On the Ramanujan's Mock theta functions of tenth order: new possible mathematical developments and mathematical connections with some sectors of Particle Physics and Black Hole physics II

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Abstract

In the present research thesis, we have obtained various and interesting new possible mathematical developments concerning some Ramanujan's Mock theta functions of tenth order and mathematical connections with some sectors of Particle Physics and Black Hole physics

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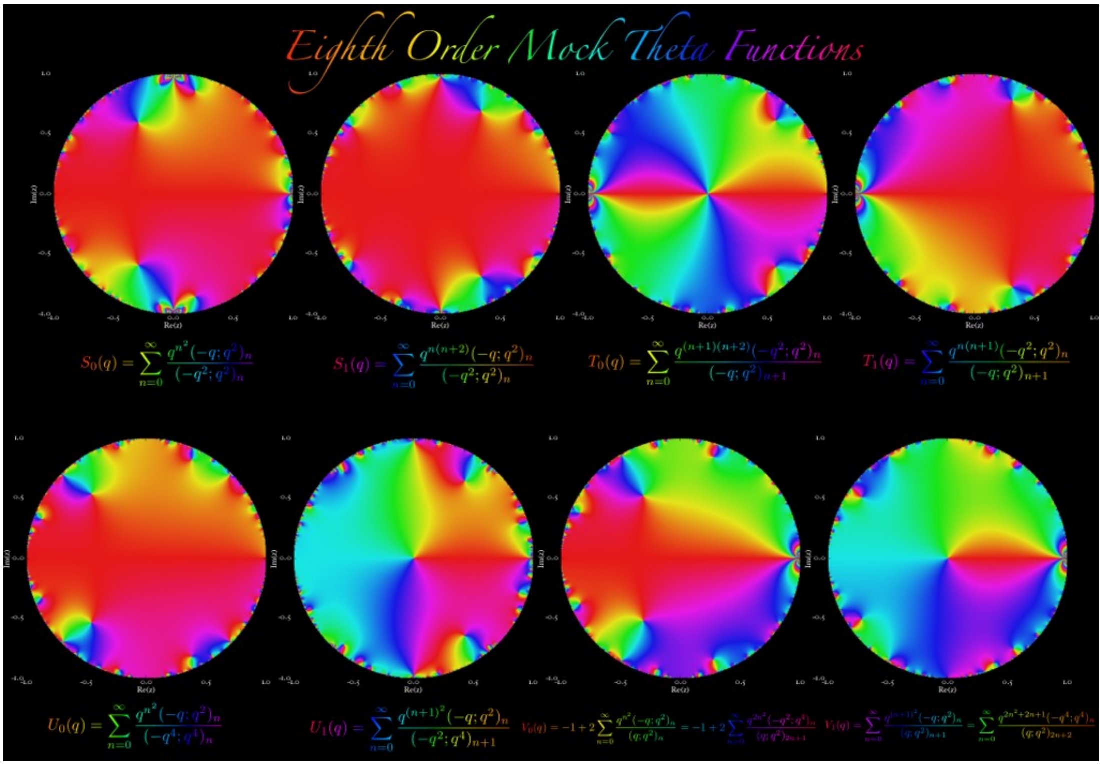
The Ramanujan's mathematical paradise

From:

Ramanujan Institute for Advanced Study in Mathematics
University of Madras, Chennai, India.

From:

http://owen.maresh.info/mocktheta.html



We want to highlight that the formulas and the very relevant results obtained, are based on our personal and original interpretation, also if with values corresponding to the indications provided by the Notebooks consulted. (for example *for* $|q| < 1$ *, for* $x \neq 0$*, for each non-negative integer n, (for* $n \geq 2$*)*, we take q = 0,5   n = 2, and x = 0.625, 1, 2 and 3).

From:

Ramanujan's Lost Notebook Part V

Tenth Order Mock Theta Functions: Part IV

For $|q| < 1$, for $x \neq 0$, for each non-negative integer n, (for $n \geq 2$):

Now,

$$\sum_{s=-\infty}^{\infty} \frac{(1-q^{4s+1})q^{4s^2+2s}}{(1-xq^{2s})(1-q^{2s+1}/x)}$$
$$= \sum_{s=-\infty}^{\infty} \frac{(1-q^{2s+1}/x+(q^{2s+1}/x)(1-xq^{2s}))q^{4s^2+2s}}{(1-xq^{2s})(1-q^{2s+1}/x)}$$
$$= \sum_{s=-\infty}^{\infty} \frac{q^{4s^2+2s}}{1-xq^{2s}} + \frac{1}{x}\sum_{s=-\infty}^{\infty} \frac{q^{4s^2+4s+1}}{1-q^{2s+1}/x}$$
$$= \sum_{s=-\infty}^{\infty} \frac{q^{(2s)^2+2s}}{1-xq^{2s}} - \sum_{s=-\infty}^{\infty} \frac{q^{(2s+1)^2+2s}}{1-xq^{2s+1}}$$
$$= \sum_{n=-\infty}^{\infty} \frac{(-1)^n q^{n^2+n}}{1-xq^n}, \qquad (11.3.15)$$

For q = 0.5, n = 2 and x = 0.625, 1, 2 and 3, we have calculated the inverse:

1/ (((0.5)^6 / (1- 1*0.5^2)))

Input:

$$\frac{1}{\frac{0.5^6}{1-1\times 0.5^2}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

48

1/ (((0.5)^6 / (1- 2*0.5^2)))

Input:

$$\frac{1}{\frac{0.5^6}{1-2\times 0.5^2}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

32

1/ (((0.5)^6 / (1- 3*0.5^2)))

Input:

$$\frac{1}{\frac{0.5^6}{1-3\times 0.5^2}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

16

1/ (((0.5)^6 / (1- 0.625*0.5^2)))

Input:

$$\frac{1}{\frac{0.5^6}{1-0.625\times 0.5^2}}$$

Open code

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Result:

54

[1/ (((0.5)^6 / (1- 2*0.5^2)))] * [1/ (((0.5)^6 / (1- 0.625*0.5^2)))]

Input:

$$\frac{1}{\frac{0.5^6}{1-2\times 0.5^2}} \times \frac{1}{\frac{0.5^6}{1-0.625\times 0.5^2}}$$

Open code

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Result:

1728

This result is very near to the mass of candidate glueball $f_0(1710)$ 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

(((([1/ (((0.5)^6 / (1- 2*0.5^2)))] * [1/ (((0.5)^6 / (1- 0.625*0.5^2)))]))))^1/3

Input:

$$\sqrt[3]{\frac{1}{\frac{0.5^6}{1-2\times 0.5^2}} \times \frac{1}{\frac{0.5^6}{1-0.625\times 0.5^2}}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

12

This result a very good approximation to the value of Black Hole entropy 12,19

2 * ((((\[1/ (((0.5)^6 / (1- 2*0.5^2)))] * [1/ (((0.5)^6 / (1- 0.625*0.5^2)))]))))^1/3

Input:

$$2\sqrt[3]{\frac{1}{\frac{0.5^6}{1-2\times 0.5^2}} \times \frac{1}{\frac{0.5^6}{1-0.625\times 0.5^2}}}$$

Open code

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Result:

24

This value is linked to the "Ramanujan function" (an elliptic modular function that satisfies the need for "conformal symmetry") that has 24 "modes" corresponding to the physical vibrations of a bosonic string.

((((\[1/ (((0.5)^6 / (1- 2*0.5^2)))] * [1/ (((0.5)^6 / (1- 0.625*0.5^2)))]))))^1/15

Input:

$$\sqrt[15]{\frac{1}{\frac{0.5^6}{1-2\times 0.5^2}} \times \frac{1}{\frac{0.5^6}{1-0.625\times 0.5^2}}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- More digits

1.64375...

$$1.64375 \approx \zeta(2) = \frac{\pi^2}{6} = 1.6449$$

1/3 * ((((\[1/ (((0.5)^6 / (1- 2*0.5^2)))] * [1/ (((0.5)^6 / (1- 0.625*0.5^2)))]))))^1/3

Input:

$$\frac{1}{3}\sqrt[3]{\frac{1}{\frac{0.5^6}{1-2\times0.5^2}}\times\frac{1}{\frac{0.5^6}{1-0.625\times0.5^2}}}$$

Open code

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Result:

4

This result is the minimal possible value of the mass of hypothetical DM particles

24 + 1/6 * ((((((((((([1/ (((0.5)^6 / (1- 2*0.5^2)))] * [1/ (((0.5)^6 / (1-0.625*0.5^2)))])))))^1/15)))))))^16

Input:

$$24+\frac{1}{6}\sqrt[15]{\frac{1}{\frac{0.5^6}{1-2\times0.5^2}}\times\frac{1}{\frac{0.5^6}{1-0.625\times0.5^2}}}^{16}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- More digits

497.401...

This result is practically equal to the rest mass of Kaon meson 497,614

11 + 1/3 * ((((((((((([1/ (((0.5)^6 / (1- 2*0.5^2)))] * [1/ (((0.5)^6 / (1-0.625*0.5^2)))])))))^1/15)))))))^16

Input:

$$11+\frac{1}{3}\sqrt[15]{\frac{1}{\frac{0.5^6}{1-2\times0.5^2}}\times\frac{1}{\frac{0.5^6}{1-0.625\times0.5^2}}}^{16}$$

Open code

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Result:

- More digits

957.801...

This result is practically equal to the rest mass of Eta prime meson 957,66

Note that:

-64 + 8 + 1/3 * ((((((((((([1/ (((0.5)^6 / (1- 2*0.5^2)))] * [1/ (((0.5)^6 / (1-0.625*0.5^2)))]))))^1/15))))))^16 + 497.401

Input interpretation:

$$-64+8+\frac{1}{3}\sqrt[15]{\frac{1}{\frac{0.5^6}{1-2\times 0.5^2}}\times\frac{1}{\frac{0.5^6}{1-0.625\times 0.5^2}}}^{16}+497.401$$

Open code

Result:

- More digits
  1388.20...

This value is very near to the rest mass of Sigma baryon 1387,2

(-48-108-64+8) + 1/3 * ((((((((((([1/ (((0.5)^6 / (1- 2*0.5^2)))] * [1/ (((0.5)^6 / (1-0.625*0.5^2)))]))))^1/15))))))^16 + 497.401

Input interpretation:

$$(-48-108-64+8)+\frac{1}{3}\sqrt[15]{\frac{1}{\frac{0.5^6}{1-2\times 0.5^2}}\times\frac{1}{\frac{0.5^6}{1-0.625\times 0.5^2}}}^{16}+497.401$$

Open code

Result:

- More digits
  1232.20...

This result is practically equal to the rest mass of Delta baryon 1232.

Now, we have:

Lemma 11.3.7. *For* $q \neq 0$,

$$xk(x,q) = m(-qx^4, q^4, -q^{-1}x^{-2}) + q^{-1}x^2 m(-q^{-1}x^4, q^4, -q^{-1}x^{-2}). \tag{11.3.19}$$

Proof. In Theorem 10.6.1 of Chapter 10, set $z = q/x^2$. Now, $B(q/x^2, x, q) = 0$ by (10.6.1). Hence,

$$\begin{aligned} j(-qx^2; q^4)\,(k(x,q) - 1/x) &= -P(q/x^2) \\ &= -\frac{1}{2}\sum_{n=-\infty}^{\infty} \frac{q^{2n^2+3n+1}x^{2n-1}}{1-q^{4n+2}/x^2} - \frac{1}{2}\sum_{n=-\infty}^{\infty} \frac{q^{2n^2+3n+1}x^{2n+1}}{1-q^{4n+4}/x^2} \\ &\quad + \frac{1}{2}\sum_{n=-\infty}^{\infty} \frac{q^{2n^2+5n}x^{-2n+1}}{1-q^{4n}x^2} + \frac{1}{2}\sum_{n=-\infty}^{\infty} \frac{q^{2n^2+5n+2}x^{-2n-1}}{1-q^{4n+2}x^2} \\ &= -\sum_{n=-\infty}^{\infty} \frac{q^{2n^2+3n+1}x^{2n-1}}{1-q^{4n+2}/x^2} - \sum_{n=-\infty}^{\infty} \frac{q^{2n^2+3n+1}x^{2n+1}}{1-q^{4n+4}/x^2}, \end{aligned}$$

Now:

$$= -\sum_{n=-\infty}^{\infty} \frac{q^{2n^2+3n+1}x^{2n-1}}{1-q^{4n+2}/x^2} - \sum_{n=-\infty}^{\infty} \frac{q^{2n^2+3n+1}x^{2n+1}}{1-q^{4n+4}/x^2},$$

For q = 0.5, n = 2 and x = 0.625, 1, 2 and 3, (we have calculated also the inverse), thence, we obtain:

((((([-(((0.5)^15 *3^3))) / (((1- 0.5^10))/3^2)))] - [(((0.5)^15 * 3^5))) / (((1- 0.5^12))/3^2)))])))))

Input:

$$-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}} - \frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}$$

Open code

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Result:

- More digits

−0.074181262286100995778415133253842931262286100995778415 13...

Open code

6 * ln -((((([-(((0.5)^15 *3^3))) / (((1- 0.5^10))/3^2)))] - [(((0.5)^15 * 3^5))) / (((1- 0.5^12))/3^2)))])))))

Input:

$$6\log\left(-\left(-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}\right)\right)$$

Open code

- $\log(x)$ is the natural logarithm

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Result:

- More digits

$-15.6075...$

Series representations:

- More

$$6\log\left(-\left(-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}\right)\right)=-6\sum_{k=1}^{\infty}\frac{(-1)^k(-0.925819)^k}{k}$$

Open code

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$$6\log\left(-\left(-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}\right)\right)=$$
$$12\,i\,\pi\left\lfloor\frac{\arg(0.0741813-x)}{2\pi}\right\rfloor+6\log(x)-6\sum_{k=1}^{\infty}\frac{(-1)^k(0.0741813-x)^k x^{-k}}{k}\quad\text{for } x<0$$

Open code

$$6\log\left(-\left(-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}\right)\right)=6\left\lfloor\frac{\arg(0.0741813-z_0)}{2\pi}\right\rfloor\log\left(\frac{1}{z_0}\right)+6\log(z_0)+$$
$$6\left\lfloor\frac{\arg(0.0741813-z_0)}{2\pi}\right\rfloor\log(z_0)-6\sum_{k=1}^{\infty}\frac{(-1)^k(0.0741813-z_0)^k z_0^{-k}}{k}$$

Open code

Integral representation:

$$6\log\left(-\left(-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}\right)\right)=6\int_1^{0.0741813}\frac{1}{t}\,dt$$

Open code

This result -15,6075 is very near to the value of black hole entropy 15,6730 with minus sign

sqrt((((((((colog -(((([-(((0.5)^15 *3^3))) / (((1- 0.5^10))/3^2)))] - [(((0.5)^15 * 3^5))) / (((1- 0.5^12))/3^2)))])))))))))

Input:

$$\sqrt{-\log\left(-\left(-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}\right)\right)}$$

Open code

- $\log(x)$ is the natural logarithm

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Result:

- More digits

1.61284...

Series representations:

- More

$$\sqrt{-\log\left(-\left(-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}\right)\right)}=\sqrt{\sum_{k=1}^{\infty}\frac{(-1)^k\,(-0.925819)^k}{k}}$$

Open code

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$$\sqrt{-\log\left(-\left(-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}\right)\right)}=$$
$$\sqrt{-1-\log(0.0741813)}\sum_{k=0}^{\infty}\binom{\frac{1}{2}}{k}(-1-\log(0.0741813))^{-k}$$

Open code

$$\sqrt{-\log\left(-\left(-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}\right)\right)}=$$
$$\sqrt{-1-\log(0.0741813)}\sum_{k=0}^{\infty}\frac{(-1)^k\,(-1-\log(0.0741813))^{-k}\left(-\frac{1}{2}\right)_k}{k!}$$

Open code

- $\binom{n}{m}$ is the binomial coefficient
- $n!$ is the factorial function
- $(a)_n$ is the Pochhammer symbol (rising factorial)

- [More information]

Integral representation:

$$\sqrt{-\log\left(-\left(-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}\right)\right)}=\sqrt{-\int_1^{0.0741813}\frac{1}{t}\,dt}$$

This value 1,61284 is very near to the golden ratio

sqrt((((((((colog -(((([-(((0.5)^15 *3^3))) / (((1- 0.5^10))/3^2)))] - [(((0.5)^15 * 3^5))) / (((1- 0.5^12))/3^2)))]))))))))))^(1.6548*3*Pi)

where 1,6548 is very near to the 14th root of the following Ramanujan's class invariant $Q = (G_{505}/G_{101/5})^3$ = 1164,2696 i.e. 1,65578...

Input interpretation:

$$\sqrt{-\log\left(-\left(-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}\right)\right)}^{1.6548\times 3\pi}$$

Open code

- $\log(x)$ is the natural logarithm

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Result:

- More digits

1728.25...

This result is very near to the mass of candidate glueball $f_0(1710)$ 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

(((((((sqrt((((((((colog -(((([-(((0.5)^15 *3^3))) / (((1- 0.5^10))/3^2)))] - [(((0.5)^15 * 3^5))) / (((1- 0.5^12))/3^2)))]))))))))))^(1.6548*3*Pi)))))))^1/3

Input interpretation:

$$\sqrt[3]{\sqrt{-\log\left(-\left(-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}\right)\right)}^{1.6548\times 3\pi}}$$

Open code

- $\log(x)$ is the natural logarithm

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Result:

- More digits

12.0006...

This result is very near to the value of black hole entropy 12,19

2*(((((((sqrt((((((colog -(((([-(((0.5)^15 *3^3))) / (((1- 0.5^10))/3^2)))] - [(((0.5)^15 * 3^5))) / (((1- 0.5^12))/3^2)))])))))))))))^(1.6548*3*Pi)))))))^1/3

Input interpretation:

$$2\sqrt[3]{\sqrt{-\log\left(-\left(-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}\right)\right)}^{1.6548\times 3\pi}}$$

Open code

- $\log(x)$ is the natural logarithm

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Result:

- More digits

24.0012...

Series representations:

- More

$$2\sqrt[3]{\sqrt{-\log\left(-\left(-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}\right)\right)}^{1.6548\times 3\pi}} = 2\sqrt[3]{\sqrt{\sum_{k=1}^{\infty}\frac{(-1)^k(-0.925819)^k}{k}}^{4.9644\pi}}$$

Open code

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$$2\sqrt[3]{\sqrt{-\log\left(-\left(-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}\right)\right)}^{1.6548\times 3\pi}} =$$

$$2\sqrt[3]{\left(\sqrt{-1-\log(0.0741813)}\sum_{k=0}^{\infty}\binom{\frac{1}{2}}{k}(-1-\log(0.0741813))^{-k}\right)^{4.9644\pi}}$$

Open code

$$2\sqrt[3]{\sqrt{-\log\left(-\left(-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}\right)\right)}^{1.6548\times 3\pi}} =$$

$$2\sqrt[3]{\left(\sqrt{-1-\log(0.0741813)}\sum_{k=0}^{\infty}\frac{(-1)^k(-1-\log(0.0741813))^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)^{4.9644\pi}}$$

Open code

Integral representation:

$$2\sqrt[3]{\sqrt{-\log\left(-\left(-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}\right)\right)}^{1.6548\times 3\pi}} = 2\sqrt[3]{\sqrt{-\int_1^{0.0741813}\frac{1}{t}\,dt}^{4.9644\pi}}$$

This value is linked to the "Ramanujan function" (an elliptic modular function that satisfies the need for "conformal symmetry") that has 24 "modes" corresponding to the physical vibrations of a bosonic string.

