3^6\sqrt{\frac{1}{8}\left(13+\sqrt{89}\right)+\sqrt{\frac{1}{8}\left(5+\sqrt{89}\right)}}\right)\right)\sqrt{2+\sqrt{5}}}{\pi}+29=$$

$$\frac{1}{\pi}\,613.013\left(0.0473073\,\pi+\sqrt{z_0}^{\,2}\left(21+\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(445-z_0)^k z_0^{-k}}{k!}\right)^{0.25}\sum_{k_1=0}^{\infty}\sum_{k_2=0}^{\infty}\frac{1}{k_1!\,k_2!}(-1)^{k_1+k_2}\left(-\frac{1}{2}\right)_{k_1}\left(-\frac{1}{2}\right)_{k_2}\left(2+\sqrt{5}-z_0\right)^{k_1}\left(\frac{1}{2}\sqrt{\frac{1}{2}\left(5+\sqrt{89}\right)}+\frac{1}{8}\left(13+\sqrt{89}\right)-z_0\right)^{k_2}z_0^{-k_1-k_2}\right)$$

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

and the following integrals:

integrate (((1/Pi) * sqrt(2+5^0.5) (1/2(21+sqrt445))^0.25 (3^6 * sqrt(((((13+89^0.5)/8)+((5+89^0.5)/8)^1/2))))))x

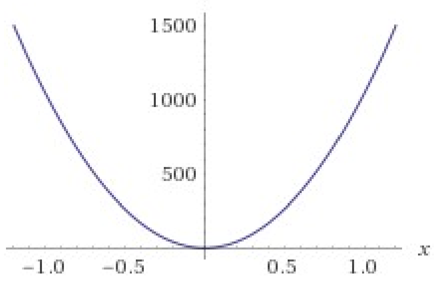
Indefinite integral:

$$\int\frac{\left(\sqrt{2+\sqrt{5}}\left(\frac{1}{2}\left(21+\sqrt{445}\right)\right)^{0.25}\left(3^6\sqrt{\frac{1}{8}\left(13+\sqrt{89}\right)+\sqrt{\frac{1}{8}\left(5+\sqrt{89}\right)}}\right)\right)x}{\pi}\,dx=$$

$1041.65\,x^2$ + constant

1041.65

Plot of the integral:



(x from −1.2 to 1.2)

Alternate form assuming x is real:

$1041.65\,x^2+0$ + constant

Definite integral after subtraction of diverging parts:

$$\int_0^\infty (2083.3\,x - 2083.3\,x)\,dx = 0$$

integrate (((1/Pi) * sqrt(2+5^0.5) (1/2(21+sqrt445))^0.25 (3^6 * sqrt(((((13+89^0.5)/8)+((5+89^0.5)/8)^1/2))))))x x,[-0.59, -1/5]

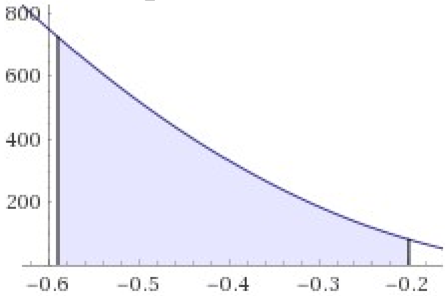
Definite integral:

$$\int_{-0.59}^{-\frac{1}{5}} \frac{\left(\sqrt{2+\sqrt{5}}\ \left(\frac{1}{2}\left(21+\sqrt{445}\right)\right)^{0.25}\left(3^6\sqrt{\frac{1}{8}\left(13+\sqrt{89}\right)+\sqrt{\frac{1}{8}\left(5+\sqrt{89}\right)}}\right)\right)x\,x}{\pi}\,dx =$$
137.066

137.066

This result is very near to the inverse of fine-structure constant 137,035

Visual representation of the integral:



Indefinite integral:

$$\int \frac{\left(\sqrt{2+\sqrt{5}}\ \left(\frac{1}{2}\left(21+\sqrt{445}\right)\right)^{0.25}\left(3^6\sqrt{\frac{1}{8}\left(13+\sqrt{89}\right)+\sqrt{\frac{1}{8}\left(5+\sqrt{89}\right)}}\right)\right)x\,x}{\pi}\,dx =$$
$694.432\,x^3$ + constant

integrate (((1/Pi) * sqrt(2+5^0.5) (1/2(21+sqrt445))^0.25 (3^6 * sqrt(((((13+89^0.5)/8)+((5+89^0.5)/8)^1/2))))))x x,[-0.573, -1/5]

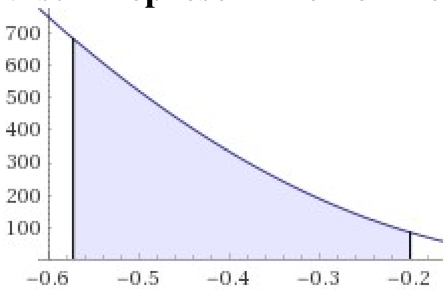
Definite integral:

$$\int_{-0.573}^{-\frac{1}{5}} \frac{\left(\sqrt{2+\sqrt{5}}\,\left(\frac{1}{2}\left(21+\sqrt{445}\right)\right)^{0.25}\left(3^6\sqrt{\frac{1}{8}\left(13+\sqrt{89}\right)+\sqrt{\frac{1}{8}\left(5+\sqrt{89}\right)}}\right)\right)x\,x}{\pi}\,dx =$$

$$125.09$$

125.09

Visual representation of the integral:



Indefinite integral:

$$\int \frac{\left(\sqrt{2+\sqrt{5}}\,\left(\frac{1}{2}\left(21+\sqrt{445}\right)\right)^{0.25}\left(3^6\sqrt{\frac{1}{8}\left(13+\sqrt{89}\right)+\sqrt{\frac{1}{8}\left(5+\sqrt{89}\right)}}\right)\right)x\,x}{\pi}\,dx =$$

$$694.432\,x^3 + \text{constant}$$

integrate (((1/Pi) * sqrt(2+5^0.5) (1/2(21+sqrt445))^0.25 (3^6 * sqrt(((((13+89^0.5)/8)+((5+89^0.5)/8)^1/2))))))x x,[-0.593, -1/5]

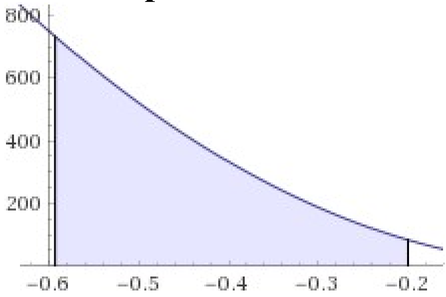
Definite integral:

$$\int_{-0.593}^{-\frac{1}{5}} \frac{\left(\sqrt{2+\sqrt{5}}\,\left(\frac{1}{2}\left(21+\sqrt{445}\right)\right)^{0.25}\left(3^6\sqrt{\frac{1}{8}\left(13+\sqrt{89}\right)+\sqrt{\frac{1}{8}\left(5+\sqrt{89}\right)}}\right)\right)x\,x}{\pi}\,dx =$$

$$139.253$$

139.253

Visual representation of the integral:



Indefinite integral:

$$\int \frac{\left(\sqrt{2+\sqrt{5}}\,\left(\frac{1}{2}\left(21+\sqrt{445}\right)\right)^{0.25}\left(3^6\sqrt{\frac{1}{8}\left(13+\sqrt{89}\right)+\sqrt{\frac{1}{8}\left(5+\sqrt{89}\right)}}\right)\right)x\,x}{\pi}\,dx =$$

$694.432\,x^3$ + constant

27*(1/2)*(((integrate (((1/Pi) * sqrt(2+5^0.5) (1/2(21+sqrt445))^0.25 (3^6 * sqrt(((((13+89^0.5)/8)+((5+89^0.5)/8)^1/2))))))x x,[-0.57733, -1/5])))

Definite integral:

$$\frac{27}{2}\int_{-0.57733}^{-\frac{1}{5}} 2083.3\,x^2\,dx = 1729.$$

1729

Now, we take the following action:

$$S = -\frac{k}{\pi}\sqrt{2\lambda}c_2^{3/2}\int \Phi^6\left[\sqrt{-G}\sqrt{1+\frac{(B\mid W)^2}{c_2\Phi^4}}-1\right]d^3x. \qquad (58)$$

For $\Phi^6 = 3^6$ and from the following Ramanujan equation:

$$G_{505}^2 = (2+\sqrt{5})\sqrt{\left\{\left(\frac{1+\sqrt{5}}{2}\right)(10+\sqrt{101})\right\}} \times \left\{\left(\frac{5\sqrt{5}+\sqrt{101}}{4}\right)+\sqrt{\left(\frac{105+\sqrt{505}}{8}\right)}\right\},$$

We place:

$$\left(-\frac{k}{\pi}\sqrt{2\lambda}c_2^{3/2}\right) = \left[\left\{\left(\frac{5\sqrt{5}+\sqrt{101}}{4}\right)+\sqrt{\left(\frac{105+\sqrt{505}}{8}\right)}\right\}\right]$$

$$\left\{\left[\sqrt{-G}\sqrt{1+\frac{(B+W)^2}{c_2\Phi^4}}-1\right]\right\} = \left[(2+\sqrt{5})\sqrt{\left\{\left(\frac{1+\sqrt{5}}{2}\right)(10+\sqrt{101})\right\}}\right]$$

Thence, we obtain:

$$G_{505}^2 = (2+\sqrt{5})\sqrt{\left\{\left(\frac{1+\sqrt{5}}{2}\right)(10+\sqrt{101})\right\}} \times \left\{\left(\frac{5\sqrt{5}+\sqrt{101}}{4}\right)+\sqrt{\left(\frac{105+\sqrt{505}}{8}\right)}\right\},$$

(2+sqrt5) sqrt[(((1+sqrt5)/2)*(10+sqrt101))))]
[1/4(5sqrt5+sqrt101)+(1/8(105+sqrt505))^0.5]

Input:

$$\left(2+\sqrt{5}\right)\sqrt{\left(\frac{1}{2}\left(1+\sqrt{5}\right)\right)\left(10+\sqrt{101}\right)}\left(\frac{1}{4}\left(5\sqrt{5}+\sqrt{101}\right)+\sqrt{\frac{1}{8}\left(105+\sqrt{505}\right)}\right)$$

Exact result:

$$\left(2+\sqrt{5}\right)\sqrt{\frac{1}{2}\left(1+\sqrt{5}\right)\left(10+\sqrt{101}\right)}\left(\frac{1}{4}\left(5\sqrt{5}+\sqrt{101}\right)+\frac{1}{2}\sqrt{\frac{1}{2}\left(105+\sqrt{505}\right)}\right)$$

Decimal approximation:

224.36895935132763918399413635761729391464432800073649303 81...

224.36895935….

Alternate forms:

$$\sqrt{\text{root of } 256x^8 - 13134080x^7 + 12406662784x^6 + 566469885440x^5 + 8970692383216x^4 + 59000758979200x^3 + 133454526025384x^2 - 21580568998020x + 63001502001 \text{ near } x = 50341.4}$$

$$\frac{1}{4}\left(2+\sqrt{5}\right)\sqrt{\frac{1}{2}\left(1+\sqrt{5}\right)\left(10+\sqrt{101}\right)}\left(5\sqrt{5}+\sqrt{101}\right)+\frac{1}{4}\left(2+\sqrt{5}\right)\sqrt{\left(1+\sqrt{5}\right)\left(10+\sqrt{101}\right)\left(105+\sqrt{505}\right)}$$

$$\frac{25}{4}\sqrt{\frac{1}{2}\left(1+\sqrt{5}\right)\left(10+\sqrt{101}\right)}+\frac{5}{2}\sqrt{\frac{5}{2}\left(1+\sqrt{5}\right)\left(10+\sqrt{101}\right)}+\frac{1}{2}\sqrt{\frac{101}{2}\left(1+\sqrt{5}\right)\left(10+\sqrt{101}\right)}+\frac{1}{4}\sqrt{\frac{505}{2}\left(1+\sqrt{5}\right)\left(10+\sqrt{101}\right)}+\frac{1}{2}\sqrt{\left(1+\sqrt{5}\right)\left(10+\sqrt{101}\right)\left(105+\sqrt{505}\right)}+\frac{1}{4}\sqrt{5\left(1+\sqrt{5}\right)\left(10+\sqrt{101}\right)\left(105+\sqrt{505}\right)}$$

Minimal polynomial:

$$256x^{16} - 13134080x^{14} + 12406662784x^{12} + 566469885440x^{10} + 8970692383216x^8 + 59000758979200x^6 + 133454526025384x^4 - 21580568998020x^2 + 63001502001$$

Thence, from

$$S = \frac{k}{\pi}\sqrt{2\lambda}c_2^{3/2}\int\Phi^6\left[\sqrt{C}\sqrt{1+\frac{(B+W)^2}{c_2\Phi^4}}-1\right]d^3x. \tag{58}$$

we obtain:

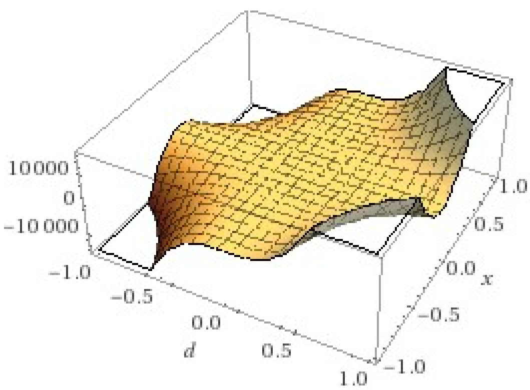
[1/4(5sqrt5+sqrt101)+(1/8(105+sqrt505))^0.5] integrate (((3^6*((((2+sqrt5) sqrt[(((1+sqrt5)/2)*(10+sqrt101))))] d^3x)))

Indefinite integral:

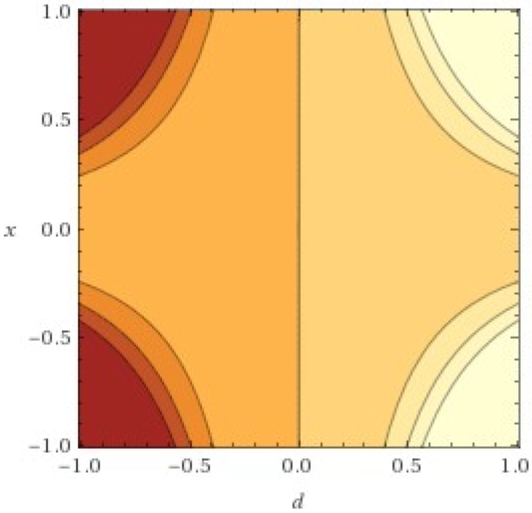
$$\frac{1}{4}\left(5\sqrt{5}+\sqrt{101}\right)+\sqrt{\frac{1}{8}\left(105+\sqrt{505}\right)}\int 3^6\left(\left(2+\sqrt{5}\right)\sqrt{\frac{1}{2}\left(1+\sqrt{5}\right)\left(10+\sqrt{101}\right)}\,(d^3\,x)\right)dx = \left(\frac{1}{4}\left(5\sqrt{5}+\sqrt{101}\right)+\frac{1}{2}\sqrt{\frac{1}{2}\left(105+\sqrt{505}\right)}\right)\left(\frac{729}{2}\sqrt{\frac{5}{2}\left(1+\sqrt{5}\right)\left(10+\sqrt{101}\right)}\,d^3\,x^2+729\sqrt{\frac{1}{2}\left(1+\sqrt{5}\right)\left(10+\sqrt{101}\right)}\,d^3\,x^2\right)+\text{constant}$$

$$\frac{1}{4}\left(5\sqrt{5}+\sqrt{101}\right)+\sqrt{\frac{1}{8}\left(105+\sqrt{505}\right)}\int 3^6\left(\left(2+\sqrt{5}\right)\sqrt{\frac{1}{2}\left(1+\sqrt{5}\right)\left(10+\sqrt{101}\right)}\,(d^3\,x)\right)dx \approx \text{constant}+81\,782.5\,d^3\,x^2$$

3D plot:



Contour plot:



Alternate forms:

$$\frac{729}{8} d^3 x^2 \Big(5\sqrt{5}\ \left(\text{root of } x^8 - 100x^6 - 10075x^4 - 2500x^2 + 625 \text{ near } x = 12.736\right) + \sqrt{101}\ \left(\text{root of } x^8 - 100x^6 - 10075x^4 - 2500x^2 + 625 \text{ near } x = 12.736\right) + 2\ \left(\text{root of } x^4 - 105x^2 + 2630 \text{ near } x = 7.98349\right) \left(\text{root of } x^8 - 100x^6 - 10075x^4 - 2500x^2 + 625 \text{ near } x = 12.736\right) + 10\sqrt{5}\ \left(\text{root of } x^8 - 20x^6 - 403x^4 - 20x^2 + 1 \text{ near } x = 5.69573\right) + 2\sqrt{101}\ \left(\text{root of } x^8 - 20x^6 - 403x^4 - 20x^2 + 1 \text{ near } x = 5.69573\right) + 4\ \left(\text{root of } x^4 - 105x^2 + 2630 \text{ near } x = 7.98349\right) \left(\text{root of } x^8 - 20x^6 - 403x^4 - 20x^2 + 1 \text{ near } x = 5.69573\right)\Big)$$

$$\frac{1}{2}\sqrt{109 + 3\sqrt{505} + \sqrt{2\left(7195 + 319\sqrt{505}\right)}} \left(\frac{729}{2}\sqrt{\frac{5}{2}\left(10 + \sqrt{505} + \sqrt{601 + 20\sqrt{505}}\right)}\, d^3 x^2 + 729\sqrt{\frac{1}{2}\left(10 + \sqrt{505} + \sqrt{601 + 20\sqrt{505}}\right)}\, d^3 x^2\right)$$

$$\left(\frac{18225}{8}\sqrt{\frac{1}{2}\left(1+\sqrt{5}\right)\left(10+\sqrt{101}\right)}+\frac{3645}{4}\sqrt{\frac{5}{2}\left(1+\sqrt{5}\right)\left(10+\sqrt{101}\right)}+\frac{729}{4}\sqrt{\frac{101}{2}\left(1+\sqrt{5}\right)\left(10+\sqrt{101}\right)}+\frac{729}{8}\sqrt{\frac{505}{2}\left(1+\sqrt{5}\right)\left(10+\sqrt{101}\right)}+\frac{729}{4}\sqrt{\left(1+\sqrt{5}\right)\left(10+\sqrt{101}\right)\left(105+\sqrt{505}\right)}+\frac{729}{8}\sqrt{5\left(1+\sqrt{5}\right)\left(10+\sqrt{101}\right)\left(105+\sqrt{505}\right)}\right)d^3x^2$$

Expanded form:

$$\frac{729}{8}\sqrt{5\left(1+\sqrt{5}\right)\left(10+\sqrt{101}\right)\left(105+\sqrt{505}\right)}\,d^3x^2+\frac{729}{4}\sqrt{\left(1+\sqrt{5}\right)\left(10+\sqrt{101}\right)\left(105+\sqrt{505}\right)}\,d^3x^2+\frac{729}{8}\sqrt{\frac{505}{2}\left(1+\sqrt{5}\right)\left(10+\sqrt{101}\right)}\,d^3x^2+\frac{729}{4}\sqrt{\frac{101}{2}\left(1+\sqrt{5}\right)\left(10+\sqrt{101}\right)}\,d^3x^2+\frac{3645}{4}\sqrt{\frac{5}{2}\left(1+\sqrt{5}\right)\left(10+\sqrt{101}\right)}\,d^3x^2+\frac{18225}{8}\sqrt{\frac{1}{2}\left(1+\sqrt{5}\right)\left(10+\sqrt{101}\right)}\,d^3x^2$$

$$\int 3^6\left(\left(2+\sqrt{5}\right)\sqrt{\frac{1}{2}\left(1+\sqrt{5}\right)\left(10+\sqrt{101}\right)}\left(d^3x\right)\right)^{\frac{1}{4}\left(5\sqrt{5}+\sqrt{101}\right)+\sqrt{\frac{1}{8}\left(105+\sqrt{505}\right)}}dx\approx \text{constant}+81782.5\,d^3x^2$$

For $d^3x^2 = 1$ we have 81782.5 from which:

1/2(81782.5 1^3 1^2)^1/2 - 3 - 1/golden ratio

Input interpretation:

$$\frac{1}{2}\sqrt{81782.5\times1^3\times1^2}-3-\frac{1}{\phi}$$

ϕ is the golden ratio

Result:

139.370...