1/3*(((((((sqrt((((((colog -(((([-(((0.5)^15 *3^3))) / (((1- 0.5^10))/3^2)))] - [(((0.5)^15 * 3^5))) / (((1- 0.5^12))/3^2)))])))))))))))^(1.6548*3*Pi))))))))^1/3

Input interpretation:

$$\frac{1}{3}\sqrt[3]{\sqrt{-\log\left(-\left(-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}\right)\right)}^{1.6548\times 3\pi}}$$

Open code

- $\log(x)$ is the natural logarithm

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Result:

- More digits

4.00019...

Series representations:

- More

$$\frac{1}{3}\sqrt[3]{\sqrt{-\log\left(-\left(-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}\right)\right)}^{1.6548\times 3\pi}} = \frac{1}{3}\sqrt[3]{\sqrt{\sum_{k=1}^{\infty}\frac{(-1)^k(-0.925819)^k}{k}}^{4.9644\pi}}$$

Open code

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$$\frac{1}{3}\sqrt[3]{\sqrt{-\log\left(-\left(-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}\right)\right)}^{1.6548\times 3\pi}} = \frac{1}{3}\sqrt[3]{\left(\sqrt{-1-\log(0.0741813)}\sum_{k=0}^{\infty}\binom{\frac{1}{2}}{k}(-1-\log(0.0741813))^{-k}\right)^{4.9644\pi}}$$

Open code

$$\frac{1}{3}\sqrt[3]{\sqrt{-\log\left(-\left(-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}\right)\right)}^{1.6548\times 3\pi}} = \frac{1}{3}\sqrt[3]{\left(\sqrt{-1-\log(0.0741813)}\sum_{k=0}^{\infty}\frac{(-1)^k(-1-\log(0.0741813))^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)^{4.9644\pi}}$$

Open code

- Integral representation:

$$\frac{1}{3}\sqrt[3]{\sqrt{-\log\left(-\left(-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}\right)\right)}^{1.6548\times 3\pi}} = \frac{1}{3}\sqrt[3]{\sqrt{-\int_1^{0.0741813}\frac{1}{t}\,dt}^{4.9644\pi}}$$

This result 4,00019 is the minimal possible value of the mass of hypothetical DM particles

((((((((sqrt((((((((colog -(((((([-(((0.5)^15 *3^3))) / (((1- 0.5^10))/3^2)))] - [((((0.5)^15 * 3^5))) / (((1- 0.5^12))/3^2)))])))))))))))^(8Pi))))))))^1/24

Input:

$$\sqrt[24]{\sqrt{-\log\left(-\left(-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}\right)\right)}^{8\pi}}$$

Open code

- $\log(x)$ is the natural logarithm

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Result:

- More digits

1.64964...

where 1,64964 is very near to the 14th root of the following Ramanujan's class invariant $Q = \left(G_{505}/G_{101/5}\right)^3 = 1164{,}2696$ i.e. 1,65578... and 1.64964 ≈ ζ(2) = $\frac{\pi^2}{6} = 1.6449$

For x = 0,625 we obtain:

ln -((((((1/ (((([-(((0.5)^15 *0.625^3))) / (((1- 0.5^10))/0.625^2)))] - [((((0.5)^15 * 0.625^5))) / (((1- 0.5^12))/0.625^2)))]))))))))

Input:

$$\log\left(-\frac{1}{-\frac{0.5^{15}\times 0.625^3}{\frac{1-0.5^{10}}{0.625^2}}-\frac{0.5^{15}\times 0.625^5}{\frac{1-0.5^{12}}{0.625^2}}}\right)$$

Open code

- $\log(x)$ is the natural logarithm

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Result:

- More digits

12.4167...

Series representations:

- More

$$\log\left(-\frac{1}{-\frac{0.5^{15}\times 0.625^3}{\frac{1-0.5^{10}}{0.625^2}}-\frac{0.5^{15}\times 0.625^5}{\frac{1-0.5^{12}}{0.625^2}}}\right)=\log(246890.)-\sum_{k=1}^{\infty}\frac{(-1)^k e^{-12.4167 k}}{k}$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$\log\left(-\frac{1}{-\frac{0.5^{15}\times 0.625^3}{\frac{1-0.5^{10}}{0.625^2}}-\frac{0.5^{15}\times 0.625^5}{\frac{1-0.5^{12}}{0.625^2}}}\right)=$$

$$2 i \pi \left\lfloor\frac{\arg(246891.-x)}{2\pi}\right\rfloor+\log(x)-\sum_{k=1}^{\infty}\frac{(-1)^k (246891.-x)^k x^{-k}}{k} \quad \text{for } x<0$$

Open code

$$\log\left(-\frac{1}{-\frac{0.5^{15}\times 0.625^3}{\frac{1-0.5^{10}}{0.625^2}}-\frac{0.5^{15}\times 0.625^5}{\frac{1-0.5^{12}}{0.625^2}}}\right)=\left\lfloor\frac{\arg(246891.-z_0)}{2\pi}\right\rfloor\log\left(\frac{1}{z_0}\right)+$$

$$\log(z_0)+\left\lfloor\frac{\arg(246891.-z_0)}{2\pi}\right\rfloor\log(z_0)-\sum_{k=1}^{\infty}\frac{(-1)^k (246891.-z_0)^k z_0^{-k}}{k}$$

Open code

Integral representations:

$$\log\left(-\frac{1}{-\frac{0.5^{15}\times 0.625^3}{\frac{1-0.5^{10}}{0.625^2}}-\frac{0.5^{15}\times 0.625^5}{\frac{1-0.5^{12}}{0.625^2}}}\right)=\int_1^{246891.}\frac{1}{t}\,dt$$

Open code

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$$\log\left(-\frac{1}{-\frac{0.5^{15}\times 0.625^3}{\frac{1-0.5^{10}}{0.625^2}}-\frac{0.5^{15}\times 0.625^5}{\frac{1-0.5^{12}}{0.625^2}}}\right)=\frac{1}{2 i \pi}\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{e^{-12.4167 s}\,\Gamma(-s)^2\,\Gamma(1+s)}{\Gamma(1-s)}\,ds$$

$$\text{for } -1<\gamma<0$$

This result 12,4167 is very near to the value of black hole entropy 12,57

For x = 3, we obtain:

4Pi * sqrt((((((((colog -(((([-(((0.5)^15 *3^3))) / (((1- 0.5^10))/3^2)))] - [((((0.5)^15 * 3^5))) / (((1- 0.5^12))/3^2)))])))))))))))

Input:

$$4\pi\sqrt{-\log\left(-\left(-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}\right)\right)}$$

Open code

- $\log(x)$ is the natural logarithm
  - Units »

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Result:

- More digits

20.2675...

Series representations:

- More

$$4\pi\sqrt{-\log\left(-\left(-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}\right)\right)} = 4\pi\sqrt{\sum_{k=1}^{\infty}\frac{(-1)^k\,(-0.925819)^k}{k}}$$

Open code

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$$4\pi\sqrt{-\log\left(-\left(-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}\right)\right)} = 4\pi\sqrt{-1-\log(0.0741813)}\sum_{k=0}^{\infty}\binom{\frac{1}{2}}{k}(-1-\log(0.0741813))^{-k}$$

Open code

$$4\pi\sqrt{-\log\left(-\left(-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}\right)\right)} = 4\pi\sqrt{-1-\log(0.0741813)}\sum_{k=0}^{\infty}\frac{(-1)^k\,(-1-\log(0.0741813))^{-k}\left(-\frac{1}{2}\right)_k}{k!}$$

Open code

- $\binom{n}{m}$ is the binomial coefficient
- $n!$ is the factorial function
- $(a)_n$ is the Pochhammer symbol (rising factorial)
- Units »
- More information

Integral representation:

$$4\pi\sqrt{-\log\left(-\left(-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}\right)\right)} = 4\pi\sqrt{-\int_1^{0.0741813}\frac{1}{t}\,dt}$$

This result 20,2675 is very near to the value of black hole entropy 20,5520

11 * sqrt(((((((colog -(((([-(((0.5)^15 *3^3))) / (((1- 0.5^10))/3^2)))] - [(((0.5)^15 * 3^5))) / (((1- 0.5^12))/3^2)))]))))))))))

Input:

$$11\sqrt{-\log\left(-\left(-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}\right)\right)}$$

Open code

- $\log(x)$ is the natural logarithm

Enlarge Data Customize A Plaintext Interactive

Result:

- More digits

17.7412...

Series representations:

- More

$$11\sqrt{-\log\left(-\left(-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}\right)\right)} = 11\sqrt{\sum_{k=1}^{\infty}\frac{(-1)^k\,(-0.925819)^k}{k}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$11\sqrt{-\log\left(-\left(-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}\right)\right)} = 11\sqrt{-1-\log(0.0741813)}\sum_{k=0}^{\infty}\binom{\frac{1}{2}}{k}(-1-\log(0.0741813))^{-k}$$

Open code

$$11\sqrt{-\log\left(-\left(-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}\right)\right)} = 11\sqrt{-1-\log(0.0741813)}\sum_{k=0}^{\infty}\frac{(-1)^k(-1-\log(0.0741813))^{-k}\left(-\frac{1}{2}\right)_k}{k!}$$

Open code

- $\binom{n}{m}$ is the binomial coefficient
- $n!$ is the factorial function
- $(a)_n$ is the Pochhammer symbol (rising factorial)
- More information

Integral representation:

$$11\sqrt{-\log\left(-\left(-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}\right)\right)} = 11\sqrt{-\int_1^{0.0741813}\frac{1}{t}\,dt}$$

This result 17,7412 is practically equal to the value of black hole entropy 17,7715

19 * sqrt((((((((colog -(((((([-(((0.5)^15 *3^3))) / (((1- 0.5^10))/3^2)))] - [(((0.5)^15 * 3^5))) / (((1- 0.5^12))/3^2)))])))))))))))

Input:

$$19\sqrt{-\log\left(-\left(-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}\right)\right)}$$

Open code

- $\log(x)$ is the natural logarithm

Enlarge Data Customize A Plaintext Interactive

Result:

- More digits

30.6439...

Series representations:

- More

$$19\sqrt{-\log\left(-\left(-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}\right)\right)} = 19\sqrt{\sum_{k=1}^{\infty}\frac{(-1)^k\,(-0.925819)^k}{k}}$$

Open code

$$19\sqrt{-\log\left(-\left(-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}\right)\right)} =$$
$$19\sqrt{-1-\log(0.0741813)}\sum_{k=0}^{\infty}\binom{\frac{1}{2}}{k}(-1-\log(0.0741813))^{-k}$$

Open code

$$19\sqrt{-\log\left(-\left(-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}\right)\right)} =$$
$$19\sqrt{-1-\log(0.0741813)}\sum_{k=0}^{\infty}\frac{(-1)^k\,(-1-\log(0.0741813))^{-k}\left(-\frac{1}{2}\right)_k}{k!}$$

Open code

- $\binom{n}{m}$ is the binomial coefficient
- $n!$ is the factorial function
- $(a)_n$ is the Pochhammer symbol (rising factorial)
- More information

Integral representation:

$$19\sqrt{-\log\left(-\left(-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}\right)\right)} = 19\sqrt{-\int_1^{0.0741813}\frac{1}{t}\,dt}$$

This result 30,6439 is very near to the value of black hole entropy 30,5963

Now, from the reciprocal of the formulas, for x = 3, we have obtained the following results:

1/ (((([-(((0.5)^15 *3^3))) / (((1- 0.5^10))/3^2)))] - [(((0.5)^15 * 3^5))) / (((1- 0.5^12))/3^2)))]))))

Input:

$$\frac{1}{-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}} - \frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- More digits

$-13.480493175530196276475874745796305799238135577113657899\ldots$

Open code

((((((3+(2*64)/ -(((([-(((0.5)^15 *3^3))) / (((1- 0.5^10))/3^2)))] - [(((0.5)^15 * 3^5))) / (((1- 0.5^12))/3^2)))]))))))))))

Input:

$$3 + -\frac{2\times 64}{-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}} - \frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}}$$

$1728.5031264678651233889119674619271423024813538705482111139\ldots$

Open code

Continued fraction:

- Linear form

$$1728 + \cfrac{1}{1 + \cfrac{1}{1 + \cfrac{1}{79 + \cfrac{1}{2 + \cfrac{1}{6 + \cfrac{1}{6 + \cfrac{1}{2 + \cfrac{1}{2 + \cfrac{1}{5 + \cfrac{1}{\ldots}}}}}}}}}}$$

Possible closed forms:

- More

$$\frac{10\,753\,063 + 4834\,\pi^2}{1989\,\pi} \approx 1728.50312646786512336483 1$$

Enlarge Data Customize A Plaintext Interactive

$$\frac{1}{7}\left(73\,e^{\pi} + 3114\,\pi - 6457\log(\pi) + 4337\log(2\,\pi) + 38\tan^{-1}(\pi)\right) \approx$$

$1728.50312646786512338860696$

$$\frac{7187\,\pi!}{30}+\frac{425}{9}+\frac{6829}{30\,\pi}-\frac{1081\,\pi}{30}\approx 1728.503126467865123389 4898$$

This result is very near to the mass of candidate glueball $f_0(1710)$ 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

((((((3+(2*64)/ -(((([-(((0.5)^15 *3^3))) / (((1- 0.5^10))/3^2)))] - [(((0.5)^15 * 3^5))) / (((1- 0.5^12))/3^2)))]))))))))))^1/3

Input:

$$\sqrt[3]{3+-\frac{2\times 64}{-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

More digits

- 12.0012...

This result is very near to the value of black hole entropy 12,19

2 * ((((((3+(2*64)/ -(((([-(((0.5)^15 *3^3))) / (((1- 0.5^10))/3^2)))] - [(((0.5)^15 * 3^5))) / (((1- 0.5^12))/3^2)))]))))))))))^1/3

Input:

$$2\sqrt[3]{3+-\frac{2\times 64}{-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

More digits

- 24.0023...

This value is linked to the "Ramanujan function" (an elliptic modular function that satisfies the need for "conformal symmetry") that has 24 "modes" corresponding to the physical vibrations of a bosonic string.

1/3 * ((((((3+(2*64)/ -(((([-(((0.5)^15 *3^3))) / (((1- 0.5^10))/3^2)))] - [(((0.5)^15 * 3^5))) / (((1- 0.5^12))/3^2)))])))))))))^1/3

Input:

$$\frac{1}{3}\sqrt[3]{3+-\frac{2\times 64}{-\frac{0.5^{15}\times 3^3}{\frac{1-0.5^{10}}{3^2}}-\frac{0.5^{15}\times 3^5}{\frac{1-0.5^{12}}{3^2}}}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- More digits

4.00039...

This result 4,00039 is the minimal possible value of the mass of hypothetical DM particles

Now, we have:

Lemma 10.2.1. *Recall that $f(a, b)$ denotes Ramanujan's ubiquitous general theta function defined in (9.2.1), and that $\varphi(q) = f(q, q)$ and $\psi(q) = f(q, q^3)$. Then*

$$
\begin{aligned}
&-b_1(q)qf(-q^2, q^3) + b_2(q)q^2f(q, -q^4) \\
&- \frac{2q(q^{10}; q^{10})^3_\infty \psi(-q^5)\varphi(q^5)}{\psi(q^5)\varphi(-q^5)f(1, q^{10})}
\end{aligned}
\tag{10.2.1}
$$

and

$$
\begin{aligned}
&2b_1(q)f(-q^4, -q^{16}) - 2b_2(q)f(-q^8, -q^{12}) \\
&= -\frac{2q(q^{10}; q^{10})^3_\infty \varphi(-q^{10})f(1, q^{10})}{\psi(q^5)\varphi(-q^5)\varphi(q^5)},
\end{aligned}
\tag{10.2.2}
$$

where

$$b_1(q) := -\frac{(q^5; q^5)_\infty (q^{10}; q^{10})_\infty f(-q^2, -q^3)}{f(-q^2, -q^8)f(-q, -q^4)} \tag{10.2.3}$$

and

$$b_2(q) := -\frac{(q^5; q^5)_\infty (q^{10}; q^{10})_\infty f(-q, -q^4)}{f(-q^4, -q^6)f(-q^2, -q^3)}. \tag{10.2.4}$$

And in conclusion:

$$
\begin{aligned}
&\frac{G(q)H(q^4)}{H(q^2)H(q)} - \frac{H(q)G(q^4)}{G(q^2)G(q)} \\
&- \frac{G(q)}{H(q)}\left(\frac{H(q)}{G(-q)}\frac{(q; q^2)_\infty}{(q^5; q^{10})_\infty}\right) - \frac{H(q)}{G(q)}\left(\frac{G(q)}{H(-q)}\frac{(q; q^2)_\infty}{(q^5; q^{10})_\infty}\right) \\
&= \frac{(q; q^2)_\infty}{(q^5; q^{10})_\infty}\frac{(G(q)H(-q) - H(q)G(-q))}{G(-q)H(-q)} \\
&- \frac{(q; q^2)_\infty}{(q^5; q^{10})_\infty}\frac{2q\psi(q^{10})}{(q^2; q^2)_\infty}\frac{(-q; -q)_\infty}{(-q^5; -q^5)_\infty},
\end{aligned}
\tag{10.2.9}
$$

We have calculated:

$$\frac{(q; q^2)_\infty}{(q^5; q^{10})_\infty}\frac{2q\psi(q^{10})}{(q^2; q^2)_\infty}\frac{(-q; -q)_\infty}{(-q^5; -q^5)_\infty},$$

From:

$$f_3(q) := \sum_{n=0}^{\infty} \frac{q^{n^2}}{(-q;q)_n^2}, \qquad (2.1.1)$$

$$\phi_3(q) := \sum_{n=0}^{\infty} \frac{q^{n^2}}{(-q^2;q^2)_n}, \qquad (2.1.2)$$

$$\psi_3(q) := \sum_{n=1}^{\infty} \frac{q^{n^2}}{(q;q^2)_n}, \qquad (2.1.3)$$

and

$$\chi_3(q) := \sum_{n=0}^{\infty} \frac{q^{n^2}}{\prod_{j=1}^{n}(1-q^j+q^{2j})}. \qquad (2.1.4)$$

For q = 0.5 we have interpreted and calculated 10.2.9 as follows:

[((0.5)^1)) / (((1- (0.5)^1)))] + [(((0.5)^4))) / ((((1- (0.5)^1))) (((1- (0.5)^3)))]

Input:

$$\frac{0.5^1}{1-0.5^1} + \frac{0.5^4}{(1-0.5^1)(1-0.5^3)}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- More digits
  1.142857142857142857142857142857142857142857142857142...

1 / ((((([((0.5)^5)) / (((1- (0.5)^5)))] + [(((0.5)^10))) / ((((1- (0.5)^5))) (((1- (0.5)^7)))])))))

Input:

$$\frac{1}{\frac{0.5^5}{1-0.5^5} + \frac{0.5^{10}}{(1-0.5^5)(1-0.5^7)}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- More digits
  30.05343511450381679389312977099236641221374045801526717557...

1 / ((((((1+[(0.5)^1)) / (((1+ (0.5)^2)))] + [(((0.5)^4))) / ((((1+ (0.5)^2))) (((1+ (0.5)^4)))])))))

Input:

$$\frac{1}{1+\frac{0.5^1}{1+0.5^2}+\frac{0.5^4}{(1+0.5^2)(1+0.5^4)}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- More digits

0.691056910569105691056910569105691056910569105691056910569...

Open code

((((((1+[(0.5)^1)) / (((1+ (0.5)^2)))] * 1 / (((((1+[(((0.5)^5)))/ (((1+ (0.5)^10)))]))))))

Input:

$$1+\frac{0.5^1}{1+0.5^2}\times\frac{1}{1+\frac{0.5^5}{1+0.5^{10}}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- More digits

1.387890255439924314096499526963103122043519394512771996215...

Open code

(1.142857142857142857142857142857142857*
30.053435114503816793893129770992366641*
0.691056910569105691056910569105691056*
1.387890255439924314096499526963103122)

Input interpretation:

1.142857142857142857142857142857142857 ×
30.053435114503816793893129770992366641 ×
0.691056910569105691056910569105691056 ×
1.387890255439924314096499526963103122

Open code

Result:

- More digits

32.942382603696640483075641439516815601063227214387119177732...

Open code

32.942382603696640483075641439516815601063227214387119177732

From the following expression (see Appendix A), we obtain:

32.942382603696640483075641439516815601063227214387119177732 * [24 * (((0.461538^((24+1)(24+2)/2))) / (((((0.461538^(((24+1)(24+2)/2)+1))))))]

Input interpretation:

$$32.9423826036966404830756414395168156010632272143871191773 2 \left(24 \times \frac{0.461538^{(24+1)\times(24+2)/2}}{0.461538^{(24+1)\times(24+2)/2+1}}\right)$$

Open code

- Result:
  More digits
  1713.005608397833702953636308491182902438190253338383535604...

  Open code

With the value of q = 0.5, we obtain:

32.94238260369664048307564143951681560106322721438711917732 * [26 * (((0.5^((26+1)(26+2)/2))) / (((((0.5^(((26+1)(26+2)/2)+1))))))]

Input interpretation:

$$32.94238260369664048307564143951681560106322721438711917732 \left(26 \times \frac{0.5^{(26+1)\times(26+2)/2}}{0.5^{(26+1)\times(26+2)/2+1}}\right)$$

Open code

Enlarge Data Customize A Plaintext Interactive

- Result:
  More digits
  1713.003895392225305119933354854874411255287815148130197220...

The results 1713.005 and 1713.003 are very near to the mass of candidate glueball $f_0(1710)$ meson.

((((32.94238260369664048307564143951681560106322721438711917732 * 26 * (((0.5^((26+1)(26+2)/2))) / (((((0.5^(((26+1)(26+2)/2)+1))))))]))))^1/3

Input interpretation:

$$\left(32.94238260369664048307564143951681560106322721438711917732 \times 26 \times \frac{0.5^{(26+1)\times(26+2)/2}}{0.5^{(26+1)\times(26+2)/2+1}}\right)^{\wedge}(1/3)$$

Open code

Enlarge Data Customize A Plaintext Interactive

- Result:
  More digits
  11.9652...

This result 11.9652 is very near to the value of black hole entropy 12.19

2*((((32.94238260369664*26*(((0.5^((26+1)(26+2)/2)))/(((((0.5^(((26+1)(26+2)/2)+1))))))]))))^1/3

Input interpretation:

$$2\sqrt[3]{32.94238260369664\times 26\times \frac{0.5^{(26+1)\times(26+2)/2}}{0.5^{(26+1)\times(26+2)/2+1}}}$$

Open code

Result:

- More digits

23.9304...

This value is very near to the value of black hole entropy 23,9078 and is linked to the "Ramanujan function" (an elliptic modular function that satisfies the need for "conformal symmetry") that has 24 "modes" corresponding to the physical vibrations of a bosonic string.

((((32.94238260369664*26*(((0.5^((26+1)(26+2)/2)))/(((((0.5^(((26+1)(26+2)/2)+1))))))]))))^1/15

Input interpretation:

$$\sqrt[15]{32.94238260369664\times 26\times \frac{0.5^{(26+1)\times(26+2)/2}}{0.5^{(26+1)\times(26+2)/2+1}}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Fewer digits
- More digits

1.6427969581762852747041463438734751705780662088482446557427...

1.6427969581762852747041463438734751705780662088482446557427...

Or:

Input interpretation:

$$\sqrt[15]{32.9423826\times 26\times \frac{0.5^{(26+1)\times(26+2)/2}}{0.5^{(26+1)\times(26+2)/2+1}}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Fewer digits
- More digits

1.6427969581639954756311241525052723825731806749219594476666...

1.6427969581639954756311241525052723825731806749219594

$$1.64279 \approx \zeta(2) = \frac{\pi^2}{6} = 1.6449$$

Continued fraction:

- Linear form

$$1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{83+\cfrac{1}{1+\cfrac{1}{78+\cfrac{1}{21+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{18+\cfrac{1}{1+\cfrac{1}{26+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{17+\cfrac{1}{3+\cfrac{1}{2+\cfrac{1}{\dots}}}}}}}}}}}}}}}}}}}}}$$

Open code

Possible closed forms:

- More

$$\frac{30094383}{5831116\,\pi} \approx 1.6427969581639955 1322$$

Enlarge Data Customize A Plaintext Interactive

$$\frac{154\,e^{\pi} - 59\,\pi - 25\log(\pi) + 97\log(2\,\pi) - 1428\tan^{-1}(\pi)}{1050} \approx 1.642796958163995475625037$$

$$\frac{2244149014\,\pi}{4291584557} \approx 1.642796958163995475613276$$

-

We have that:

Lemma 11.3.7. *For* $q \neq 0$,

$$xk(x,q) = m(-qx^4, q^4, -q^{-1}x^{-2}) + q^{-1}x^2 m(-q^{-1}x^4, q^4, -q^{-1}x^{-2}). \tag{11.3.19}$$

Proof. In Theorem 10.6.1 of Chapter 10, set $z = q/x^2$. Now, $B(q/x^2, x, q) = 0$ by (10.6.1). Hence,

$$\begin{aligned} j(-qx^2;q^4)\,(k(x,q)-1/x) &= -P(q/x^2) \\ &= -\frac{1}{2}\sum_{n=-\infty}^{\infty}\frac{q^{2n^2+3n+1}x^{2n-1}}{1-q^{4n+2}/x^2} - \frac{1}{2}\sum_{n=-\infty}^{\infty}\frac{q^{2n^2+3n+1}x^{2n+1}}{1-q^{4n+4}/x^2} \\ &\quad + \frac{1}{2}\sum_{n=-\infty}^{\infty}\frac{q^{2n^2+5n}x^{-2n+1}}{1-q^{4n}x^2} + \frac{1}{2}\sum_{n=-\infty}^{\infty}\frac{q^{2n^2+5n+2}x^{-2n-1}}{1-q^{4n+2}x^2} \\ &= -\sum_{n=-\infty}^{\infty}\frac{q^{2n^2+3n+1}x^{2n-1}}{1-q^{4n+2}/x^2} - \sum_{n=-\infty}^{\infty}\frac{q^{2n^2+3n+1}x^{2n+1}}{1-q^{4n+4}/x^2}, \end{aligned}$$

For q = 0,5 x = 0,8 n = 2, we obtain:

-(0.5^15 * 0.8^3)/(((1-0.5^10)/0.8^2))) - (0.5^15 * 0.8^5)/(((1-0.5^12)/0.8^2)))

Input:

$$-\frac{0.5^{15}\times 0.8^3}{\frac{1-0.5^{10}}{0.8^2}} - \frac{0.5^{15}\times 0.8^5}{\frac{1-0.5^{12}}{0.8^2}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- More digits

−0.000016411338052628375209020370310692891338052628375209020...

Open code

10^5 * -[-(0.5^15 *0.8^3)/(((1-0.5^10)/0.8^2))-(0.5^15*0.8^5)/(((1-0.5^12)/0.8^2)))]

Input:

$$10^5 \times (-1)\left(-\frac{0.5^{15}\times 0.8^3}{\frac{1-0.5^{10}}{0.8^2}} - \frac{0.5^{15}\times 0.8^5}{\frac{1-0.5^{12}}{0.8^2}}\right)$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- More digits

1.641133805262837520902037031069289133805262837520902037031...

1.641133805262837520902037031069289133805262837520902037031

$1.64113 \approx \zeta(2) = \frac{\pi^2}{6} = 1.6449$

colog -[-(0.5^15*0.8^3)/(((1-0.5^10)/0.8^2))-(0.5^15*0.8^5)/(((1-0.5^12)/0.8^2)))]

Input:

$$-\log\left(-\left(-\frac{0.5^{15}\times 0.8^3}{\frac{1-0.5^{10}}{0.8^2}} - \frac{0.5^{15}\times 0.8^5}{\frac{1-0.5^{12}}{0.8^2}}\right)\right)$$

Open code

- $\log(x)$ is the natural logarithm

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Result:

- More digits

11.0175...

Series representations:

- More

$$-\log\left(-\left(-\frac{0.5^{15}\times 0.8^3}{\frac{1-0.5^{10}}{0.8^2}} - \frac{0.5^{15}\times 0.8^5}{\frac{1-0.5^{12}}{0.8^2}}\right)\right) = \sum_{k=1}^{\infty} \frac{(-1)^k (-0.999984)^k}{k}$$

Open code

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$$-\log\left(-\left(-\frac{0.5^{15}\times 0.8^3}{\frac{1-0.5^{10}}{0.8^2}} - \frac{0.5^{15}\times 0.8^5}{\frac{1-0.5^{12}}{0.8^2}}\right)\right) = -2 i \pi \left\lfloor \frac{\arg(0.0000164113 - x)}{2\pi} \right\rfloor - \log(x) + \sum_{k=1}^{\infty} \frac{(-1)^k (0.0000164113 - x)^k x^{-k}}{k} \quad \text{for } x < 0$$

Open code

$$-\log\left(-\left(-\frac{0.5^{15}\times 0.8^3}{\frac{1-0.5^{10}}{0.8^2}} - \frac{0.5^{15}\times 0.8^5}{\frac{1-0.5^{12}}{0.8^2}}\right)\right) = -\left\lfloor \frac{\arg(0.0000164113 - z_0)}{2\pi} \right\rfloor \log\left(\frac{1}{z_0}\right) - \log(z_0) - \left\lfloor \frac{\arg(0.0000164113 - z_0)}{2\pi} \right\rfloor \log(z_0) + \sum_{k=1}^{\infty} \frac{(-1)^k (0.0000164113 - z_0)^k z_0^{-k}}{k}$$

Open code

Integral representation:

$$-\log\left(-\left(-\frac{0.5^{15}\times 0.8^3}{\frac{1-0.5^{10}}{0.8^2}}-\frac{0.5^{15}\times 0.8^5}{\frac{1-0.5^{12}}{0.8^2}}\right)\right) = -\int_1^{0.0000164113} \frac{1}{t}\,dt$$

((sqrt(5)+1)/2))*colog-[-(0.5^15*0.8^3)/(((1-0.5^10)/0.8^2)))-(0.5^15*0.8^5)/(((1-0.5^12)/0.8^2)))]

Input:

$$\left(\frac{1}{2}\left(\sqrt{5}+1\right)\right)\left(-\log\left(-\left(-\frac{0.5^{15}\times 0.8^3}{\frac{1-0.5^{10}}{0.8^2}}-\frac{0.5^{15}\times 0.8^5}{\frac{1-0.5^{12}}{0.8^2}}\right)\right)\right)$$

Open code

- $\log(x)$ is the natural logarithm

Enlarge Data Customize A Plaintext Interactive

Result:

- More digits

17.8268...

Series representations:

- More

$$\frac{1}{2}\left(-\log\left(-\left(-\frac{0.5^{15}\times 0.8^3}{\frac{1-0.5^{10}}{0.8^2}}-\frac{0.5^{15}\times 0.8^5}{\frac{1-0.5^{12}}{0.8^2}}\right)\right)\right)\left(\sqrt{5}+1\right) = \frac{1}{2}\left(\sum_{k=1}^{\infty}\frac{(-1)^k(-0.999984)^k}{k}\right)\left(1+\sqrt{4}\sum_{k=0}^{\infty}4^{-k}\binom{\frac{1}{2}}{k}\right)$$

Open code

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$$\frac{1}{2}\left(-\log\left(-\left(-\frac{0.5^{15}\times 0.8^3}{\frac{1-0.5^{10}}{0.8^2}}-\frac{0.5^{15}\times 0.8^5}{\frac{1-0.5^{12}}{0.8^2}}\right)\right)\right)\left(\sqrt{5}+1\right) = \frac{1}{2}\left(\sum_{k=1}^{\infty}\frac{(-1)^k(-0.999984)^k}{k}\right)\left(1+\sqrt{4}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{4}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)$$

Open code

$$\frac{1}{2}\left(-\log\left(-\left(-\frac{0.5^{15}\times 0.8^3}{\frac{1-0.5^{10}}{0.8^2}}-\frac{0.5^{15}\times 0.8^5}{\frac{1-0.5^{12}}{0.8^2}}\right)\right)\right)\left(\sqrt{5}+1\right)=$$

$$-\frac{\log(0.0000164113)}{2}-\frac{1}{2}\exp\left(i\pi\left\lfloor\frac{\arg(5-x)}{2\pi}\right\rfloor\right)\log(0.0000164113)$$

$$\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(5-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\quad \text{for } (x\in\mathbb{R} \text{ and } x<0)$$

Integral representation:

$$\frac{1}{2}\left(-\log\left(-\left(-\frac{0.5^{15}\times 0.8^3}{\frac{1-0.5^{10}}{0.8^2}}-\frac{0.5^{15}\times 0.8^5}{\frac{1-0.5^{12}}{0.8^2}}\right)\right)\right)\left(\sqrt{5}+1\right)=-\frac{1}{2}\left(1+\sqrt{5}\right)\int_1^{0.0000164113}\frac{1}{t}\,dt$$

Open code

This result 17,8268 is very near to the value of black hole entropy 17,7715

10^2 * 1.5849 * colog -[-(0.5^15*0.8^3)/(((1-0.5^10)/0.8^2)))-(0.5^15* 0.8^5)/(((1-0.5^12)/0.8^2)))]

Input interpretation:

$$10^2\times 1.5849\left(-\log\left(-\left(-\frac{0.5^{15}\times 0.8^3}{\frac{1-0.5^{10}}{0.8^2}}-\frac{0.5^{15}\times 0.8^5}{\frac{1-0.5^{12}}{0.8^2}}\right)\right)\right)$$

Open code

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- $\log(x)$ is the natural logarithm

Result:

- More digits

1746.17...

Series representations:

- More

$$(10^2\times 1.5849)(-1)\log\left(-\left(-\frac{0.5^{15}\times 0.8^3}{\frac{1-0.5^{10}}{0.8^2}}-\frac{0.5^{15}\times 0.8^5}{\frac{1-0.5^{12}}{0.8^2}}\right)\right)=$$

$$158.49\sum_{k=1}^{\infty}\frac{(-1)^k(-0.999984)^k}{k}$$

Open code

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$$(10^2 \times 1.5849)(-1)\log\left(-\left(-\frac{0.5^{15}\times 0.8^3}{\frac{1-0.5^{10}}{0.8^2}} - \frac{0.5^{15}\times 0.8^5}{\frac{1-0.5^{12}}{0.8^2}}\right)\right) = -316.98\, i\, \pi \left\lfloor \frac{\arg(0.0000164113 - x)}{2\pi} \right\rfloor - 158.49\log(x) + 158.49 \sum_{k=1}^{\infty} \frac{(-1)^k (0.0000164113 - x)^k x^{-k}}{k} \quad \text{for } x < 0$$

Open code

$$(10^2 \times 1.5849)(-1)\log\left(-\left(-\frac{0.5^{15}\times 0.8^3}{\frac{1-0.5^{10}}{0.8^2}} - \frac{0.5^{15}\times 0.8^5}{\frac{1-0.5^{12}}{0.8^2}}\right)\right) = -158.49 \left\lfloor \frac{\arg(0.0000164113 - z_0)}{2\pi} \right\rfloor \log\left(\frac{1}{z_0}\right) - 158.49\log(z_0) - 158.49 \left\lfloor \frac{\arg(0.0000164113 - z_0)}{2\pi} \right\rfloor \log(z_0) + 158.49 \sum_{k=1}^{\infty} \frac{(-1)^k (0.0000164113 - z_0)^k z_0^{-k}}{k}$$

Integral representation:

$$(10^2 \times 1.5849)(-1)\log\left(-\left(-\frac{0.5^{15}\times 0.8^3}{\frac{1-0.5^{10}}{0.8^2}} - \frac{0.5^{15}\times 0.8^5}{\frac{1-0.5^{12}}{0.8^2}}\right)\right) = -158.49 \int_1^{0.0000164113} \frac{1}{t}\, dt$$

This result 1746,17 is in the range of the mass of pseudo-scalar meson Eta (1760) 1751±15; 1744±10±15 J/ψ → γωω. Indeed: 1747,5 is the mean of values. Furthermore this result is also very near to the mass of candidate glueball $f_0(1710)$ meson.

10^2 * (Pi/2) * colog -[-(0.5^15*0.8^3)/(((1-0.5^10)/0.8^2))-(0.5^15* 0.8^5)/(((1-0.5^12)/0.8^2)))]

Input:

$$10^2 \times \frac{\pi}{2}\left(-\log\left(-\left(-\frac{0.5^{15}\times 0.8^3}{\frac{1-0.5^{10}}{0.8^2}} - \frac{0.5^{15}\times 0.8^5}{\frac{1-0.5^{12}}{0.8^2}}\right)\right)\right)$$

Open code

- $\log(x)$ is the natural logarithm

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Result:

- More digits

1730.63...