139.370...

1/2(81782.5 1^3 1^2)^1/2 - 18 + 1/golden ratio

Input interpretation:

$$\frac{1}{2}\sqrt{81782.5\times1^3\times1^2}-18+\frac{1}{\phi}$$

ϕ is the golden ratio

Result:

125.606...

125.606...

(29+11)(81782.5 1^3 1^2)^1/3-7

Input interpretation:

$$(29+11)\sqrt[3]{81782.5\times1^3\times1^2}-7$$

Result:

1729.25...

1729.25...

((((29+11)(81782.5 1^3 1^2)^1/3-7)))^1/15

Input interpretation:

$$\sqrt[15]{(29+11)\sqrt[3]{81782.5\times1^3\times1^2}-7}$$

Result:

1.6438314...

1.6438314...

((((29+11)(81782.5 1^3 1^2)^1/3-7)))^1/15 - (21+5)1/10^3

Input interpretation:

$$\sqrt[15]{(29+11)\sqrt[3]{81782.5\times1^3\times1^2}-7}-(21+5)\times\frac{1}{10^3}$$

Result:

1.617831375556369990605637987758175537760660200497815486646...

1.6178313755....

Now, we have that:

We can now write down the D2-brane action. Using the fact that the S_2 cancels the potential term as in the previous examples, it is in static gauge

$$S = -T_{D2}\int\left(\sqrt{-\det(c_2R^2\Phi^4G_{\mu\nu}+2\pi\alpha' F_{\mu\nu})}-(c_2R^2\Phi^4)^{3/2}\right)d^3\sigma$$

$$--\beta\int\Phi^6\left(\sqrt{-\det(G_{\mu\nu}+\gamma\Phi^{-4}F_{\mu\nu})}-1\right)d^3\sigma, \tag{70}$$

where

$$\beta = T_{D2}R^3c_2^{3/2} = \frac{\sqrt{2kN}}{\pi}c_2^{3/2}, \tag{71}$$

$$\gamma = \frac{2\pi\alpha'}{c_2R^2} = (2c_2\sqrt{2\lambda})^{-1}. \tag{72}$$

Thence:

$$-\frac{\sqrt{2kN}}{\pi}c_2^{3/2}\int\Phi^6\left(\sqrt{-det\left(G_{\mu\nu}+\left(2c_2\sqrt{2\lambda}\right)^{-1}\Phi^{-4}\mathrm{F}_{\mu\nu}\right)}-1\right)d^3\sigma$$

From:

EVALUATIONS OF RAMANUJAN-WEBER CLASS INVARIANT g_n

S.Bhargava, K. R. Vasuki and B. R. Srivatsa Kumar - Journal of the Indian Mathematical Society · January 2005

From the following Ramanujan equation:

$$g_{150} = \frac{1}{\sqrt{2}}\left(\sqrt{3+\sqrt{10}+\sqrt{15+6\sqrt{10}}}\right)\left(153+108\sqrt{2}+68\sqrt{5}+48\sqrt{10}\right)^{1/12}$$
$$= g_{2/75}^{-1},$$

1/(sqrt2) (3+sqrt10+(15+6sqrt10)^0.5)^0.5 (153+108sqrt2+68sqrt5+48sqrt10)^(1/12)

Input:

$$\frac{1}{\sqrt{2}}\sqrt{3+\sqrt{10}+\sqrt{15+6\sqrt{10}}}\ \sqrt[12]{153+108\sqrt{2}+68\sqrt{5}+48\sqrt{10}}$$

Exact result:

$$\frac{\sqrt[12]{153+108\sqrt{2}+68\sqrt{5}+48\sqrt{10}}\ \sqrt{3+\sqrt{10}+\sqrt{15+6\sqrt{10}}}}{\sqrt{2}}$$

Decimal approximation:

4.178283400961411420166164170011182182228761017151663703062...

4.17828340096141….

Alternate forms:

$$\frac{\sqrt[12]{(17+12\sqrt{2})(9+4\sqrt{5})}\ \sqrt{3+\sqrt{10}+\sqrt{3(5+2\sqrt{10})}}}{\sqrt{2}}$$

$$\sqrt[12]{\left(17+12\sqrt{2}\right)\left(9+4\sqrt{5}\right)}\ \left(\text{root of } x^8-6x^6+x^4-6x^2+1 \text{ near } x=2.44857\right)$$

$$\sqrt[6]{\left(\begin{array}{l}\text{root of } x^8-5312x^7-47500x^6-20672x^5-\\ \quad 96986x^4+20672x^3-47500x^2+5312x+1 \text{ near } x=5320.93\end{array}\right)}$$

Minimal polynomial:

$$x^{48}-5312x^{42}-47500x^{36}-20672x^{30}-96986x^{24}+20672x^{18}-47500x^{12}+5312x^6+1$$

We have:

$$-\frac{\sqrt{2kN}}{\pi}c_2^{3/2}\int\Phi^6\left(\sqrt{-det\left(G_{\mu\nu}+\left(2c_2\sqrt{2\lambda}\right)^{-1}\Phi^{-4}\mathrm{F}_{\mu\nu}\right)}-1\right)d^3\sigma$$

and

$$\frac{1}{\sqrt{2}}\left(\sqrt{3+\sqrt{10}+\sqrt{15+6\sqrt{10}}}\right)\left(153+108\sqrt{2}+68\sqrt{5}+48\sqrt{10}\right)^{1/12}$$

For $\Phi^6 = 3^6$:

$$-\frac{\sqrt{2kN}}{\pi}c_2^{3/2} = \left[\left(153+108\sqrt{2}+68\sqrt{5}+48\sqrt{10}\right)^{1/12}\right]$$

and

$$\left(\sqrt{-det\left(G_{\mu\nu}+\left(2c_2\sqrt{2\lambda}\right)^{-1}\Phi^{-4}F_{\mu\nu}\right)}-1\right) = \left[\frac{1}{\sqrt{2}}\left(\sqrt{3+\sqrt{10}+\sqrt{15+6\sqrt{10}}}\right)\right]$$

We obtain:

(153+108sqrt2+68sqrt5+48sqrt10)^(1/12) integrate (((3^6* 1/(sqrt2) (3+sqrt10+(15+6sqrt10)^0.5)^0.5))) d^3x

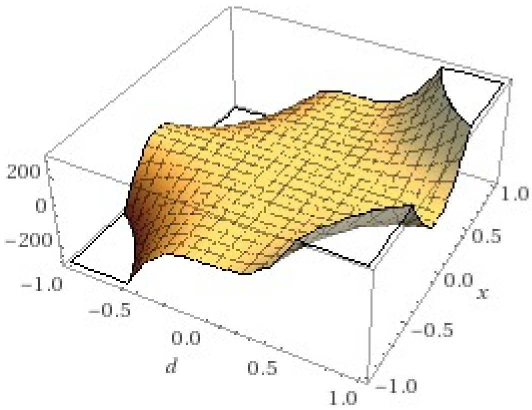
Indefinite integral:

$$\sqrt[12]{153+108\sqrt{2}+68\sqrt{5}+48\sqrt{10}}\int\frac{\left(3^6\sqrt{3+\sqrt{10}+\sqrt{15+6\sqrt{10}}}\right)d^3x}{\sqrt{2}}dx = \frac{729\sqrt[12]{153+108\sqrt{2}+68\sqrt{5}+48\sqrt{10}}\sqrt{3+\sqrt{10}+\sqrt{15+6\sqrt{10}}}\,d^3x^2}{2\sqrt{2}} + \text{constant}$$

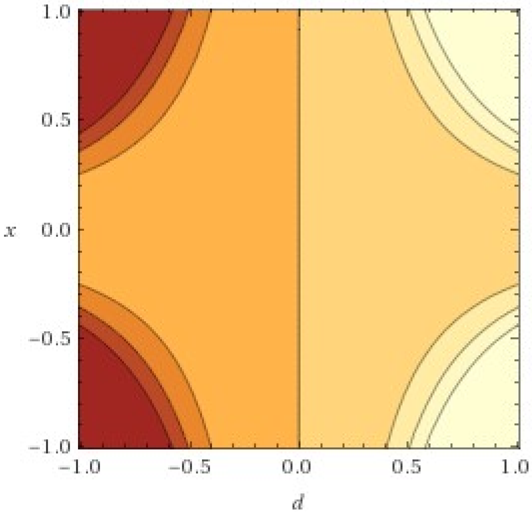
$$\sqrt[12]{153+108\sqrt{2}+68\sqrt{5}+48\sqrt{10}}\int\frac{\left(3^6\sqrt{3+\sqrt{10}+\sqrt{15+6\sqrt{10}}}\right)d^3x}{\sqrt{2}}dx \approx \text{constant} + 1522.98\,d^3x^2$$

$1522.98\ d^3x^2$

3D plot:



Contour plot:



Alternate forms:

$$\frac{1}{2\sqrt{2}} 729\, d^3\, x^2 \boxed{\text{root of } x^8 - 12x^6 + 4x^4 - 48x^2 + 16 \text{ near } x = 3.4628}$$

$$\boxed{\text{root of } x^{24} - 24x^{18} - 18x^{12} + 24x^6 + 1 \text{ near } x = 1.70642}$$

$$d^3 x^2 \left(\text{root of } 281474976710656 x^8 - 3506574369893230388560985176670208 x^7 - 73536641850318627670151037429483821363217039360000 x^6 - 75054696988529395903882931151513769526041996964390948950568337408 x^5 - 825828037897990045929305256479771177452485124065506802083983772997660525100793856 x^4 + 412808154658675113967693922681635443180773440117883143894744528867755017674471233799111802093568 x^3 - 2224562321243144311876112455106783177302429844730985153043557150308345812289991460382251329760312091071477760000 x^2 + 583437352317940006279395672040834245643638941625605357836171715454697574565388094987536906861535009011250226055423805472780288 x + 257585468675898878692697829828877177271726674504483915376269783622959081398497813668497925744699677646719926465210614240928932342001644161 \text{ near } x = 1.24788 \times 10^{19}\right)^{(1/6)}$$

$$\frac{\frac{1}{2\times 2^{3/4}} 729 \sqrt[12]{153 + 108\sqrt{2} + 68\sqrt{5} + 48\sqrt{10}}}{\sqrt{\sqrt{15 - 3 i \sqrt{15}} + \sqrt{2}\left(3 + \sqrt{10} + \sqrt{\frac{3}{2} i \left(\sqrt{15} + -5 i\right)}\right)}} d^3 x^2$$

$$\sqrt[12]{153 + 108\sqrt{2} + 68\sqrt{5} + 48\sqrt{10}} \int \frac{\left(3^6 \sqrt{3 + \sqrt{10} + \sqrt{15 + 6\sqrt{10}}}\right) d^3 x}{\sqrt{2}} dx \approx$$

$$\text{constant} + 1522.98\, d^3 x^2$$

For $d^3x^2 = 1$, we obtain:

(1522.98 + 11 + golden ratio)

Input interpretation:

$1522.98 + 11 + \phi$

ϕ is the golden ratio

Result:

1535.60...

1535.60.... result practically equal to the rest mass of Xi baryon 1535 and:

Pi(1522.98)^1/2+golden ratio^2

Input interpretation:

$$\pi\sqrt{1522.98}+\phi^2$$

ϕ is the golden ratio

Result:

125.220...

125.220....

Series representations:

$$\pi\sqrt{1522.98}+\phi^2=\phi^2+156.102\sum_{k=0}^{\infty}\frac{(-1)^k}{1+2k}$$

$$\pi\sqrt{1522.98}+\phi^2=-78.0508+\phi^2+78.0508\sum_{k=1}^{\infty}\frac{2^k}{\binom{2k}{k}}$$

$$\pi\sqrt{1522.98}+\phi^2=\phi^2+39.0254\sum_{k=0}^{\infty}\frac{2^{-k}(-6+50k)}{\binom{3k}{k}}$$

Integral representations:

$$\pi\sqrt{1522.98}+\phi^2=\phi^2+78.0508\int_0^{\infty}\frac{1}{1+t^2}\,dt$$

$$\pi\sqrt{1522.98}+\phi^2=\phi^2+156.102\int_0^1\sqrt{1-t^2}\,dt$$

$$\pi\sqrt{1522.98}+\phi^2=\phi^2+78.0508\int_0^{\infty}\frac{\sin(t)}{t}\,dt$$

Pi(1522.98)^1/2+11+2Pi

Input interpretation:

$\pi \sqrt{1522.98} + 11 + 2\pi$

Result:

139.885...