Series representations:

- More

$$\frac{1}{2}\left(10^2\left(-\log\left(-\left(-\frac{0.5^{15}\times 0.8^3}{\frac{1-0.5^{10}}{0.8^2}}-\frac{0.5^{15}\times 0.8^5}{\frac{1-0.5^{12}}{0.8^2}}\right)\right)\right)\right)\pi = 50\,\pi\sum_{k=1}^{\infty}\frac{(-1)^k\,(-0.999984)^k}{k}$$

Open code

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$$\frac{1}{2}\left(10^2\left(-\log\left(-\left(-\frac{0.5^{15}\times 0.8^3}{\frac{1-0.5^{10}}{0.8^2}}-\frac{0.5^{15}\times 0.8^5}{\frac{1-0.5^{12}}{0.8^2}}\right)\right)\right)\right)\pi = -100\,i\,\pi^2\left\lfloor\frac{\arg(0.0000164113-x)}{2\,\pi}\right\rfloor - 50\,\pi\log(x) + 50\,\pi\sum_{k=1}^{\infty}\frac{(-1)^k\,(0.0000164113-x)^k\,x^{-k}}{k} \quad \text{for } x<0$$

Open code

$$\frac{1}{2}\left(10^2\left(-\log\left(-\left(-\frac{0.5^{15}\times 0.8^3}{\frac{1-0.5^{10}}{0.8^2}}-\frac{0.5^{15}\times 0.8^5}{\frac{1-0.5^{12}}{0.8^2}}\right)\right)\right)\right)\pi = -100\,i\,\pi^2\left\lfloor-\frac{-\pi+\arg\left(\frac{0.0000164113}{z_0}\right)+\arg(z_0)}{2\,\pi}\right\rfloor - 50\,\pi\log(z_0) + 50\,\pi\sum_{k=1}^{\infty}\frac{(-1)^k\,(0.0000164113-z_0)^k\,z_0^{-k}}{k}$$

Integral representation:

$$\frac{1}{2}\left(10^2\left(-\log\left(-\left(-\frac{0.5^{15}\times 0.8^3}{\frac{1-0.5^{10}}{0.8^2}}-\frac{0.5^{15}\times 0.8^5}{\frac{1-0.5^{12}}{0.8^2}}\right)\right)\right)\right)\pi = -50\,\pi\int_1^{0.0000164113}\frac{1}{t}\,dt$$

This result 1730,63 is very near to the mass of candidate glueball $f_0(1710)$ meson

(((((10^2 * (Pi/2) * colog -[-(0.5^15 * 0.8^3)/(((1-0.5^10)/0.8^2)) - (0.5^15 * 0.8^5)/(((1-0.5^12)/0.8^2)))])))))^1/15

Input:

$$\sqrt[15]{10^2 \times \frac{\pi}{2} \left(-\log\left(-\left(-\frac{0.5^{15} \times 0.8^3}{\frac{1-0.5^{10}}{0.8^2}} - \frac{0.5^{15} \times 0.8^5}{\frac{1-0.5^{12}}{0.8^2}}\right)\right)\right)}$$

Open code

- $\log(x)$ is the natural logarithm

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Result:

- More digits

1.643919...

This result is also very near to the Hausdorff dimension 1,6402. Furthermore:

$$1.643919 \approx \zeta(2) = \frac{\pi^2}{6} = 1.6449$$

-8 + Pi^4/(89) * (((((10^2 * colog -[-(0.5^15 * 0.8^3)/(((1-0.5^10)/0.8^2))) - (0.5^15 * 0.8^5)/(((1-0.5^12)/0.8^2)))])))))

Input:

$$-8 + \frac{\pi^4}{89} \left(10^2 \left(-\log\left(-\left(-\frac{0.5^{15} \times 0.8^3}{\frac{1-0.5^{10}}{0.8^2}} - \frac{0.5^{15} \times 0.8^5}{\frac{1-0.5^{12}}{0.8^2}}\right)\right)\right)\right)$$

Open code

- $\log(x)$ is the natural logarithm

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Result:

- More digits

1197.85...

Series representations:

- More

$$-8 + \frac{1}{89} \left(10^2 \left(-\log\left(-\left(-\frac{0.5^{15} \times 0.8^3}{\frac{1-0.5^{10}}{0.8^2}} - \frac{0.5^{15} \times 0.8^5}{\frac{1-0.5^{12}}{0.8^2}}\right)\right)\right)\right) \pi^4 =$$

$$-8 + \frac{100}{89} \pi^4 \sum_{k=1}^{\infty} \frac{(-1)^k (-0.999984)^k}{k}$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$-8+\frac{1}{89}\left(10^2\left(-\log\left(-\left(-\frac{0.5^{15}\times 0.8^3}{\frac{1-0.5^{10}}{0.8^2}}-\frac{0.5^{15}\times 0.8^5}{\frac{1-0.5^{12}}{0.8^2}}\right)\right)\right)\right)\pi^4 =$$

$$-8-\frac{100}{89}\pi^4\left(\log(z_0)+\left\lfloor\frac{\arg(0.0000164113-z_0)}{2\pi}\right\rfloor\left(\log\left(\frac{1}{z_0}\right)+\log(z_0)\right)-\sum_{k=1}^{\infty}\frac{(-1)^k(0.0000164113-z_0)^k z_0^{-k}}{k}\right)$$

Open code

$$-8+\frac{1}{89}\left(10^2\left(-\log\left(-\left(-\frac{0.5^{15}\times 0.8^3}{\frac{1-0.5^{10}}{0.8^2}}-\frac{0.5^{15}\times 0.8^5}{\frac{1-0.5^{12}}{0.8^2}}\right)\right)\right)\right)\pi^4 =$$

$$-8-\frac{200}{89}i\pi^5\left\lfloor\frac{\arg(0.0000164113-x)}{2\pi}\right\rfloor-\frac{100}{89}\pi^4\log(x)+\frac{100}{89}\pi^4\sum_{k=1}^{\infty}\frac{(-1)^k(0.0000164113-x)^k x^{-k}}{k}\quad\text{for } x<0$$

Integral representation:

$$-8+\frac{1}{89}\left(10^2\left(-\log\left(-\left(-\frac{0.5^{15}\times 0.8^3}{\frac{1-0.5^{10}}{0.8^2}}-\frac{0.5^{15}\times 0.8^5}{\frac{1-0.5^{12}}{0.8^2}}\right)\right)\right)\right)\pi^4 =$$

$$-8-\frac{100\pi^4}{89}\int_1^{0.0000164113}\frac{1}{t}\,dt$$

This result is practically equal to the rest mass of Sigma baryon 1197.449±0.030

And:

((((((((((-8 + Pi^4/(89) * (((((10^2 * colog -[-(0.5^15 * 0.8^3)/(((1-0.5^10)/0.8^2))) - (0.5^15 * 0.8^5)/(((1-0.5^12)/0.8^2)))])))))))))))))^1/14

Input:

$$\sqrt[14]{-8+\frac{\pi^4}{89}\left(10^2\left(-\log\left(-\left(-\frac{0.5^{15}\times 0.8^3}{\frac{1-0.5^{10}}{0.8^2}}-\frac{0.5^{15}\times 0.8^5}{\frac{1-0.5^{12}}{0.8^2}}\right)\right)\right)\right)}$$

Open code

- $\log(x)$ is the natural logarithm

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Result:

- More digits

1.659151...

where 1,659151 is very near to the 14th root of the following Ramanujan's class invariant $Q = (G_{505}/G_{101/5})^3 = 1164,2696$ i.e. 1,65578...

Furthermore:

(((((((((-8 + Pi^4/(89) * (((((10^2 * colog -[-(0.5^15 * 0.8^3)/(((1-0.5^10)/0.8^2))) - (0.5^15 * 0.8^5)/(((1-0.5^12)/0.8^2)))])))))))))))))^1/15

Input:

$$\sqrt[15]{-8 + \frac{\pi^4}{89}\left(10^2\left(-\log\left(-\left(-\frac{0.5^{15}\times 0.8^3}{\frac{1-0.5^{10}}{0.8^2}} - \frac{0.5^{15}\times 0.8^5}{\frac{1-0.5^{12}}{0.8^2}}\right)\right)\right)\right)}$$

Open code

- $\log(x)$ is the natural logarithm

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Result:

- More digits

1.604083...

This result is very near to the electric charge of positron.

Now, we have that:

$$\varphi(-q) := \sum_{n=-\infty}^{\infty} (-1)^n q^{n^2} = \frac{(q;q)_\infty}{(-q;q)_\infty}, \qquad (3.1.14)$$

$$\psi(q) := \sum_{n=0}^{\infty} q^{n(n+1)/2} = \frac{(q^2;q^2)_\infty}{(q;q^2)_\infty}, \qquad (3.1.15)$$

Entry 11.1.1. *In the notation above,*

$$\phi_{10}(q) - q^{-1}\psi_{10}(-q^4) + q^{-2}\chi_{10}(q^8) = \frac{\varphi(q)h(-q^2)}{\psi(-q)}, \tag{11.1.1}$$

where $h(q)$ is defined by

$$h(q) := \sum_{n=-\infty}^{\infty} (-1)^n q^{n(5n+3)/2}. \tag{11.1.2}$$

Entry 11.1.2. *In the notation above,*

$$\psi_{10}(q) + q\phi_{10}(-q^4) + q^{-2}X_{10}(q^8) = \frac{\varphi(q)g(-q^2)}{\psi(-q)}, \tag{11.1.3}$$

where $g(q)$ is defined by

$$g(q) := \sum_{n=-\infty}^{\infty} (-1)^n q^{n(5n+1)/2}. \tag{11.1.4}$$

For $\varphi(-q) = (-1)^n q^{n\^2} = 0.5^4 = 0.0625$; $\varphi(q) = 0.0625 = 1/16$

$\psi(q) = q^{n(n+1)/2} = 0.5^3 = 0.125 = 1/8$; $\psi(-q) = -q^{n(n+1)/2} = -0.5^3 = -0.125$;

$h(q) = q^{n(5n+3)/2} = 0.5^{13} = 0{,}0001220703125 = 1/8192$

$g(q) = q^{n(5n+1)/2} = 0.5^{11} = 0{,}00048828125 = 1/2048$

We note that 2048 = 4096/2 and 8192 = 4096*2 where $4096 = 64^2$

We first address Entry 11.1.2.

Proof. By Lemmas 11.4.1–11.4.3,

$$\begin{aligned}\psi_{10}(q) + q\phi_{10}(-q^4) + X_{10}(q^8) &= -m(q^3, q^{10}, q) - m(q^3, q^{10}, q^3) \\ &\quad + q\left(q^{-4}m(-q^4, q^{40}, -q^4) + q^{-4}m(-q^4, q^{40}, q^8)\right) \\ &\quad + m(-q^{16}, q^{40}, q^8) + m(-q^{16}, q^{40}, q^{32}). \end{aligned} \tag{11.4.16}$$

By (11.3.3) and (11.3.1),

$$m(q^3, q^{10}, q) = m(q^3, q^{10}, q^{-4}) = m(q^3, q^{10}, q^6). \tag{11.4.17}$$

By (11.3.3) and (11.3.1),

$$m(q^3, q^{10}, q^3) = m(q^3, q^{10}, q^{-6}) = m(q^3, q^{10}, q^4). \tag{11.4.18}$$

By (11.3.1),

$$m(-q^{16}, q^{40}, q^{-8}) = m(-q^{16}, q^{40}, q^{32}). \tag{11.4.19}$$

By (11.3.2),

$$q^{-3}m(-q^4, q^{40}, -q^4) = -q^{-7}m(-q^{-4}, q^{40}, -q^{-4}) \tag{11.4.20}$$

and

$$q^{-3}m(-q^4, q^{40}, q^8) = -q^{-7}m(-q^4, q^{40}, q^{-8}). \tag{11.4.21}$$

Now, in (11.4.16), we do not alter $m(-q^{16}, q^{40}, q^8)$, but we do replace each of the five remaining m-functions by the expressions given in (11.4.17)–(11.4.21). Accordingly, we deduce that

$$\begin{aligned}&\psi_{10}(q) + q\phi_{10}(-q^4) + X_{10}(q^8) \\ &\quad = \left(-m(q^3, q^{10}, q^6) + m(-q^{16}, q^{40}, q^{-8}) - q^{-7}m(-q^{-4}, q^{40}, q^{-8})\right) \\ &\qquad + \left(-m(q^3, q^{10}, q^4) + m(-q^{16}, q^{40}, q^8) - q^{-7}m(-q^{-4}, q^{40}, q^8)\right) \\ &\quad = -D(q^3, q^{10}, q^6, q^{-8}) - D(q^3, q^{10}, q^4, q^8), \end{aligned} \tag{11.4.22}$$

by (11.3.31). We now apply Lemma 11.3.11 and the Jacobi triple product identity (11.1.6) many times to find that

$$\begin{aligned}&\psi_{10}(q) + q\phi_{10}(-q^4) + X_{10}(q^8) \\ &= \frac{(q^{20}; q^{20})_\infty^3 j(-q^{14}; q^{20}) j(q^{20}; q^{40})}{j(q; q^{10}) j(q^8; q^{40}) j(-q^8; q^{20}) j(q^6; q^{20})} \\ &\quad + \frac{q(q^{20}; q^{20})_\infty^3 j(-q^{18}; q^{20}) j(q^{20}; q^{40})}{j(q^7; q^{10}) j(q^8; q^{40}) j(-q^4; q^{20}) j(q^6; q^{20})} \\ &= \frac{(q^{20}; q^{20})_\infty^3 j(q^{20}; q^{40})}{j(q^8; q^{40}) j(q^6; q^{20}) j(q; q^{10}) j(q^7; q^{10}) j(-q^4; q^{20}) j(-q^8; q^{20})} \\ &\quad \times \left(j(-q^{14}; q^{20}) j(q^7; q^{10}) j(-q^4; q^{20}) + q j(-q^{18}; q^{20}) j(q; q^{10}) j(-q^8; q^{20})\right) \\ &= \frac{(q^{20}; q^{20})_\infty^5 j(q^{20}; q^{40})}{(q^{10}; q^{10})_\infty j(q^8; q^{40}) j(q^6; q^{20}) j(q; q^{10}) j(q^7; q^{10}) j(-q^4; q^{20}) j(-q^8; q^{20})} \end{aligned}$$

$$\times\left(j(-q^4;q^{10})j(q^7;q^{10})+qj(-q^8;q^{10})j(q;q^{10})\right)$$
$$=\frac{(q^{20};q^{20})^5_\infty j(q^{20};q^{40})j(-q;-q^5)j(-q^3;-q^5)}{(q^{10};q^{10})_\infty j(q^8;q^{40})j(q^6;q^{20})j(q;q^{10})j(q^7;q^{10})j(-q^4;q^{20})j(-q^8;q^{20})}, \tag{11.4.23}$$

where we applied Lemma 6.3.2 with $x=-q$, $y=-q^3$, and q replaced by $-q^5$. We are now faced with the laborious task of applying the Jacobi triple product identity (11.1.6) to each of the j-functions on the far right side of (11.4.23) and simplifying. Using (11.1.4) and the familiar product representations

$$\varphi(q)=(-q;q^2)^2_\infty(q^2;q^2)_\infty \quad \text{and} \quad \psi(q)=\frac{(q^2;q^2)_\infty}{(q;q^2)_\infty}, \tag{11.4.24}$$

respectively, from (3.1.14) (or (5.1.1)) and (3.1.15), we eventually reduce the right-hand side of (11.4.23) to

$$\frac{\varphi(q)g(-q^2)}{\psi(-q)},$$

and so the proof of Entry 11.1.2 is complete. □

Now:

$$\frac{\varphi(q)g(-q^2)}{\psi(-q)},$$

From the previous expressions:

$g(q) = q^{n(5n+1)/2} = 0.5^{11} = 0{,}00048828125;$

$\varphi(-q) = (-1)^n q^{n\text{^}2} = 0.5^4 = 0.0625$; $\varphi(q) = 0.0625$

$\psi(q) = q^{n(n+1)/2} = 0.5^3 = 0.125 = 1/8$; $\psi(-q) = -q^{n(n+1)/2} = -0.5^3 = -0.125$;

we obtain:

((0.0625 * (-0.00048828125)^2)) / (-0.125)

((0.0625 * (-0.00048828125)^2)) / (-0.125)

Input interpretation:

$$-\frac{0.0625\,(-0.00048828125)^2}{0.125}$$

Open code

Enlarge Data Customize A Plaintext Interactive
Result:
$-1.1920928955078125\times10^{-7}$

Rational form:
$$-\frac{1}{8\,388\,608}$$

Where 8388608 = 64^3 * 32

Indeed:

Input interpretation:
$$\frac{1}{-\frac{0.0625\,(-0.00048828125)^2}{0.125}}$$
Open code

Enlarge Data Customize A Plaintext Interactive
Result:
$-8\,388\,608$

Now:

ln -[1/ ((((0.0625 * (-0.00048828125)^2)) / (-0.125))))]

Input interpretation:
$$\log\left(-\frac{1}{-\frac{0.0625\,(-0.00048828125)^2}{0.125}}\right)$$
Open code

- $\log(x)$ is the natural logarithm

Enlarge Data Customize A Plaintext Interactive
Result:
- More digits

$15.94239\ldots$

Series representations:
- More

$$\log\left(-\frac{1}{-\frac{0.0625\,(-0.000488281)^2}{0.125}}\right)=\log(8.38861\times10^6)-\sum_{k=1}^{\infty}\frac{(-1)^k\,e^{-15.9424\,k}}{k}$$
Open code

Enlarge Data Customize A Plaintext Interactive

$$\log\left(-\frac{1}{-\frac{0.0625\,(-0.000488281)^2}{0.125}}\right) = 2\,i\,\pi\left\lfloor\frac{\arg(8.38861\times10^6 - x)}{2\,\pi}\right\rfloor + \log(x) - \sum_{k=1}^{\infty}\frac{(-1)^k\,(8.38861\times10^6 - x)^k\,x^{-k}}{k} \quad \text{for } x < 0$$

Open code

$$\log\left(-\frac{1}{-\frac{0.0625\,(-0.000488281)^2}{0.125}}\right) = \left\lfloor\frac{\arg(8.38861\times10^6 - z_0)}{2\,\pi}\right\rfloor \log\left(\frac{1}{z_0}\right) + \log(z_0) + \left\lfloor\frac{\arg(8.38861\times10^6 - z_0)}{2\,\pi}\right\rfloor \log(z_0) - \sum_{k=1}^{\infty}\frac{(-1)^k\,(8.38861\times10^6 - z_0)^k\,z_0^{-k}}{k}$$

Integral representations:

$$\log\left(-\frac{1}{-\frac{0.0625\,(-0.000488281)^2}{0.125}}\right) = \int_1^{8.38861\times10^6}\frac{1}{t}\,dt$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$\log\left(-\frac{1}{-\frac{0.0625\,(-0.000488281)^2}{0.125}}\right) = \frac{1}{2\,i\,\pi}\int_{-i\,\infty+\gamma}^{i\,\infty+\gamma}\frac{e^{-15.9424\,s}\,\Gamma(-s)^2\,\Gamma(1+s)}{\Gamma(1-s)}\,ds \quad \text{for } -1 < \gamma < 0$$

Open code

27 * 4 ln -[1/ ((((0.0625 * (-0.00048828125)^2)) / (-0.125))))]

Input interpretation:

$$27\times4\log\left(-\frac{1}{-\frac{0.0625\,(-0.00048828125)^2}{0.125}}\right)$$

Open code

- $\log(x)$ is the natural logarithm

Enlarge Data Customize A Plaintext Interactive

Result:

- More digits

1721.778...

This result is very near to the mass of candidate glueball $f_0(1710)$ meson.