139.885…

Series representations:

$$\pi \sqrt{1522.98} + 11 + 2\pi = 11 + 164.102 \sum_{k=0}^{\infty} \frac{(-1)^k}{1+2k}$$

$$\pi \sqrt{1522.98} + 11 + 2\pi = -71.0508 + 82.0508 \sum_{k=1}^{\infty} \frac{2^k}{\binom{2k}{k}}$$

$$\pi \sqrt{1522.98} + 11 + 2\pi = 11 + 41.0254 \sum_{k=0}^{\infty} \frac{2^{-k}(-6+50k)}{\binom{3k}{k}}$$

Integral representations:

$$\pi \sqrt{1522.98} + 11 + 2\pi = 11 + 82.0508 \int_0^{\infty} \frac{1}{1+t^2}\,dt$$

$$\pi \sqrt{1522.98} + 11 + 2\pi = 11 + 164.102 \int_0^1 \sqrt{1-t^2}\,dt$$

$$\pi \sqrt{1522.98} + 11 + 2\pi = 11 + 82.0508 \int_0^{\infty} \frac{\sin(t)}{t}\,dt$$

27*1/2(((Pi(1522.98)^1/2+golden ratio^2+e)))+2

Input interpretation:

$27 \times \frac{1}{2}\left(\pi \sqrt{1522.98} + \phi^2 + e\right) + 2$

ϕ is the golden ratio

Result:

1729.17...

1729.17…

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".*

Series representations:

$$\frac{27}{2}\left(\pi\sqrt{1522.98}+\phi^2+e\right)+2=2+13.5\,\phi^2+\sum_{k=0}^{\infty}\left(\frac{2107.37\,(-1)^k}{1+2k}+\frac{13.5}{k!}\right)$$

$$\frac{27}{2}\left(\pi\sqrt{1522.98}+\phi^2+e\right)+2=2+13.5\,\phi^2+\sum_{k=0}^{\infty}\left(\frac{2107.37\,(-1)^k}{1+2k}+\frac{13.5\,(-1+k)^2}{k!}\right)$$

$$\frac{27}{2}\left(\pi\sqrt{1522.98}+\phi^2+e\right)+2=$$
$$13.5\left(0.148148+\phi^2+\sum_{k=0}^{\infty}\frac{1}{k!}+39.0254\times\sum_{k=1}^{\infty}4^{-k}\left(-1+3^k\right)\zeta(1+k)\right)$$

Integral representations:

$$\frac{27}{2}\left(\pi\sqrt{1522.98}+\phi^2+e\right)+2=2+13.5\,e+13.5\,\phi^2+1053.69\int_0^{\infty}\frac{1}{1+t^2}\,dt$$

$$\frac{27}{2}\left(\pi\sqrt{1522.98}+\phi^2+e\right)+2=2+13.5\,e+13.5\,\phi^2+2107.37\int_0^{1}\sqrt{1-t^2}\,dt$$

$$\frac{27}{2}\left(\pi\sqrt{1522.98}+\phi^2+e\right)+2 = 2+13.5\,e+13.5\,\phi^2+1053.69\int_0^\infty \frac{\sin(t)}{t}\,dt$$

[27*1/2(((Pi(1522.98)^1/2+golden ratio^2+e)))+2]^1/15

Input interpretation:

$$\sqrt[15]{27\times\frac{1}{2}\left(\pi\sqrt{1522.98}+\phi^2+e\right)+2}$$

ϕ is the golden ratio

Result:

1.643825689193214052768304981334113708898747733392234069634...

1.64382568919......

[27*1/2(((Pi(1522.98)^1/2+golden ratio^2+e)))+2]^1/15 - (21+5)1/10^3

Input interpretation:

$$\sqrt[15]{27\times\frac{1}{2}\left(\pi\sqrt{1522.98}+\phi^2+e\right)+2}-(21+5)\times\frac{1}{10^3}$$

ϕ is the golden ratio

Result:

1.617825689193214052768304981334113708898747733392234069634...

1.61782568919…..

Series representations:

$$\sqrt[15]{\frac{27}{2}\left(\pi\sqrt{1522.98}+\phi^2+e\right)+2}-\frac{21+5}{10^3} = -0.026+1.18948\sqrt[15]{0.148148+\phi^2+\sum_{k=0}^{\infty}\left(\frac{156.102\,(-1)^k}{1+2k}+\frac{1}{k!}\right)}$$

$$\sqrt[15]{\frac{27}{2}\left(\pi\sqrt{1522.98}+\phi^2+e\right)+2}-\frac{21+5}{10^3}=$$
$$-0.026+1.18948\sqrt[15]{0.148148+\phi^2+\sum_{k=0}^{\infty}\left(\frac{156.102\,(-1)^k}{1+2k}+\frac{(-1+k)^2}{k!}\right)}$$

$$\sqrt[15]{\frac{27}{2}\left(\pi\sqrt{1522.98}+\phi^2+e\right)+2}-\frac{21+5}{10^3}=1.18948$$
$$\left(-0.0218584+\sqrt[15]{0.148148+\phi^2+\sum_{k=0}^{\infty}\frac{1}{k!}+39.0254\times\sum_{k=1}^{\infty}4^{-k}\left(-1+3^k\right)\zeta(1+k)}\right)$$

Integral representations:

$$\sqrt[15]{\frac{27}{2}\left(\pi\sqrt{1522.98}+\phi^2+e\right)+2}-\frac{21+5}{10^3}=$$
$$-0.026+1.18948\sqrt[15]{0.148148+e+\phi^2+78.0508\int_0^{\infty}\frac{1}{1+t^2}\,dt}$$

$$\sqrt[15]{\frac{27}{2}\left(\pi\sqrt{1522.98}+\phi^2+e\right)+2}-\frac{21+5}{10^3}=$$
$$-0.026+1.18948\sqrt[15]{0.148148+e+\phi^2+156.102\int_0^{1}\sqrt{1-t^2}\,dt}$$

$$\sqrt[15]{\frac{27}{2}\left(\pi\sqrt{1522.98}+\phi^2+e\right)+2}-\frac{21+5}{10^3}=$$
$$-0.026+1.18948\sqrt[15]{0.148148+e+\phi^2+78.0508\int_0^{\infty}\frac{\sin(t)}{t}\,dt}$$

[27*1/2(((Pi(1522.98)^1/2+golden ratio^2+e)))+2]^1/14+29/10^3

Input interpretation:

$$\sqrt[14]{27\times\frac{1}{2}\left(\pi\sqrt{1522.98}+\phi^2+e\right)+2}+\frac{29}{10^3}$$

ϕ is the golden ratio

Result:

1.732233...

1.732233…

Series representations:

$$\sqrt[14]{\frac{27}{2}\left(\pi\sqrt{1522.98}+\phi^2+e\right)+2}+\frac{29}{10^3}=$$
$$0.029+1.20431\sqrt[14]{0.148148+\phi^2+\sum_{k=0}^{\infty}\left(\frac{156.102\,(-1)^k}{1+2k}+\frac{1}{k!}\right)}$$

$$\sqrt[14]{\frac{27}{2}\left(\pi\sqrt{1522.98}+\phi^2+e\right)+2}+\frac{29}{10^3}=$$
$$0.029+1.20431\sqrt[14]{0.148148+\phi^2+\sum_{k=0}^{\infty}\left(\frac{156.102\,(-1)^k}{1+2k}+\frac{(-1+k)^2}{k!}\right)}$$

$$\sqrt[14]{\frac{27}{2}\left(\pi\sqrt{1522.98}+\phi^2+e\right)+2}+\frac{29}{10^3}=1.20431$$
$$\left(0.0240802+\sqrt[14]{0.148148+\phi^2+\sum_{k=0}^{\infty}\frac{1}{k!}+39.0254\times\sum_{k=1}^{\infty}4^{-k}\left(-1+3^k\right)\zeta(1+k)}\right)$$

Integral representations:

$$\sqrt[14]{\frac{27}{2}\left(\pi\sqrt{1522.98}+\phi^2+e\right)+2}+\frac{29}{10^3}=$$
$$0.029+1.20431\sqrt[14]{0.148148+e+\phi^2+78.0508\int_0^{\infty}\frac{1}{1+t^2}\,dt}$$

$$\sqrt[14]{\frac{27}{2}\left(\pi\sqrt{1522.98}+\phi^2+e\right)+2}+\frac{29}{10^3}=$$
$$0.029+1.20431\sqrt[14]{0.148148+e+\phi^2+156.102\int_0^{1}\sqrt{1-t^2}\,dt}$$

$$\sqrt[14]{\frac{27}{2}\left(\pi\sqrt{1522.98}+\phi^2+e\right)+2}+\frac{29}{10^3}=$$

$$0.029+1.20431\sqrt[14]{0.148148+e+\phi^2+78.0508\int_0^\infty\frac{\sin(t)}{t}\,dt}$$

Observations

Figs.

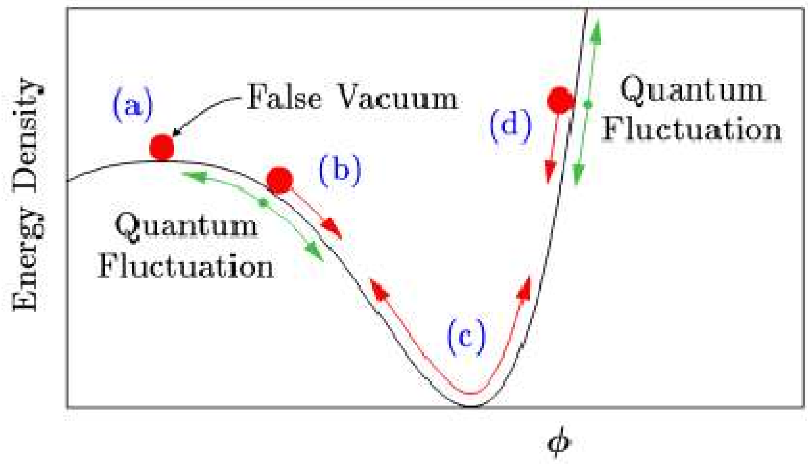
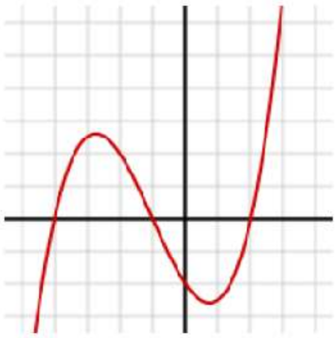


FIG. 1: In simple inflationary models, the universe at early times is dominated by the potential energy density of a scalar field, ϕ. Red arrows show the classical motion of ϕ. When ϕ is near region (a), the energy density will remain nearly constant, $\rho \cong \rho_f$, even as the universe expands. Moreover, cosmic expansion acts like a frictional drag, slowing the motion of ϕ: Even near regions (b) and (d), ϕ behaves more like a marble moving in a bowl of molasses, slowly creeping down the side of its potential, rather than like a marble sliding down the inside of a polished bowl. During this period of "slow roll," ρ remains nearly constant. Only after ϕ has slid most of the way down its potential will it begin to oscillate around its minimum, as in region (c), ending inflation.



Graph of a cubic function with 3 real roots (where the curve crosses the horizontal axis at $y = 0$). The case shown has two critical points. Here the function is $f(x) = (x^3 + 3x^2 - 6x - 8)/4$.

The ratio between M_0 and q

$$M_0 = \sqrt{3q^2 - \Sigma^2},$$

$$q = \frac{(3\sqrt{3})\, M_s}{2}.$$

i.e. the gravitating mass M_0 and the Wheelerian mass q of the wormhole, is equal to:

$$\frac{\sqrt{3\,(2.17049 \times 10^{37})^2 - 0.001^2}}{\frac{1}{2}\,((3\sqrt{3})\,(4.2 \times 10^6 \times 1.9891 \times 10^{30}))}$$

1.7320507879051944207039476256710181600835665488020824605 20...

1.7320507879

$1.7320507879 \approx \sqrt{3}$ that is the ratio between the gravitating mass M_0 and the Wheelerian mass q of the wormhole

We note that:

$$\left(-\frac{1}{2} + \frac{i}{2}\sqrt{3}\right) - \left(-\frac{1}{2} - \frac{i}{2}\sqrt{3}\right)$$

i is the imaginary unit

$i\sqrt{3}$

1.7320508075688772935274463415058723669428052538103806280558... i

$r \approx 1.73205$ (radius), $\theta = 90°$ (angle)

1.73205

This result is very near to the ratio between M_0 and q, that is equal to 1.7320507879 $\approx \sqrt{3}$

With regard $\sqrt{3}$, we note that is a fundamental value of the formula structure that we need to calculate a Cubic Equation

We have that the previous result

$$\left(-\frac{1}{2}+\frac{i}{2}\sqrt{3}\right)-\left(-\frac{1}{2}-\frac{i}{2}\sqrt{3}\right) = i\sqrt{3} =$$

$=$ 1.7320508075688772935274463415058723669428052538103806280558... i

$r \approx 1.73205$ (radius), $\theta = 90°$ (angle)

can be related with:

$$u^2(-u)\left(\frac{1}{2}\pm\frac{i\sqrt{3}}{2}\right)+v^2(-v)\left(\frac{1}{2}\pm\frac{i\sqrt{3}}{2}\right)=q$$

Considering:

$$(-1)\left(\frac{1}{2}-\frac{i\sqrt{3}}{2}\right)-(-1)\left(\frac{1}{2}+\frac{i\sqrt{3}}{2}\right)=q$$

$= i\sqrt{3} =$ 1.7320508075688772935274463415058723669428052538103806280558... i

$r \approx 1.73205$ (radius), $\theta = 90°$ (angle)

Thence:

$$\left(-\frac{1}{2}+\frac{i}{2}\sqrt{3}\right)-\left(-\frac{1}{2}-\frac{i}{2}\sqrt{3}\right) \Rightarrow$$

$$\Rightarrow (-1)\left(\frac{1}{2}-\frac{i\sqrt{3}}{2}\right)-(-1)\left(\frac{1}{2}+\frac{i\sqrt{3}}{2}\right)=q=1.73205\approx\sqrt{3}$$

We observe how the graph above, concerning the cubic function, is very similar to the graph that represent the scalar field (in red). It is possible to hypothesize that cubic functions and cubic equations, with their roots, are connected to the scalar field.