Series representations:

- More

$$27\times 4\log\left(-\frac{1}{-\frac{0.0625(-0.000488281)^2}{0.125}}\right) = 108\log\left(8.38861\times 10^6\right) - 108\sum_{k=1}^{\infty}\frac{(-1)^k e^{-15.9424 k}}{k}$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$27\times 4\log\left(-\frac{1}{-\frac{0.0625(-0.000488281)^2}{0.125}}\right) = 216 i\pi\left\lfloor\frac{\arg(8.38861\times 10^6 - x)}{2\pi}\right\rfloor + 108\log(x) - 108\sum_{k=1}^{\infty}\frac{(-1)^k (8.38861\times 10^6 - x)^k x^{-k}}{k} \quad \text{for } x < 0$$

Open code

$$27\times 4\log\left(-\frac{1}{-\frac{0.0625(-0.000488281)^2}{0.125}}\right) = 108\left\lfloor\frac{\arg(8.38861\times 10^6 - z_0)}{2\pi}\right\rfloor\log\left(\frac{1}{z_0}\right) + 108\log(z_0) + 108\left\lfloor\frac{\arg(8.38861\times 10^6 - z_0)}{2\pi}\right\rfloor\log(z_0) - 108\sum_{k=1}^{\infty}\frac{(-1)^k (8.38861\times 10^6 - z_0)^k z_0^{-k}}{k}$$

Integral representations:

$$27\times 4\log\left(-\frac{1}{-\frac{0.0625(-0.000488281)^2}{0.125}}\right) = 108\int_1^{8.38861\times 10^6}\frac{1}{t}\,dt$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$27\times 4\log\left(-\frac{1}{-\frac{0.0625(-0.000488281)^2}{0.125}}\right) = \frac{54}{i\pi}\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{e^{-15.9424 s}\,\Gamma(-s)^2\,\Gamma(1+s)}{\Gamma(1-s)}\,ds \quad \text{for } -1 < \gamma < 0$$

(((((27 * 4 ln -[1/ ((((0.0625 * (-0.00048828125)^2)) / (-0.125)))])))))^1/3

Input interpretation:

$$\sqrt[3]{27\times 4\log\left(-\frac{1}{-\frac{0.0625(-0.00048828125)^2}{0.125}}\right)}$$

Open code

- $\log(x)$ is the natural logarithm

Enlarge Data Customize A Plaintext Interactive

Result:

- More digits

11.98558...

This result 11,985 is very near to the values of black hole entropies 11,8458 and 12,1904

2 * (((((27 * 4 ln -[1/ ((((0.0625 * (-0.00048828125)^2)) / (-0.125))))]))))))^1/3

Input interpretation:

$$2\sqrt[3]{27\times 4\log\left(-\frac{1}{-\frac{0.0625\,(-0.00048828125)^2}{0.125}}\right)}$$

Open code

- $\log(x)$ is the natural logarithm

Enlarge Data Customize A Plaintext Interactive

Result:

- More digits

23.97116...

Series representations:

- More

$$2\sqrt[3]{27\times 4\log\left(-\frac{1}{-\frac{0.0625\,(-0.000488281)^2}{0.125}}\right)} = 6\times 2^{2/3}\sqrt[3]{\log\left(8.38861\times 10^6\right)-\sum_{k=1}^{\infty}\frac{(-1)^k\, e^{-15.9424\,k}}{k}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$2\sqrt[3]{27\times 4\log\left(-\frac{1}{-\frac{0.0625\,(-0.000488281)^2}{0.125}}\right)} = 6\times 2^{2/3}\sqrt[3]{2\,i\,\pi\left\lfloor\frac{\arg\left(8.38861\times 10^6-x\right)}{2\,\pi}\right\rfloor+\log(x)-\sum_{k=1}^{\infty}\frac{(-1)^k\left(8.38861\times 10^6-x\right)^k x^{-k}}{k}} \quad \text{for } x<0$$

Open code

$$2\sqrt[3]{27\times 4\log\left(-\frac{1}{-\frac{0.0625\,(-0.000488281)^2}{0.125}}\right)} =$$

$$6\times 2^{2/3}\left(\log(z_0)+\left\lfloor\frac{\arg(8.38861\times 10^6 - z_0)}{2\pi}\right\rfloor\left(\log\left(\frac{1}{z_0}\right)+\log(z_0)\right)-\sum_{k=1}^{\infty}\frac{(-1)^k\,(8.38861\times 10^6 - z_0)^k\,z_0^{-k}}{k}\right)\text{^}(1/3)$$

Integral representations:

$$2\sqrt[3]{27\times 4\log\left(-\frac{1}{-\frac{0.0625\,(-0.000488281)^2}{0.125}}\right)} = 6\times 2^{2/3}\sqrt[3]{\int_1^{8.38861\times 10^6}\frac{1}{t}\,dt}$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$2\sqrt[3]{27\times 4\log\left(-\frac{1}{-\frac{0.0625\,(-0.000488281)^2}{0.125}}\right)} =$$

$$6\sqrt[3]{2}\sqrt[3]{\frac{1}{i\pi}\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{e^{-15.9424\,s}\,\Gamma(-s)^2\,\Gamma(1+s)}{\Gamma(1-s)}\,ds}\quad \text{for } -1<\gamma<0$$

This value is linked to the "Ramanujan function" (an elliptic modular function that satisfies the need for "conformal symmetry") that has 24 "modes" corresponding to the physical vibrations of a bosonic string and to the value of black hole entropy 23,9078

Now:

We next turn to the proof of Entry 11.1.1.

Proof. By Lemmas 11.4.1, 11.4.2, and 11.4.5,

$$\begin{aligned}\phi_{10}(q) - q^{-1}\psi_{10}(-q^4) + q^{-2}\chi_{10}(q^8) &= -q^{-1}m(q, q^{10}, q) - q^{-1}m(q, q^{10}, q^2)\\ &\quad - q^{-1}\left(-m(-q^{12}, q^{40}, -q^4) - m(-q^{12}, q^{40}, -q^{12})\right)\\ &\quad + q^{-2}\left(m(-q^8, q^{40}, q^{16}) + m(-q^8, q^{40}, q^{24})\right). \end{aligned} \tag{11.4.25}$$

By (11.3.3) and (11.3.1),

$$m(q, q^{10}, q) = m(q, q^{10}, q^{-2}) = m(q, q^{10}, q^8). \tag{11.4.26}$$

By (11.3.3),

$$m(-q^{12}, q^{40}, -q^{12}) = m(-q^{12}, q^{40}, q^{-24}), \tag{11.4.27}$$

and

$$m(-q^{12}, q^{40}, -q^4) = m(-q^{12}, q^{40}, q^{-16}). \tag{11.4.28}$$

By (11.3.2),

$$q^{-2}m(-q^8, q^{40}, q^{16}) = -q^{-10}m(-q^{-8}, q^{40}, q^{-16}) \tag{11.4.29}$$

and

$$q^{-2}m(-q^8, q^{40}, q^{24}) = -q^{-10}m(-q^{-8}, q^{40}, q^{-24}). \tag{11.4.30}$$

Now in (11.4.25) we do not alter $m(q, q^{10}, q^2)$, but we do replace the other five m-functions with (11.4.26)–(11.4.30). We thus obtain

$$
\begin{aligned}
&\phi_{10}(q) - q^{-1}\psi_{10}(-q^4) + q^{-2}\chi_{10}(q^8) \\
&= -q^{-1}m(q,q^{10},q^8) + q^{-1}m(-q^{12},q^{40},q^{-24}) - q^{-10}m(-q^{-8},q^{40},q^{-24}) \\
&\quad - q^{-1}m(q,q^{10},q^2) + q^{-1}m(-q^{12},q^{40},q^{-16}) - q^{-10}m(-q^{-8},q^{40},q^{-16}) \\
&= -q^{-1}D(q,q^{10},q^8,q^{-24}) - q^{-1}D(q,q^{10},q^2,q^{-16}), \qquad (11.4.31)
\end{aligned}
$$

by (11.3.31). We next apply Lemma 11.3.12 to deduce that

$$
\begin{aligned}
&- q^{-1}D(q,q^{10},q^8,q^{-24}) - q^{-1}D(q,q^{10},q^2,q^{-16}) \\
&= \frac{(q^{20};q^{20})_\infty^3 j(-q^2;q^{20})j(q^{20};q^{40})}{j(q^9;q^{10})j(q^{24};q^{40})j(\;q^{12};q^{20})j(q^{18};q^{20})} \\
&\quad + \frac{q(q^{20};q^{20})_\infty^3 j(-q^6;q^{20})j(q^{20};q^{40})}{j(q^3;q^{10})j(q^{16};q^{40})j(-q^4;q^{20})j(q^2;q^{20})} \\
&= \frac{(q^{20};q^{20})_\infty^3 j(q^{20};q^{40})}{j(q^2;q^{20})j(q^{16};q^{40})j(q^9;q^{10})j(\;q^{12};q^{20})j(q^3;q^{10})j(\;q^4;q^{20})} \\
&\quad \times \left(j(q^3;q^{10})j(-q^6;q^{20})j(-q^4;q^{20}) + qj(q^9;q^{10})j(-q^{12};q^{20})j(-q^2;q^{20})\right) \\
&= \frac{(q^{20};q^{20})_\infty^5 j(q^{20};q^{40})}{(q^{10};q^{10})_\infty j(q^2;q^{20})j(q^{16};q^{40})j(q^9;q^{10})j(-q^{12};q^{20})j(q^3;q^{10})j(-q^4;q^{20})} \\
&\quad \times \left(j(q^3;q^{10})j(-q^4;q^{10}) + qj(q^9;q^{10})j(-q^2;q^{10})\right) \\
&= \frac{(q^{20};q^{20})_\infty^5 j(q^{20};q^{40})j(-q;q^5)j(-q^3;-q^5)}{(q^{10};q^{10})_\infty j(q^2;q^{20})j(q^{16};q^{40})j(q^9;q^{10})j(-q^{12};q^{20})j(q^3;q^{10})j(-q^4;q^{20})}, \\
&\qquad (11.4.32)
\end{aligned}
$$

where we made exactly the same application of Lemma 6.3.2 as before, i.e., with $x = -q$, $y = -q^3$, and q replaced by $-q^5$. We are now faced with the laborious task of applying the Jacobi triple product identity (11.1.6) to each of the j-functions on the far right side of (11.4.32) and simplifying. Using (11.1.2) and the product representations (11.4.24), we find that the far right side of (11.4.32) reduces to

$$
\frac{\varphi(q)h(-q^2)}{\psi(\;q)},
$$

and so the proof of Entry 11.1.1 is complete. □

From:

$g(q) = q^{n(5n+1)/2} = 0.5^{11} = 0,00048828125;$

$\varphi(-q) = (-1)^n q^{n\char`^2} = 0.5^4 = 0.0625;$ $\varphi(q) = 0.0625$

$\psi(q) = q^{n(n+1)/2} = 0.5^3 = 0.125 = 1/8;$ $\psi(-q) = -q^{n(n+1)/2} = -0.5^3 = -0.125;$

$h(q) = q^{n(5n+3)/2} = 0.5^{13} = 0,0001220703125 = 1/8192$

$$\frac{\varphi(q)h(-q^2)}{\psi(-q)},$$

We obtain:

(((0.0625*(-0.0001220703125)^2)) / (-0.125)

(((0.0625*(-0.0001220703125)^2)) / (-0.125)

Input interpretation:

$$-\frac{0.0625\,(-0.0001220703125)^2}{0.125}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

$-7.450580596923828125 \times 10^{-9}$

Rational form:

$$-\frac{1}{134\,217\,728}$$

Where $134217728 = 64^4 * 8$

Indeed:

Input interpretation:

$$\frac{1}{-\frac{0.0625\,(-0.0001220703125)^2}{0.125}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

$-134\,217\,728$

ln -[1/((((((0.0625*(-0.0001220703125)^2)) / (-0.125))))))]

Input interpretation:

$$\log\left(-\frac{1}{-\frac{0.0625\,(-0.0001220703125)^2}{0.125}}\right)$$

Open code

- $\log(x)$ is the natural logarithm

Enlarge Data Customize A Plaintext Interactive

Result:

- More digits

18.71497...

Series representations:

- More

$$\log\left(-\frac{1}{-\frac{0.0625\,(-0.00012207)^2}{0.125}}\right) = \log(1.34218\times10^8) - \sum_{k=1}^{\infty}\frac{(-1)^k\,e^{-18.715\,k}}{k}$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$\log\left(-\frac{1}{-\frac{0.0625\,(-0.00012207)^2}{0.125}}\right) = 2\,i\,\pi\left\lfloor\frac{\arg(1.34218\times10^8 - x)}{2\,\pi}\right\rfloor + \log(x) - \sum_{k=1}^{\infty}\frac{(-1)^k\,(1.34218\times10^8 - x)^k\,x^{-k}}{k} \quad \text{for } x < 0$$

Open code

$$\log\left(-\frac{1}{-\frac{0.0625\,(-0.00012207)^2}{0.125}}\right) = \left\lfloor\frac{\arg(1.34218\times10^8 - z_0)}{2\,\pi}\right\rfloor \log\left(\frac{1}{z_0}\right) + \log(z_0) + \left\lfloor\frac{\arg(1.34218\times10^8 - z_0)}{2\,\pi}\right\rfloor \log(z_0) - \sum_{k=1}^{\infty}\frac{(-1)^k\,(1.34218\times10^8 - z_0)^k\,z_0^{-k}}{k}$$

Open code

Integral representations:

$$\log\left(-\frac{1}{-\frac{0.0625\,(-0.00012207)^2}{0.125}}\right) = \int_1^{1.34218\times10^8}\frac{1}{t}\,dt$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$\log\left(-\frac{1}{-\frac{0.0625\,(-0.00012207)^2}{0.125}}\right) = \frac{1}{2\,i\,\pi}\int_{-i\,\infty+\gamma}^{i\,\infty+\gamma}\frac{e^{-18.715\,s}\,\Gamma(-s)^2\,\Gamma(1+s)}{\Gamma(1-s)}\,ds \quad \text{for } -1 < \gamma < 0$$

Open code

(108 - 16) * ln -[1/((((((0.0625*(-0.0001220703125)^2)) / (-0.125))))))]

Input interpretation:

$$(108-16)\log\left(-\frac{1}{-\frac{0.0625(-0.0001220703125)^2}{0.125}}\right)$$

Open code

- $\log(x)$ is the natural logarithm

Enlarge Data Customize A Plaintext Interactive

Result:

- More digits

1721.778...

This result is very near to the mass of candidate glueball $f_0(1710)$ meson.

Series representations:

- More

$$(108-16)\log\left(-\frac{1}{-\frac{0.0625(-0.00012207)^2}{0.125}}\right)=92\log(1.34218\times10^8)-92\sum_{k=1}^{\infty}\frac{(-1)^k e^{-18.715k}}{k}$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$(108-16)\log\left(-\frac{1}{-\frac{0.0625(-0.00012207)^2}{0.125}}\right)=184\,i\,\pi\left\lfloor\frac{\arg(1.34218\times10^8-x)}{2\pi}\right\rfloor+92\log(x)-92\sum_{k=1}^{\infty}\frac{(-1)^k(1.34218\times10^8-x)^k x^{-k}}{k}\quad\text{for } x<0$$

Open code

$$(108-16)\log\left(-\frac{1}{-\frac{0.0625(-0.00012207)^2}{0.125}}\right)=92\left\lfloor\frac{\arg(1.34218\times10^8-z_0)}{2\pi}\right\rfloor\log\left(\frac{1}{z_0}\right)+92\log(z_0)+92\left\lfloor\frac{\arg(1.34218\times10^8-z_0)}{2\pi}\right\rfloor\log(z_0)-92\sum_{k=1}^{\infty}\frac{(-1)^k(1.34218\times10^8-z_0)^k z_0^{-k}}{k}$$

Integral representations:

$$(108-16)\log\left(-\frac{1}{-\frac{0.0625(-0.00012207)^2}{0.125}}\right)=92\int_1^{1.34218\times10^8}\frac{1}{t}\,dt$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$(108-16)\log\left(-\frac{1}{-\frac{0.0625(-0.00012207)^2}{0.125}}\right) = \frac{46}{i\pi}\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{e^{-18.715 s}\,\Gamma(-s)^2\,\Gamma(1+s)}{\Gamma(1-s)}\,ds$$

for $-1 < \gamma < 0$

((((((((((108 - 16) * ln -[1/((((((0.0625*(-0.0001220703125)^2)) / (-0.125))))))])))))))))^1/3

Input interpretation:

$$\sqrt[3]{(108-16)\log\left(-\frac{1}{-\frac{0.0625(-0.0001220703125)^2}{0.125}}\right)}$$

Open code

- $\log(x)$ is the natural logarithm

Enlarge Data Customize A Plaintext Interactive

Result:

- More digits

11.98558...

This result 11,985 is very near to the values of black hole entropies 11,8458 and 12,1904

2 * ((((((((((108 - 16) * ln -[1/((((((0.0625*(-0.0001220703125)^2)) / (-0.125))))))])))))))))^1/3

Input interpretation:

$$2\sqrt[3]{(108-16)\log\left(-\frac{1}{-\frac{0.0625(-0.0001220703125)^2}{0.125}}\right)}$$

Open code

- $\log(x)$ is the natural logarithm

Enlarge Data Customize A Plaintext Interactive

Result:

- More digits

23.97116...

This value is linked to the "Ramanujan function" (an elliptic modular function that satisfies the need for "conformal symmetry") that has 24 "modes" corresponding to

the physical vibrations of a bosonic string and to the value of black hole entropy 23,9078

Now, we have the following expressions:

(((((27 * 4 ln -[1/ ((((0.0625 * (-0.00048828125)^2)) / (-0.125))))])))))^1/15

Input interpretation:

$$\sqrt[15]{27\times 4\log\left(-\frac{1}{-\frac{0.0625\,(-0.00048828125)^2}{0.125}}\right)}$$

Open code

- $\log(x)$ is the natural logarithm

Enlarge Data Customize A Plaintext Interactive

Result:

- More digits

1.6433566...

And:

((((((108 - 16) * ln -[1/((((((0.0625*(-0.0001220703125)^2)) / (-0.125))))))])))))^1/15

Input interpretation:

$$\sqrt[15]{(108-16)\log\left(-\frac{1}{-\frac{0.0625\,(-0.0001220703125)^2}{0.125}}\right)}$$

Open code

- $\log(x)$ is the natural logarithm

Enlarge Data Customize A Plaintext Interactive

Result:

- More digits

1.6433566...