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).

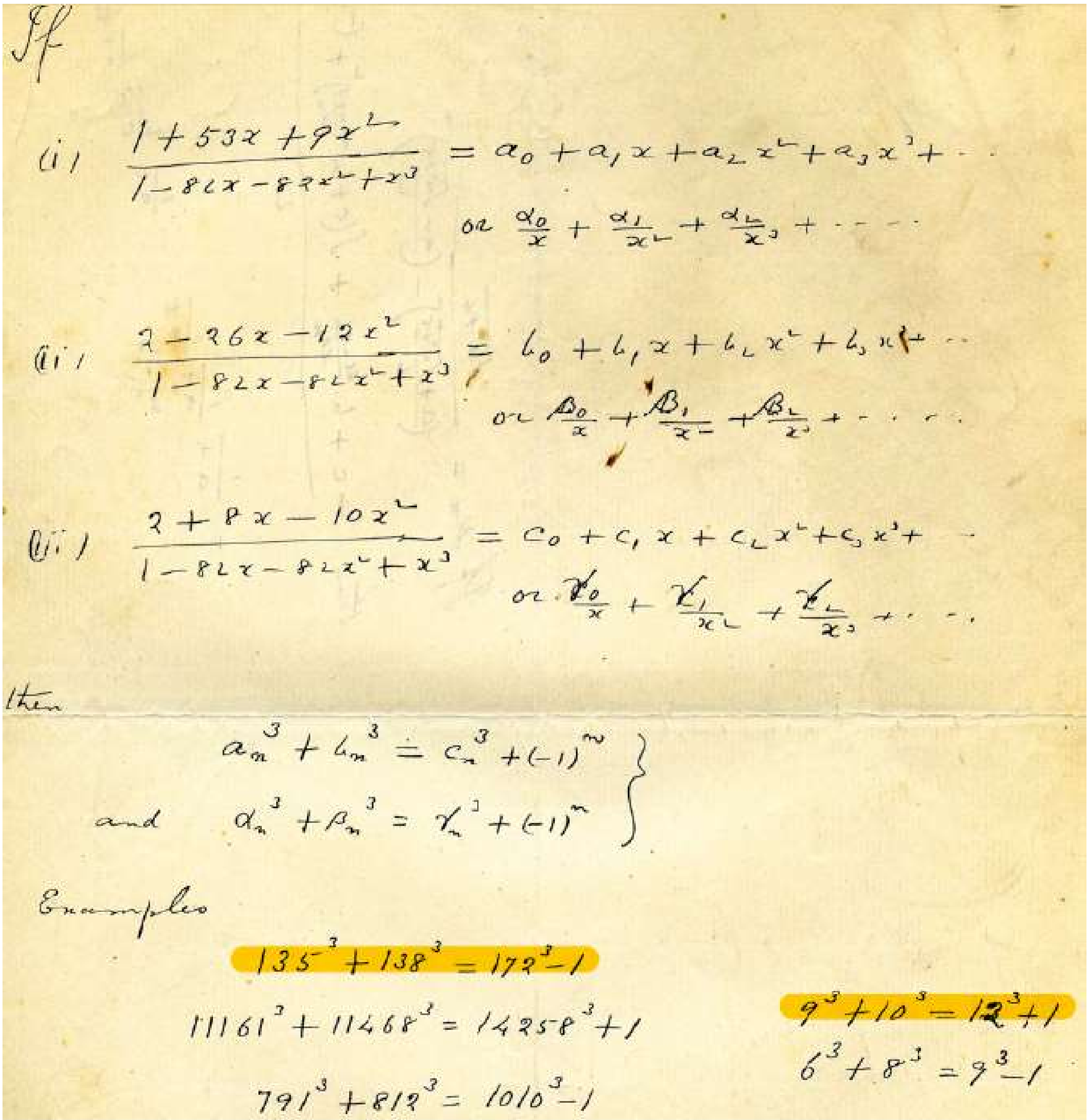
In geometry, a golden spiral is a logarithmic spiral whose growth factor is φ, the golden ratio.[1] That is, a golden spiral gets wider (or further from its origin) by a factor of φ for every quarter turn it makes. Approximate logarithmic spirals can occur in nature, for example the arms of spiral galaxies[3]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

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.



If

(i) $$\frac{1+53x+9x^2}{1-82x-82x^2+x^3} = a_0 + a_1 x + a_2 x^2 + a_3 x^3 + \cdots$$ or $$\frac{\alpha_0}{x} + \frac{\alpha_1}{x^2} + \frac{\alpha_2}{x^3} + \cdots$$

(ii) $$\frac{2-26x-12x^2}{1-82x-82x^2+x^3} = b_0 + b_1 x + b_2 x^2 + b_3 x^3 + \cdots$$ or $$\frac{\beta_0}{x} + \frac{\beta_1}{x^2} + \frac{\beta_2}{x^3} + \cdots$$

(iii) $$\frac{2+8x-10x^2}{1-82x-82x^2+x^3} = c_0 + c_1 x + c_2 x^2 + c_3 x^3 + \cdots$$ or $$\frac{\gamma_0}{x} + \frac{\gamma_1}{x^2} + \frac{\gamma_2}{x^3} + \cdots$$

then

$$a_n^3 + b_n^3 = c_n^3 + (-1)^n$$

and $$\alpha_n^3 + \beta_n^3 = \gamma_n^3 + (-1)^n$$

Examples

$$135^3 + 138^3 = 172^3 - 1$$

$$11161^3 + 11468^3 = 14258^3 + 1$$

$$791^3 + 812^3 = 1010^3 - 1$$

$$9^3 + 10^3 = 12^3 + 1$$

$$6^3 + 8^3 = 9^3 - 1$$

https://plus.maths.org/content/ramanujan

Note that 135, 138 and 1729 ($9^3+10^3 = 12^3 +1$ that is the Hardy-Ramanujan number) are values (highlighted in yellow) very near to the rest mass of two Pion mesons and to the scalar meson $f_0(1710)$, that is also a candidate “glueball”

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