$1.6433566... \approx \zeta(2) = \frac{\pi^2}{6} = 1.6449$

Thence, we have the following identity:

$$\frac{\varphi(q)g(-q^2)}{\psi(-q)} = \frac{\varphi(q)h(-q^2)}{\psi(-q)}$$

We note this interesting new physical connection with the above expression concerning the tenth order mock theta functions:

1/10^16 * 4 * (((((27 * 4 ln -[1/ ((((0.0625 * (-0.00048828125)^2)) / (-0.125))))])))))^1/15

Input interpretation:

$$\frac{1}{10^{16}} \times 4 \sqrt[15]{27 \times 4 \log\left(-\frac{1}{-\frac{0.0625\,(-0.00048828125)^2}{0.125}}\right)}$$

Open code

- $\log(x)$ is the natural logarithm

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Result:

- More digits

$6.5734263... \times 10^{-16}$

Series representations:

- More

$$\frac{4 \sqrt[15]{27 \times 4 \log\left(-\frac{1}{-\frac{0.0625\,(-0.000488281)^2}{0.125}}\right)}}{10^{16}} = \frac{\sqrt[5]{3}\ \sqrt[15]{\log(8.38861 \times 10^6) - \sum_{k=1}^{\infty} \frac{(-1)^k e^{-15.9424\,k}}{k}}}{1\,250\,000\,000\,000\,000 \times 2^{13/15}}$$

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$$\frac{4 \sqrt[15]{27 \times 4 \log\left(-\frac{1}{-\frac{0.0625\,(-0.000488281)^2}{0.125}}\right)}}{10^{16}} = \frac{\sqrt[5]{3}\ \sqrt[15]{2\,i\,\pi \left\lfloor \frac{\arg(8.38861\times10^6 - x)}{2\,\pi} \right\rfloor + \log(x) - \sum_{k=1}^{\infty} \frac{(-1)^k (8.38861\times10^6 - x)^k x^{-k}}{k}}}{1\,250\,000\,000\,000\,000 \times 2^{13/15}} \quad \text{for } x < 0$$

Open code

$$\frac{4 \sqrt[15]{27 \times 4 \log\left(-\frac{1}{-\frac{0.0625\,(-0.000488281)^2}{0.125}}\right)}}{10^{16}} = \left(\sqrt[5]{3}\left(\log(z_0) + \left\lfloor \frac{\arg(8.38861 \times 10^6 - z_0)}{2\,\pi} \right\rfloor \left(\log\left(\frac{1}{z_0}\right) + \log(z_0)\right) - \sum_{k=1}^{\infty} \frac{(-1)^k (8.38861 \times 10^6 - z_0)^k z_0^{-k}}{k}\right)^\wedge (1/15)\right) \Big/ \left(1\,250\,000\,000\,000\,000 \times 2^{13/15}\right)$$

Integral representations:

$$\frac{4\sqrt[15]{27\times 4\log\left(-\frac{1}{\frac{0.0625\,(-0.000488281)^2}{0.125}}\right)}}{10^{16}} = \frac{\sqrt[5]{3}\,\sqrt[15]{\int_1^{8.38861\times 10^6}\frac{1}{t}\,dt}}{1\,250\,000\,000\,000\,000\times 2^{13/15}}$$

Open code

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$$\frac{4\sqrt[15]{27\times 4\log\left(-\frac{1}{\frac{0.0625\,(-0.000488281)^2}{0.125}}\right)}}{10^{16}} = \frac{\sqrt[5]{3}\,\sqrt[15]{\frac{1}{i\pi}\int_{-i\,\infty+\gamma}^{i\,\infty+\gamma}\frac{e^{-15.9424\,s}\,\Gamma(-s)^2\,\Gamma(1+s)}{\Gamma(1-s)}\,ds}}{1\,250\,000\,000\,000\,000\times 2^{14/15}}$$

for $-1 < \gamma < 0$

This result $6.5734263 \times 10^{-16}$ is practically equal to the very fundamental physical value $6.582119514(40)\times10^{-16}$ eV * s, that is the reduced Planck constant.

In conclusion, we have obtained another interesting physical connection:

2.529 * (((((27 * 4 ln -[1/ ((((0.0625 * (-0.00048828125)^2)) / (-0.125))))])))))^1/15

Where 2.529 is a following Hausdorff dimension:

$$\frac{\log\left(\frac{\sqrt{7}}{6}-\frac{1}{3}\right)}{\log(\sqrt{2}-1)}$$

((([(((ln((sqrt(7)/6)-1/3))) / (((ln((sqrt(2)-1)))])))) * (((((27 * 4 ln -[1/ ((((0.0625 * (-0.00048828125)^2)) / (-0.125))))])))))^1/15

Input interpretation:

$$\frac{\log\left(\frac{\sqrt{7}}{6}-\frac{1}{3}\right)}{\log(\sqrt{2}-1)}\sqrt[15]{27\times 4\log\left(-\frac{1}{\frac{0.0625\,(-0.00048828125)^2}{0.125}}\right)}$$

Open code

- $\log(x)$ is the natural logarithm

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Result:

- More digits

4.1562473...

Series representations:

- More

$$\frac{\sqrt[15]{27\times 4\log\left(-\frac{1}{\frac{0.0625(-0.000488281)^2}{0.125}}\right)\log\left(\frac{\sqrt{7}}{6}-\frac{1}{3}\right)}}{\log(\sqrt{2}-1)} = \left(2^{2/15}\sqrt[5]{3}\sqrt[15]{\log(8.38861\times 10^6)}\log\left(\frac{1}{6}\left(-2+\exp\left(i\pi\left\lfloor\frac{\arg(7-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(7-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)\right)\right)\Big/ \log\left(-1+\exp\left(i\pi\left\lfloor\frac{\arg(2-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(2-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)$$

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

Open code

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$$\frac{\sqrt[15]{27\times 4\log\left(-\frac{1}{\frac{0.0625(-0.000488281)^2}{0.125}}\right)\log\left(\frac{\sqrt{7}}{6}-\frac{1}{3}\right)}}{\log(\sqrt{2}-1)} = \left(2^{2/15}\sqrt[5]{3}\sqrt[15]{2i\pi\left\lfloor\frac{\arg(8.38861\times 10^6-x)}{2\pi}\right\rfloor+\log(x)-\sum_{k=1}^{\infty}\frac{(-1)^k(8.38861\times 10^6-x)^k x^{-k}}{k}}\left(2i\pi\left\lfloor\frac{\arg\left(\frac{1}{6}(-2-6x+\sqrt{7})\right)}{2\pi}\right\rfloor+\log(x)-\sum_{k=1}^{\infty}\frac{\left(-\frac{1}{6}\right)^k x^{-k}(-2-6x+\sqrt{7})^k}{k}\right)\right)\Big/\left(2i\pi\left\lfloor\frac{\arg(-1-x+\sqrt{2})}{2\pi}\right\rfloor+\log(x)-\sum_{k=1}^{\infty}\frac{(-1)^k x^{-k}(-1-x+\sqrt{2})^k}{k}\right)$$

for $x<0$

Open code

$$\frac{\sqrt[15]{27\times 4\log\left(-\frac{1}{-\frac{0.0625(-0.000488281)^2}{0.125}}\right)\log\left(\frac{\sqrt{7}}{6}-\frac{1}{3}\right)}}{\log(\sqrt{2}-1)} = \left(2^{2/15}\sqrt[5]{3}\right.$$

$$\sqrt[15]{2 i\pi\left\lfloor\frac{\arg(8.38861\times 10^6-x)}{2\pi}\right\rfloor+\log(x)-\sum_{k=1}^{\infty}\frac{(-1)^k(8.38861\times 10^6-x)^k x^{-k}}{k}}$$

$$\left.\left(2 i\pi\left\lfloor\frac{\arg\left(-\frac{1}{3}-x+\frac{\sqrt{7}}{6}\right)}{2\pi}\right\rfloor+\log(x)-\sum_{k=1}^{\infty}\frac{\left(-\frac{1}{6}\right)^k x^{-k}(-2-6x+\sqrt{7})^k}{k}\right)\right)\Big/$$

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

Integral representation:

$$\frac{\sqrt[15]{27\times 4\log\left(-\frac{1}{-\frac{0.0625(-0.000488281)^2}{0.125}}\right)\log\left(\frac{\sqrt{7}}{6}-\frac{1}{3}\right)}}{\log(\sqrt{2}-1)} = \frac{2^{2/15}\sqrt[5]{3}\sqrt[15]{\int_1^{8.38861\times 10^6}\frac{1}{t}\,dt\int_1^{\frac{1}{6}(-2+\sqrt{7})}\frac{1}{t}\,dt}}{\int_1^{-1+\sqrt{2}}\frac{1}{t}\,dt}$$

This result 4,1562473 is in the range of the mass of DM particle that is between 4 – 4.2 eV

Now, we have:

Lemma 12.2.12. *For $z \in \mathcal{H}$,*

$$\begin{aligned}
&\eta_{50}^{18}\eta_{10,2}^{4}\eta_{10,3}\eta_{20,2}\eta_{20,4}\eta_{100,50}\\
&\quad\times\big(-\eta_{50,5}\eta_{50,10}^{2}\eta_{50,15}\eta_{50,25}\eta_{100,40}+\eta_{50,5}\eta_{50,10}\eta_{50,15}\eta_{50,20}\eta_{50,25}\eta_{100,40}\\
&\qquad-\eta_{50,15}^{2}\eta_{50,20}^{2}\eta_{50,25}\eta_{100,20}+2\eta_{50,5}\eta_{50,15}\eta_{50,20}^{2}\eta_{50,25}\eta_{100,40}\\
&\qquad-2\eta_{50,5}^{2}\eta_{50,20}\eta_{50,25}\eta_{100,30}\eta_{100,40}^{2}+\eta_{50,5}^{2}\eta_{50,15}\eta_{50,20}\eta_{100,40}^{2}\eta_{100,50}\big)\\
&\quad=\eta_{10}^{2}\eta_{100}^{16}\eta_{10,1}^{2}\eta_{10,2}^{4}\eta_{20,8}^{2}\eta_{50,10}\eta_{50,15}\eta_{50,20}^{2}\eta_{50,25}\eta_{100,50}^{9}. \qquad (12.2.25)
\end{aligned}$$

By Lemma 12.2.11 and a straightforward calculation, each g_j^1 is a modular form of weight 0 on $\Gamma_1(300)$ with the multiplier system I. Therefore, each $f_j^1 g_j^1$ is a modular form of weight 9 on $\Gamma_1(300)$ with multiplier system v_1. By Lemma 12.2.10, $[\Gamma(1) : \Gamma_1(300)] = 57600$. Let F_1 denote the difference of the left- and right-hand sides of (12.2.25). Applying Lemma 12.2.8 for a fundamental region R for $\Gamma_1(300)$, we deduce that

$$\sum_{z \in R} \mathrm{Ord}_{\Gamma_1(300)}(F_1; z) = \frac{9 \cdot 57600}{12} = 43200 \geq \mathrm{ord}(F_1; \infty), \qquad (12.2.26)$$

Lemma 12.2.13. *For $z \in \mathcal{H}$,*

$$\begin{aligned}
&\eta_{50}^{18}\eta_{10,1}\eta_{10,2}^{16}\eta_{20,6}\eta_{20,8}\eta_{100,50} \\
&\quad \times \big(\eta_{50,5}\eta_{50,10}\eta_{50,15}\eta_{50,20}\eta_{50,25}\eta_{100,20} + \eta_{50,5}\eta_{50,15}\eta_{50,20}^2\eta_{50,25}\eta_{100,20} \\
&\qquad \eta_{50,5}^2\eta_{50,10}^2\eta_{50,25}\eta_{100,40} \quad 2\eta_{50,5}\eta_{50,10}^2\eta_{50,15}\eta_{50,25}\eta_{100,20} \\
&\qquad -2\eta_{50,10}\eta_{50,15}^2\eta_{50,25}\eta_{100,10}\eta_{100,20}^2 + \eta_{50,5}\eta_{50,10}\eta_{50,15}^2\eta_{100,20}^2\eta_{100,50}\big) \\
&\quad = \eta_{10}^2\eta_{100}^{16}\eta_{10,2}^{16}\eta_{10,3}^2\eta_{20,4}\eta_{50,5}\eta_{50,10}^2\eta_{50,20}\eta_{50,25}\eta_{100,50}^9. \qquad (12.2.27)
\end{aligned}$$

By Lemma 12.2.11 and a straightforward calculation, each g_j^2 is a modular form of weight 0 on $\Gamma_1(300)$ with the multiplier system I. Hence, each $f_j^2 g_j^2$ is a modular form of weight 9 on $\Gamma_1(300)$ with multiplier system v_2. Let F_2 denote the difference of the left- and right-hand sides of (12.2.27). Applying Lemma 12.2.8 for a fundamental region R for $\Gamma_1(300)$, we deduce that

$$\sum_{z \in R} \mathrm{Ord}_{\Gamma_1(300)}(F_2; z) = \frac{9 \cdot 57600}{12} = 43200 \geq \mathrm{ord}(F_2; \infty), \qquad (12.2.28)$$

Lemma 12.2.14. *For $z \in \mathcal{H}$,*

$$\begin{aligned}
&\eta_5^2\eta_{100}^2\eta_{5,1}^{10}\eta_{6,1}^3 \\
&\times \big(\eta_{50,5}\eta_{50,10}^3\eta_{100,40}\eta_{100,50} + \eta_{50,15}\eta_{50,20}^3\eta_{100,20}\eta_{100,50} - 3\eta_{50,10}^2\eta_{50,20}^2\eta_{100,25}^2\big) \\
&= \eta_{20}^2\eta_{25}^2\eta_{5,1}^{10}\eta_{6,1}^3\eta_{20,5}^2\eta_{25,5}^2\eta_{25,10}^2\eta_{50,10}^2\eta_{50,20}^2. \qquad (12.2.29)
\end{aligned}$$

By Lemma 12.2.11 and a straightforward calculation, each g_j^3 is a modular form of weight 0 on $\Gamma_1(300)$ with the multiplier system I. Hence, each $f_j^3 g_j^3$ is a modular form of weight 2 on $\Gamma_1(300)$ with multiplier system v_3. Let F_3 denote the difference of the left- and right-hand sides of (12.2.29). Applying Lemma 12.2.8 for a fundamental region R for $\Gamma_1(300)$, we deduce that

$$\sum_{z\in R} \mathrm{Ord}_{\Gamma_1(300)}(F_3;z) - \frac{2\cdot 57600}{12} - 9600 \geq \mathrm{ord}(F_3;\infty), \tag{12.2.30}$$

Lemma 12.2.15. *For $z \in \mathcal{H}$,*

$$\begin{aligned} &\eta_4^2\eta_{50}^2\eta_{10,1}^2\eta_{10,2}^3\eta_{10,3}\eta_{20,2} \\ &\quad\times (\eta_{50,5}\eta_{50,15}\eta_{50,25}\eta_{100,50} + \eta_{50,5}\eta_{50,15}\eta_{50,25}\eta_{100,30} \\ &\quad - \eta_{50,5}\eta_{50,15}\eta_{50,25}\eta_{100,10} - \eta_{50,5}^2\eta_{50,15}\eta_{100,50} - \eta_{50,5}\eta_{50,25}^2\eta_{100,30} \\ &\quad + 2\eta_{50,5}^2\eta_{50,25}\eta_{100,30} - \eta_{50,15}^2\eta_{50,25}\eta_{100,10}) \\ &= \eta_{10}^2\eta_{20}^2\eta_{10,1}^3\eta_{10,2}^3\eta_{20,4}^3\eta_{20,8}^3\eta_{50,5}\eta_{50,15}\eta_{50,25}. \end{aligned} \tag{12.2.31}$$

By Lemma 12.2.11 and a straightforward calculation, each g_j^4 is a modular form of weight 0 on $\Gamma_1(300)$ with the multiplier system I. Hence, each $f_j^4 g_j^4$ is a modular form of weight 2 on $\Gamma_1(300)$ with multiplier system v_4. Let F_4 denote the difference of the left- and right-hand sides of (12.2.31). Applying Lemma 12.2.8 for a fundamental region R for $\Gamma_1(300)$, we deduce that

$$\sum_{z\in R} \mathrm{Ord}_{\Gamma_1(300)}(F_4;z) = \frac{2\cdot 57600}{12} = 9600 \geq \mathrm{ord}(F_4;\infty), \tag{12.2.32}$$

Lemma 12.2.16. *For $z \in \mathcal{H}$,*

$$\begin{aligned}
&\eta_{10}^{8}\eta_{20}^{3}\eta_{50}\eta_{10,1}\eta_{10,4}\eta_{20,4}\eta_{20,8}^{2}\eta_{50,5}\eta_{50,15}\eta_{50,25}\eta_{200,50}\eta_{200,100}\\
&\quad\times(\eta_{10,1}\eta_{20,10}\eta_{50,10}\eta_{100,40}-4\eta_{10,3}\eta_{20,2}\eta_{50,10}\eta_{100,40}\\
&\quad+\eta_{10,1}\eta_{20,10}\eta_{50,20}\eta_{100,20}+6\eta_{10,3}\eta_{20,2}\eta_{50,20}\eta_{100,20})\\
&\quad-4\eta_{10,1}\eta_{10,4}\eta_{20,4}\eta_{20,8}^{2}\eta_{40,10}\eta_{50,5}\eta_{50,10}\eta_{50,15}\eta_{50,20}\eta_{50,25}\eta_{200,100}\\
&\quad\times(\eta_{10}^{7}\eta_{20}^{2}\eta_{50}^{2}\eta_{100}\eta_{10,1}\eta_{50,10}^{2}\eta_{50,20}^{2}+\eta_{10}\eta_{20}^{10}\eta_{100}\eta_{10,3}\eta_{20,2}\eta_{20,10}^{3})\\
&-\eta_{10}^{8}\eta_{20}^{3}\eta_{50}\eta_{50,5}\eta_{50,10}\eta_{50,15}\eta_{50,20}\eta_{100,50}\eta_{200,50}\eta_{200,100}\\
&\quad\times(\eta_{10,1}^{3}\eta_{20,6}\eta_{20,8}^{2}\eta_{20,10}-4\eta_{10,1}\eta_{10,3}\eta_{10,4}\eta_{20,2}\eta_{20,5}^{2}\eta_{20,8}\\
&\quad-\eta_{10,3}^{3}\eta_{20,2}\eta_{20,4}^{2}\eta_{20,10})\\
&\quad+\eta_{10}^{8}\eta_{20}^{3}\eta_{50}\eta_{50,5}\eta_{50,10}\eta_{50,20}\eta_{50,25}\eta_{100,30}\eta_{200,50}\eta_{200,100}\\
&\quad\times(2\eta_{10,1}^{3}\eta_{20,6}\eta_{20,8}^{2}\eta_{20,10}+2\eta_{10,1}\eta_{10,3}\eta_{10,4}\eta_{20,2}\eta_{20,5}^{2}\eta_{20,8}\\
&\quad+3\eta_{10,3}^{3}\eta_{20,2}\eta_{20,4}^{2}\eta_{20,10})\\
&\quad-\eta_{10}^{8}\eta_{20}^{3}\eta_{50}\eta_{50,10}\eta_{50,15}\eta_{50,20}\eta_{50,25}\eta_{100,10}\eta_{200,50}\eta_{200,100}\\
&\quad\times(3\eta_{10,1}^{3}\eta_{20,6}\eta_{20,8}^{2}\eta_{20,10}-2\eta_{10,1}\eta_{10,3}\eta_{10,4}\eta_{20,2}\eta_{20,5}^{2}\eta_{20,8}\\
&\quad+2\eta_{10,3}^{3}\eta_{20,2}\eta_{20,4}^{2}\eta_{20,10}).
\end{aligned}\tag{12.2.33}$$

By Lemma 12.2.11 and a straightforward calculation, each g_j^5 is a modular form of weight 0 on $\Gamma_1(200)$ with the multiplier system I. Hence, each $f_j^5 g_j^5$ is a modular form of weight 6 on $\Gamma_1(200)$ with multiplier system v_5. By Lemma 12.2.10, $[\Gamma(1):\Gamma_1(200)] = 28800$. Let F_5 denote the difference of the left and right sides of (12.2.33). Applying Lemma 12.2.8 for a fundamental region R for $\Gamma_1(200)$, we deduce that

$$\sum_{z\in R}\mathrm{Ord}_{\Gamma_1(200)}(F_5;z)=\frac{6\cdot 28800}{12}=14400\geq \mathrm{ord}(F_5;\infty),\tag{12.2.34}$$

Lemma 12.2.17. *For $z \in \mathcal{H}$,*

$$\begin{aligned}
&\eta_{10}^{8}\eta_{20}^{3}\eta_{50}^{3}\eta_{10,1}\eta_{20,4}^{2}\eta_{20,6}\eta_{20,8}^{2}\eta_{50,5}\eta_{50,15}\eta_{50,25}\eta_{200,50}\eta_{200,100} \\
&\quad \times (\eta_{10,1}\eta_{20,10}\eta_{50,10}\eta_{100,40} - \eta_{10,1}\eta_{20,10}\eta_{50,20}\eta_{100,20} \\
&\quad - 2\eta_{10,3}\eta_{20,2}\eta_{50,20}\eta_{100,20}) + 4\eta_{10}\eta_{20}^{10}\eta_{50}^{2}\eta_{100}\eta_{10,1}\eta_{10,3}\eta_{20,2}\eta_{20,4}^{2}\eta_{20,6} \\
&\quad \times \eta_{20,8}^{2}\eta_{20,10}^{3}\eta_{40,10}\eta_{50,5}\eta_{50,10}\eta_{50,15}\eta_{50,20}\eta_{100,25}^{2}\eta_{200,100} \\
&= \eta_{10}^{8}\eta_{20}^{3}\eta_{50}^{3}\eta_{50,10}\eta_{50,20}\eta_{200,50}\eta_{200,100} \\
&\quad \times (\eta_{10,1}^{3}\eta_{20,6}\eta_{20,8}^{2}\eta_{20,10}\eta_{50,5}\eta_{50,15}\eta_{100,50} \\
&\quad + \eta_{10,3}^{3}\eta_{20,2}\eta_{20,4}^{2}\eta_{20,10}\eta_{50,5}\eta_{50,15}\eta_{100,50} \\
&\quad - 2\eta_{10,1}\eta_{10,3}\eta_{20,2}\eta_{20,4}\eta_{20,5}^{2}\eta_{20,6}\eta_{20,8}\eta_{50,5}\eta_{50,25}\eta_{100,30} \\
&\quad - \eta_{10,3}^{3}\eta_{20,2}\eta_{20,4}^{2}\eta_{20,10}\eta_{50,5}\eta_{50,25}\eta_{100,30} \\
&\quad - \eta_{10,1}^{3}\eta_{20,6}\eta_{20,8}^{2}\eta_{20,10}\eta_{50,15}\eta_{50,25}\eta_{100,10} \\
&\quad + 2\eta_{10,1}\eta_{10,3}\eta_{20,2}\eta_{20,4}\eta_{20,5}^{2}\eta_{20,6}\eta_{20,8}\eta_{50,15}\eta_{50,25}\eta_{100,10}). \qquad (12.2.35)
\end{aligned}$$

By Lemma 12.2.11 and a straightforward calculation, each g_j^6 is a modular form of weight 0 on $\Gamma_1(200)$ with the multiplier system I. Hence, each $f_j^6 g_j^6$ is a modular form of weight 7 on $\Gamma_1(200)$ with multiplier system v_6. Let F_6 denote the difference of the left and right sides of (12.2.35). Applying Lemma 12.2.8 for a fundamental region R for $\Gamma_1(200)$, we deduce that

$$\sum_{z \in R} \mathrm{Ord}_{\Gamma_1(200)}(F_6; z) = \frac{7 \cdot 28800}{12} = 16800 \geq \mathrm{ord}(F_6; \infty), \qquad (12.2.36)$$

Our next task is to take each of the six eta function identities from Lemmas 12.2.12–12.2.17 and rewrite them in terms of Ramanujan's theta functions $f(a, b)$.

Lemma 12.2.18. *If $f(a,b)$ is defined by (12.1.5), then*

$$
\begin{aligned}
&-\frac{f(-q^5,-q^{45})f(-q^{40},-q^{60})f(-q^{50},-q^{50})}{f^2(-q^{20},-q^{30})}\\
&\times\left(q^6 f(-q^{10},-q^{40})-q^4 f(-q^{20},-q^{30})\right)\\
&\frac{f(-q^{50},-q^{50})}{f(-q^{10},-q^{40})}\\
&\times\left(q^3 f(-q^{15},-q^{35})f(-q^{20},-q^{80})-2q^2 f(-q^5,-q^{45})f(-q^{40},-q^{60})\right)\\
&-2q\frac{f^2(-q^5,-q^{45})f(-q^{40},-q^{60})(q^{50};q^{50})_\infty(q^{100};q^{100})_\infty}{f(-q^{15},-q^{35})f(-q^{10},-q^{90})f(-q^{20},-q^{80})}\\
&+\frac{f^2(-q^5,-q^{45})f(-q^{40},-q^{60})(q^{50};q^{50})^3_\infty}{f(-q^{25},-q^{25})f(-q^{10},-q^{90})f(-q^{20},-q^{80})f(-q^{30},-q^{70})}\\
=&\frac{f^2(-q,-q^9)f(-q^8,-q^{12})(q^{10};q^{10})_\infty(q^{20};q^{20})_\infty}{f(-q^3,-q^7)f(-q^2,-q^{18})f(-q^4,-q^{16})}.
\end{aligned}
\tag{12.2.37}
$$

Proof. Simplify slightly the right-hand side of (12.2.25) by using the identity $\eta_{100,50}\eta_{100}^2=\eta_{50}^2$. Then divide both sides of (12.2.25) by

$$q^{451/30}\eta_{50}^{18}\eta_{10,2}^4\eta_{10,3}\eta_{20,2}\eta_{20,4}\eta_{50,10}\eta_{50,15}\eta_{50,20}^2\eta_{50,25}/\eta_{100}^2.$$

Using (12.2.23) and (12.2.24) to convert the resulting identity, we deduce (12.2.37). ∎

Lemma 12.2.19. *We have*

$$\begin{aligned}
&\frac{f(-q^{15},-q^{35})f(-q^{20},-q^{80})f(-q^{50},-q^{50})}{f^2(-q^{10},-q^{40})}\\
&\times\left(q^2 f(-q^{10},-q^{40})+f(-q^{20},-q^{30})\right)\\
&-\frac{f(-q^{50},-q^{50})}{f(-q^{20},-q^{30})}\\
&\times\left(q^3 f(-q^5,-q^{45})f(-q^{40},-q^{60})+2q^4 f(-q^{15},-q^{35})f(-q^{20},-q^{80})\right)\\
&-2q^5\frac{f^2(-q^{15},-q^{35})f(-q^{20},-q^{80})(q^{50};q^{50})_\infty(q^{100};q^{100})_\infty}{f(-q^5,-q^{45})f(-q^{30},-q^{70})f(-q^{40},-q^{60})}\\
&+q\frac{f^2(-q^{15},-q^{35})f(-q^{20},-q^{80})(q^{50};q^{50})_\infty^3}{f(-q^{25},-q^{25})f(-q^{10},-q^{90})f(-q^{30},-q^{70})f(-q^{40},-q^{60})}\\
=&\frac{f^2(-q^3,-q^7)f(-q^4,-q^{16})(q^{10};q^{10})_\infty(q^{20};q^{20})_\infty}{f(-q,-q^9)f(-q^6,-q^{14})f(-q^8,-q^{12})}. \qquad (12.2.38)
\end{aligned}$$

Proof. Simplify the right-hand side of (12.2.27) with the identity $\eta_{100,50}\eta_{100}^2 = \eta_{50}^2$. Then divide both sides of (12.2.25) by

$$q^{589/30}\eta_{50}^{18}\eta_{10,1}\eta_{10,2}^{16}\eta_{20,6}\eta_{20,8}\eta_{50,5}\eta_{50,10}^2\eta_{50,20}\eta_{50,25}/\eta_{100}^2.$$

Using (12.2.23) and (12.2.24) to convert the resulting identity to a q-series identity, we deduce (12.2.38). □

Lemma 12.2.20. *We have*

$$q^5\frac{f(-q^5,-q^{45})f(-q^{10},-q^{40})f(-q^{40},-q^{60})f(-q^{50},-q^{50})}{f^2(-q^{20},-q^{30})}$$
$$+\frac{f(-q^{15},-q^{35})f(-q^{20},-q^{30})f(-q^{20},-q^{80})f(-q^{50},-q^{50})}{f^2(-q^{10},-q^{40})}$$
$$-3q^5f^2(-q^{25},-q^{75})=f^2(-q^5,-q^{15}). \tag{12.2.39}$$

Proof. Employ the identity $\eta_{25,5}\eta_{25,10}\eta_{25}=\eta_5$ on the right-hand side of (12.2.29) in Lemma 12.2.14, divide both sides of (12.2.29) by

$$q^{25/4}\eta_5^2\eta_{5,1}^{10}\eta_{6,1}^3\eta_{50,10}^2\eta_{50,20}^2,$$

apply (12.2.23) and (12.2.24) to express the identity in terms of theta functions, and finally deduce (12.2.39). □

Lemma 12.2.21. *We have*

$$f(q^{25},q^{25})f(-q^{25},-q^{25})+q^2f(q^{15},q^{35})f(-q^{15},-q^{35})$$
$$-q^8f(q^5,q^{45})f(-q^5,-q^{45})-q^4f(q^{25},q^{25})f(-q^5,-q^{45})$$
$$-qf(q^{15},q^{35})f(-q^{25},-q^{25})+2q^5f(q^{15},q^{35})f(-q^5,-q^{45})$$
$$-q^5f(q^5,q^{45})f(-q^{15},-q^{35})=\frac{f(-q,-q^9)(q^4;q^4)_\infty(q^{10};q^{10})_\infty^2}{f(-q^3,-q^7)f(-q^2,-q^{18})}. \tag{12.2.40}$$

Proof. Using the Jacobi triple product identity (12.1.6), we can readily show that, for each integer n,

$$\frac{(q^{50};q^{50})_\infty^2f(-q^{2n},-q^{100-2n})}{(q^{100};q^{100})_\infty f(-q^n,-q^{50-n})}=f(q^n,q^{50-n}). \tag{12.2.41}$$

Now use the identity $\eta_{20}\eta_{20,4}\eta_{20,8}=\eta_4$ on the right side of (12.2.31), divide both sides of (12.2.31) by

$$q^{329/30}\eta_4^2\eta_{10,1}^2\eta_{10,2}^3\eta_{10,3}\eta_{20,2}\eta_{50,5}\eta_{50,15}\eta_{50,25},$$

apply (12.2.23), (12.2.24), and (12.2.41) with $n=5,15$, and 25, respectively, and thus complete the proof of Lemma 12.2.21. □

Lemma 12.2.22. *We have*

$$f(q^{20},q^{30})\left(\frac{f(-q,-q^9)(q^4;q^4)_\infty(q^{10};q^{10})_\infty^2}{f(-q^3,-q^7)f(-q^2,-q^{18})}-4qf(-q^4,-q^{16})f(-q^8,-q^{12})\right)$$
$$+q^2f(q^{10},q^{40})\left(\frac{f(-q,-q^9)(q^4;q^4)_\infty(q^{10};q^{10})_\infty^2}{f(-q^3,-q^7)f(-q^2,-q^{18})}\right.$$
$$\left.+6qf(-q^4,-q^{16})f(-q^8,-q^{12})\right)$$

$$
\begin{aligned}
&- 4q^6 f(q^{50},q^{150})\left(\frac{f(-q,-q^9)(q^4;q^4)_\infty(q^{10};q^{10})_\infty^2}{f(-q^3,-q^7)f(-q^2,-q^{18})}\right.\\
&\qquad\qquad\left. + qf(-q^4,-q^{16})f(-q^8,-q^{12})\right)\\
&= f(q^{25},q^{25})\left(\frac{f^2(-q,-q^9)f(-q^8,-q^{12})(q^{10};q^{10})_\infty(q^{20};q^{20})_\infty}{f(-q^3,-q^7)f(-q^2,-q^{18})f(-q^4,-q^{16})}\right.\\
&\quad\left. -4qf^2(-q^5,-q^{15}) - q\frac{f^2(-q^3,-q^7)f(-q^4,-q^{16})(q^{10};q^{10})_\infty(q^{20};q^{20})_\infty}{f(-q,-q^9)f(-q^6,-q^{14})f(-q^8,-q^{12})}\right)\\
&\quad + qf(q^{15},q^{35})\left(2\frac{f^2(-q,-q^9)f(-q^8,-q^{12})(q^{10};q^{10})_\infty(q^{20};q^{20})_\infty}{f(-q^3,-q^7)f(-q^2,-q^{18})f(-q^4,-q^{16})}\right.\\
&\quad\left. +2qf^2(-q^5,-q^{15}) + 3q\frac{f^2(-q^3,-q^7)f(-q^4,-q^{16})(q^{10};q^{10})_\infty(q^{20};q^{20})_\infty}{f(-q,-q^9)f(-q^6,-q^{14})f(-q^8,-q^{12})}\right)\\
&\quad - q^4 f(q^{25},q^{25})\left(3\frac{f^2(-q,-q^9)f(-q^8,-q^{12})(q^{10};q^{10})_\infty(q^{20};q^{20})_\infty}{f(-q^3,-q^7)f(-q^2,-q^{18})f(-q^4,-q^{16})}\right.\\
&\quad\left. -2qf^2(-q^5,-q^{15}) + 2q\frac{f^2(-q^3,-q^7)f(-q^4,-q^{16})(q^{10};q^{10})_\infty(q^{20};q^{20})_\infty}{f(-q,-q^9)f(-q^6,-q^{14})f(-q^8,-q^{12})}\right).
\end{aligned}
\tag{12.2.42}
$$

Proof. First, employ the identities

$$
\begin{aligned}
\eta_{20}^2\eta_{20,10} &= \eta_{10}^2,\\
\eta_{20}\eta_{40,10} &= \eta_{10},\\
\eta_{20}\eta_{20,4}\eta_{20,8} &= \eta_4,\\
\eta_{50}\eta_{50,10}\eta_{50,20} &= \eta_{10}
\end{aligned}
$$

in (12.2.33). Second, divide both sides of (12.2.33) by

$$
\begin{aligned}
&q^{233/6}\eta_{10}^8\eta_{20}\eta_{10,1}\eta_{10,3}\eta_{20,2}\eta_{20,4}\eta_{20,6}\eta_{20,8}\\
&\times \eta_{50,5}\eta_{50,10}\eta_{50,15}\eta_{50,20}\eta_{50,25}\eta_{200,50}\eta_{200,100}.
\end{aligned}
$$

Third, use the identities (12.2.23), (12.2.24), and (12.2.41) with n replaced by $5, 10, 15, 20$, and 25, respectively, and with q replaced by q^4 and q^{50}, respectively. The identity (12.2.33) then assumes the form (12.2.42). □

Lemma 12.2.23. *We have*

$$
\begin{aligned}
&f(q^{20},q^{30})\frac{f(-q,-q^9)(q^4;q^4)_\infty(q^{10};q^{10})_\infty^2}{f(-q^3,-q^7)f(-q^2,-q^{18})}\\
&\quad - q^2 f(q^{10},q^{40})\left(\frac{f(-q,-q^9)(q^4;q^4)_\infty(q^{10};q^{10})_\infty^2}{f(-q^3,-q^7)f(-q^2,-q^{18})}\right.\\
&\quad\left. + 2q\, f(-q^4,-q^{16})f(-q^8,-q^{12})\right)\\
&\quad + 4q^7 f(q^{50},q^{150})f(-q^4,-q^{16})f(-q^8,-q^{12})
\end{aligned}
$$

$$
\begin{aligned}
&= f(q^{25},q^{25})\left(\frac{f^2(-q,-q^9)f(-q^8,-q^{12})(q^{10};q^{10})_\infty(q^{20};q^{20})_\infty}{f(-q^3,-q^7)f(-q^2,-q^{18})f(-q^4,-q^{16})}\right.\\
&\quad\left.+q\,\frac{f^2(-q^3,-q^7)f(-q^4,-q^{16})(q^{10};q^{10})_\infty(q^{20};q^{20})_\infty}{f(-q,-q^9)f(-q^6,-q^{14})f(-q^8,-q^{12})}\right)\\
&\quad-q^2f(q^{15},q^{35})\Bigg(2f^2(-q^5,-q^{15})\\
&\quad+3q\,\frac{f^2(\;q^3,\;q^7)f(\;q^4,\;q^{16})(q^{10};q^{10})_\infty(q^{20};q^{20})_\infty}{f(-q,-q^9)f(-q^6,-q^{14})f(-q^8,-q^{12})}\Bigg)\\
&\quad-q^4f(q^5,q^{45})\Bigg(\frac{f^2(-q,-q^9)f(-q^8,-q^{12})(q^{10};q^{10})_\infty(q^{20};q^{20})_\infty}{f(-q^3,-q^7)f(-q^2,-q^{18})f(-q^4,-q^{16})}\\
&\quad-2qf^2(-q^5,-q^{15})\Bigg). \qquad (12.2.43)
\end{aligned}
$$

Proof. First, simplify (12.2.35) by using the identities

$$
\begin{aligned}
\eta_{20}^2\eta_{20,10} &= \eta_{10}^2,\\
\eta_{20}\eta_{40,10} &= \eta_{10},\\
\eta_{20}\eta_{20,4}\eta_{20,8} &= \eta_4,\\
\eta_{50}\eta_{100,25} &= \eta_{25}.
\end{aligned}
$$

Second, divide both sides of (12.2.35) by

$$
q^{233/6}\eta_{10}^8\eta_{20}\eta_{50}^2\eta_{10,1}\eta_{10,3}\eta_{20,2}\eta_{20,4}\eta_{20,6}\eta_{20,8}
\times\eta_{50,5}\eta_{50,10}\eta_{50,15}\eta_{50,20}\eta_{50,25}\eta_{200,50}\eta_{200,100}.
$$

Third, apply (12.2.23), (12.2.24), and (12.2.41) with n replaced by 5, 10, 15, 20, and 25, respectively, and with q replaced by q^4 and q^{50}, respectively. Then (12.2.43) follows. ∎

We have that:

Let F_1 denote the difference of the left- and right-hand sides of (12.2.25), and divide both sides of (12.2.25) by

$$
q^{451/30}\eta_{50}^{18}\eta_{10,2}^4\eta_{10,3}\eta_{20,2}\eta_{20,4}\eta_{50,10}\eta_{50,15}\eta_{50,20}^2\eta_{50,25}/\eta_{100}^2,
$$

We obtain the following mathematical connection with the theta function identity:

$$
\frac{f^2(-q,-q^9)f(-q^8,-q^{12})(q^{10};q^{10})_\infty(q^{20};q^{20})_\infty}{f(-q^3,-q^7)f(-q^2,-q^{18})f(-q^4,-q^{16})}
$$

Thence:

$$\eta_{50}^{18}\eta_{10,2}^{4}\eta_{10,3}\eta_{20,2}\eta_{20,4}\eta_{100,50}$$
$$\times\big(-\eta_{50,5}\eta_{50,10}^{2}\eta_{50,15}\eta_{50,25}\eta_{100,40}+\eta_{50,5}\eta_{50,10}\eta_{50,15}\eta_{50,20}\eta_{50,25}\eta_{100,40}$$
$$-\eta_{50,15}^{2}\eta_{50,20}^{2}\eta_{50,25}\eta_{100,20}+2\eta_{50,5}\eta_{50,15}\eta_{50,20}^{2}\eta_{50,25}\eta_{100,40}$$
$$-2\eta_{50,5}^{2}\eta_{50,20}\eta_{50,25}\eta_{100,30}\eta_{100,40}^{2}+\eta_{50,5}^{2}\eta_{50,15}\eta_{50,20}\eta_{100,40}^{2}\eta_{100,50}\big) \quad /$$

$$q^{451/30}\eta_{50}^{18}\eta_{10,2}^{4}\eta_{10,3}\eta_{20,2}\eta_{20,4}\eta_{50,10}\eta_{50,15}\eta_{50,20}^{2}\eta_{50,25}/\eta_{100}^{2}) \quad -$$

$$(\eta_{10}^{2}\eta_{100}^{16}\eta_{10,1}^{2}\eta_{10,2}^{4}\eta_{20,8}^{2}\eta_{50,10}\eta_{50,15}\eta_{50,20}^{2}\eta_{50,25}\eta_{100,50}^{9} \quad /$$

$$q^{451/30}\eta_{50}^{18}\eta_{10,2}^{4}\eta_{10,3}\eta_{20,2}\eta_{20,4}\eta_{50,10}\eta_{50,15}\eta_{50,20}^{2}\eta_{50,25}/\eta_{100}^{2}) \quad =$$

$$= 43200 \,/\, q^{451/30}\eta_{50}^{18}\eta_{10,2}^{4}\eta_{10,3}\eta_{20,2}\eta_{20,4}\eta_{50,10}\eta_{50,15}\eta_{50,20}^{2}\eta_{50,25}/\eta_{100}^{2}$$

$$=\frac{f^{2}(-q,-q^{9})f(-q^{8},-q^{12})(q^{10};q^{10})_{\infty}(q^{20};q^{20})_{\infty}}{f(-q^{3},-q^{7})f(-q^{2},-q^{18})f(-q^{4},-q^{16})} \qquad \text{(a)}$$

$$\eta_{50}^{18}\eta_{10,2}^{4}\eta_{10,3}\eta_{20,2}\eta_{20,4}\eta_{100,50}$$
$$\times\big(-\eta_{50,5}\eta_{50,10}^{2}\eta_{50,15}\eta_{50,25}\eta_{100,40}+\eta_{50,5}\eta_{50,10}\eta_{50,15}\eta_{50,20}\eta_{50,25}\eta_{100,40}$$
$$-\eta_{50,15}^{2}\eta_{50,20}^{2}\eta_{50,25}\eta_{100,20}+2\eta_{50,5}\eta_{50,15}\eta_{50,20}^{2}\eta_{50,25}\eta_{100,40}$$
$$-2\eta_{50,5}^{2}\eta_{50,20}\eta_{50,25}\eta_{100,30}\eta_{100,40}^{2}+\eta_{50,5}^{2}\eta_{50,15}\eta_{50,20}\eta_{100,40}^{2}\eta_{100,50}\big) \quad /$$

$$q^{589/30}\eta_{50}^{18}\eta_{10,1}\eta_{10,2}^{16}\eta_{20,6}\eta_{20,8}\eta_{50,5}\eta_{50,10}^{2}\eta_{50,20}\eta_{50,25}/\eta_{100}^{2}) \quad -$$

$$(\eta_{10}^{2}\eta_{100}^{16}\eta_{10,1}^{2}\eta_{10,2}^{4}\eta_{20,8}^{2}\eta_{50,10}\eta_{50,15}\eta_{50,20}^{2}\eta_{50,25}\eta_{100,50}^{9} \quad /$$

$$q^{589/30}\eta_{50}^{18}\eta_{10,1}\eta_{10,2}^{16}\eta_{20,6}\eta_{20,8}\eta_{50,5}\eta_{50,10}^{2}\eta_{50,20}\eta_{50,25}/\eta_{100}^{2}) \quad =$$

$$= 43200 \,/\, q^{589/30}\eta_{50}^{18}\eta_{10,1}\eta_{10,2}^{16}\eta_{20,6}\eta_{20,8}\eta_{50,5}\eta_{50,10}^{2}\eta_{50,20}\eta_{50,25}/\eta_{100}^{2} =$$

$$=\frac{f^{2}(-q^{3},-q^{7})f(-q^{4},-q^{16})(q^{10};q^{10})_{\infty}(q^{20};q^{20})_{\infty}}{f(-q,-q^{9})f(-q^{6},-q^{14})f(-q^{8},-q^{12})} \qquad \text{(b)}$$

$$\eta_5^2\eta_{100}^2\eta_{5,1}^{10}\eta_{6,1}^3$$
$$\times\,(\eta_{50,5}\eta_{50,10}^3\eta_{100,40}\eta_{100,50}+\eta_{50,15}\eta_{50,20}^3\eta_{100,20}\eta_{100,50}-3\eta_{50,10}^2\eta_{50,20}^2\eta_{100,25})\ /$$

$$q^{25/4}\eta_5^2\eta_{5,1}^{10}\eta_{6,1}^3\eta_{50,10}^2\eta_{50,20}^2)\ -\ (\ \eta_{20}^2\eta_{25}^2\eta_{5,1}^{10}\eta_{6,1}^3\eta_{20,5}^2\eta_{25,5}^2\eta_{25,10}^2\eta_{50,10}^2\eta_{50,20}^2\ /$$

$$q^{25/4}\eta_5^2\eta_{5,1}^{10}\eta_{6,1}^3\eta_{50,10}^2\eta_{50,20}^2) = \quad 9600\ /\quad q^{25/4}\eta_5^2\eta_{5,1}^{10}\eta_{6,1}^3\eta_{50,10}^2\eta_{50,20}^2 = f^2(-q^5,-q^{15})\quad \text{(c)}$$

$$\eta_4^2\eta_{50}^2\eta_{10,1}^2\eta_{10,2}^3\eta_{10,3}\eta_{20,2}$$
$$\times\,(\eta_{50,5}\eta_{50,15}\eta_{50,25}\eta_{100,50}+\eta_{50,5}\eta_{50,15}\eta_{50,25}\eta_{100,30}$$
$$-\,\eta_{50,5}\eta_{50,15}\eta_{50,25}\eta_{100,10}-\eta_{50,5}^2\eta_{50,15}\eta_{100,50}-\eta_{50,5}\eta_{50,25}^2\eta_{100,30}$$
$$+\,2\eta_{50,5}^2\eta_{50,25}\eta_{100,30}-\eta_{50,15}^2\eta_{50,25}\eta_{100,10})\qquad /$$

$$q^{329/30}\eta_4^2\eta_{10,1}^2\eta_{10,2}^3\eta_{10,3}\eta_{20,2}\eta_{50,5}\eta_{50,15}\eta_{50,25})\ -\ (\eta_{10}^2\eta_{20}^2\eta_{10,1}^3\eta_{10,2}^3\eta_{20,4}^3\eta_{20,8}^3\eta_{50,5}\eta_{50,15}\eta_{50,25}\ /$$

$$q^{329/30}\eta_4^2\eta_{10,1}^2\eta_{10,2}^3\eta_{10,3}\eta_{20,2}\eta_{50,5}\eta_{50,15}\eta_{50,25}) = 9600\ /\quad q^{329/30}\eta_4^2\eta_{10,1}^2\eta_{10,2}^3\eta_{10,3}\eta_{20,2}\eta_{50,5}\eta_{50,15}\eta_{50,25}$$

$$=\ \frac{f(-q,-q^9)(q^4;q^4)_\infty(q^{10};q^{10})_\infty^2}{f(-q^3,-q^7)f(-q^2,-q^{18})}\quad \text{(d)}$$

$$\eta_{10}^8\eta_{20}^3\eta_{50}\eta_{10,1}\eta_{10,4}\eta_{20,4}\eta_{20,8}^2\eta_{50,5}\eta_{50,15}\eta_{50,25}\eta_{200,50}\eta_{200,100}$$
$$\times\,(\eta_{10,1}\eta_{20,10}\eta_{50,10}\eta_{100,40}\quad 4\eta_{10,3}\eta_{20,2}\eta_{50,10}\eta_{100,40}$$
$$+\,\eta_{10,1}\eta_{20,10}\eta_{50,20}\eta_{100,20}+6\eta_{10,3}\eta_{20,2}\eta_{50,20}\eta_{100,20})$$
$$-\,4\eta_{10,1}\eta_{10,4}\eta_{20,4}\eta_{20,8}^2\eta_{40,10}\eta_{50,5}\eta_{50,10}\eta_{50,15}\eta_{50,20}\eta_{50,25}\eta_{200,100}$$
$$\times\,(\eta_{10}^7\eta_{20}^2\eta_{50}^2\eta_{100}\eta_{10,1}\eta_{50,10}^2\eta_{50,20}^2+\eta_{10}\eta_{20}^{10}\eta_{100}\eta_{10,3}\eta_{20,2}\eta_{20,10}^3)\quad /$$

$$q^{233/6}\eta_{10}^{8}\eta_{20}\eta_{10,1}\eta_{10,3}\eta_{20,2}\eta_{20,4}\eta_{20,6}\eta_{20,8}$$
$$\times \eta_{50,5}\eta_{50,10}\eta_{50,15}\eta_{50,20}\eta_{50,25}\eta_{200,50}\eta_{200,100}) - ($$

$$\eta_{10}^{8}\eta_{20}^{3}\eta_{50}\eta_{50,5}\eta_{50,10}\eta_{50,15}\eta_{50,20}\eta_{100,50}\eta_{200,50}\eta_{200,100}$$
$$\times (\eta_{10,1}^{3}\eta_{20,6}\eta_{20,8}^{2}\eta_{20,10} - 4\eta_{10,1}\eta_{10,3}\eta_{10,4}\eta_{20,2}\eta_{20,5}^{2}\eta_{20,8}$$
$$- \eta_{10,3}^{3}\eta_{20,2}\eta_{20,4}^{2}\eta_{20,10})$$
$$+ \eta_{10}^{8}\eta_{20}^{3}\eta_{50}\eta_{50,5}\eta_{50,10}\eta_{50,20}\eta_{50,25}\eta_{100,30}\eta_{200,50}\eta_{200,100}$$
$$\times (2\eta_{10,1}^{3}\eta_{20,6}\eta_{20,8}^{2}\eta_{20,10} + 2\eta_{10,1}\eta_{10,3}\eta_{10,4}\eta_{20,2}\eta_{20,5}^{2}\eta_{20,8}$$
$$+ 3\eta_{10,3}^{3}\eta_{20,2}\eta_{20,4}^{2}\eta_{20,10})$$
$$- \eta_{10}^{8}\eta_{20}^{3}\eta_{50}\eta_{50,10}\eta_{50,15}\eta_{50,20}\eta_{50,25}\eta_{100,10}\eta_{200,50}\eta_{200,100}$$
$$\times (3\eta_{10,1}^{3}\eta_{20,6}\eta_{20,8}^{2}\eta_{20,10} - 2\eta_{10,1}\eta_{10,3}\eta_{10,4}\eta_{20,2}\eta_{20,5}^{2}\eta_{20,8}$$
$$+ 2\eta_{10,3}^{3}\eta_{20,2}\eta_{20,4}^{2}\eta_{20,10}).$$

$$/ \begin{matrix} q^{233/6}\eta_{10}^{8}\eta_{20}\eta_{10,1}\eta_{10,3}\eta_{20,2}\eta_{20,4}\eta_{20,6}\eta_{20,8} \\ \times \eta_{50,5}\eta_{50,10}\eta_{50,15}\eta_{50,20}\eta_{50,25}\eta_{200,50}\eta_{200,100} \end{matrix})$$

$$= 14400 / \begin{matrix} q^{233/6}\eta_{10}^{8}\eta_{20}\eta_{10,1}\eta_{10,3}\eta_{20,2}\eta_{20,4}\eta_{20,6}\eta_{20,8} \\ \times \eta_{50,5}\eta_{50,10}\eta_{50,15}\eta_{50,20}\eta_{50,25}\eta_{200,50}\eta_{200,100} \end{matrix} =$$

$$f(q^{25},q^{25})\left(\frac{f^2(-q,-q^9)f(-q^8,-q^{12})(q^{10};q^{10})_\infty(q^{20};q^{20})_\infty}{f(-q^3,-q^7)f(-q^2,-q^{18})f(-q^4,-q^{16})}\right.$$
$$\left. 4qf^2(\ q^5,\ q^{15})\quad q\frac{f^2(-q^3,-q^7)f(-q^4,-q^{16})(q^{10};q^{10})_\infty(q^{20};q^{20})_\infty}{f(-q,-q^9)f(-q^6,-q^{14})f(-q^8,-q^{12})}\right)$$
$$+qf(q^{15},q^{35})\left(2\frac{f^2(-q,-q^9)f(-q^8,-q^{12})(q^{10};q^{10})_\infty(q^{20};q^{20})_\infty}{f(-q^3,-q^7)f(-q^2,-q^{18})f(-q^4,-q^{16})}\right.$$
$$\left.+2qf^2(-q^5,-q^{15})+3q\frac{f^2(-q^3,-q^7)f(-q^4,-q^{16})(q^{10};q^{10})_\infty(q^{20};q^{20})_\infty}{f(-q,-q^9)f(-q^6,-q^{14})f(-q^8,-q^{12})}\right)$$
$$-q^4f(q^{25},q^{25})\left(3\frac{f^2(-q,-q^9)f(-q^8,-q^{12})(q^{10};q^{10})_\infty(q^{20};q^{20})_\infty}{f(-q^3,-q^7)f(-q^2,-q^{18})f(-q^4,-q^{16})}\right.$$
$$\left.-2qf^2(-q^5,-q^{15})+2q\frac{f^2(-q^3,-q^7)f(-q^4,-q^{16})(q^{10};q^{10})_\infty(q^{20};q^{20})_\infty}{f(\ q,\ q^9)f(\ q^6,\ q^{14})f(\ q^8,\ q^{12})}\right). \quad \text{(e)}$$

$$\eta_{10}^{8}\eta_{20}^{3}\eta_{50}^{3}\eta_{10,1}\eta_{20,4}^{2}\eta_{20,6}\eta_{20,8}^{2}\eta_{50,5}\eta_{50,15}\eta_{50,25}\eta_{200,50}\eta_{200,100}$$
$$\times (\eta_{10,1}\eta_{20,10}\eta_{50,10}\eta_{100,40} - \eta_{10,1}\eta_{20,10}\eta_{50,20}\eta_{100,20}$$
$$- 2\eta_{10,3}\eta_{20,2}\eta_{50,20}\eta_{100,20}) + 4\eta_{10}\eta_{20}^{10}\eta_{50}^{2}\eta_{100}\eta_{10,1}\eta_{10,3}\eta_{20,2}\eta_{20,4}^{2}\eta_{20,6}$$
$$\times \eta_{20,8}^{2}\eta_{20,10}^{3}\eta_{40,10}\eta_{50,5}\eta_{50,10}\eta_{50,15}\eta_{50,20}\eta_{100,25}^{2}\eta_{200,100} \qquad /$$

$$q^{233/6}\eta_{10}^{8}\eta_{20}\eta_{50}^{2}\eta_{10,1}\eta_{10,3}\eta_{20,2}\eta_{20,4}\eta_{20,6}\eta_{20,8} \times \eta_{50,5}\eta_{50,10}\eta_{50,15}\eta_{50,20}\eta_{50,25}\eta_{200,50}\eta_{200,100}) - ($$

$$\eta_{10}^{8}\eta_{20}^{3}\eta_{50}^{3}\eta_{50,10}\eta_{50,20}\eta_{200,50}\eta_{200,100}$$
$$\times (\eta_{10,1}^{3}\eta_{20,6}\eta_{20,8}^{2}\eta_{20,10}\eta_{50,5}\eta_{50,15}\eta_{100,50}$$
$$+ \eta_{10,3}^{3}\eta_{20,2}\eta_{20,4}^{2}\eta_{20,10}\eta_{50,5}\eta_{50,15}\eta_{100,50}$$
$$- 2\eta_{10,1}\eta_{10,3}\eta_{20,2}\eta_{20,4}\eta_{20,5}^{2}\eta_{20,6}\eta_{20,8}\eta_{50,5}\eta_{50,25}\eta_{100,30}$$
$$\eta_{10,3}^{3}\eta_{20,2}\eta_{20,4}^{2}\eta_{20,10}\eta_{50,5}\eta_{50,25}\eta_{100,30}$$
$$- \eta_{10,1}^{3}\eta_{20,6}\eta_{20,8}^{2}\eta_{20,10}\eta_{50,15}\eta_{50,25}\eta_{100,10}$$
$$+ 2\eta_{10,1}\eta_{10,3}\eta_{20,2}\eta_{20,4}\eta_{20,5}^{2}\eta_{20,6}\eta_{20,8}\eta_{50,15}\eta_{50,25}\eta_{100,10}) \;/\; q^{233/6}\eta_{10}^{8}\eta_{20}\eta_{50}^{2}\eta_{10,1}\eta_{10,3}\eta_{20,2}\eta_{20,4}\eta_{20,6}\eta_{20,8} \times \eta_{50,5}\eta_{50,10}\eta_{50,15}\eta_{50,20}\eta_{50,25}\eta_{200,50}\eta_{200,100}) =$$

$$= 16800 \;/\; q^{233/6}\eta_{10}^{8}\eta_{20}\eta_{50}^{2}\eta_{10,1}\eta_{10,3}\eta_{20,2}\eta_{20,4}\eta_{20,6}\eta_{20,8} \times \eta_{50,5}\eta_{50,10}\eta_{50,15}\eta_{50,20}\eta_{50,25}\eta_{200,50}\eta_{200,100} =$$

$$\begin{aligned}
&f(q^{25},q^{25})\left(\frac{f^2(-q,-q^9)f(-q^8,-q^{12})(q^{10};q^{10})_\infty(q^{20};q^{20})_\infty}{f(-q^3,-q^7)f(-q^2,-q^{18})f(-q^4,-q^{16})}\right.\\
&\left.+q\,\frac{f^2(-q^3,-q^7)f(-q^4,-q^{16})(q^{10};q^{10})_\infty(q^{20};q^{20})_\infty}{f(-q,-q^9)f(-q^6,-q^{14})f(-q^8,-q^{12})}\right)\\
&-q^2f(q^{15},q^{35})\left(2f^2(-q^5,-q^{15})\right.\\
&\left.+3q\,\frac{f^2(-q^3,-q^7)f(-q^4,-q^{16})(q^{10};q^{10})_\infty(q^{20};q^{20})_\infty}{f(-q,-q^9)f(-q^6,-q^{14})f(-q^8,-q^{12})}\right)\\
&-q^4f(q^5,q^{45})\left(\frac{f^2(-q,-q^9)f(-q^8,-q^{12})(q^{10};q^{10})_\infty(q^{20};q^{20})_\infty}{f(-q^3,-q^7)f(-q^2,-q^{18})f(-q^4,-q^{16})}\right.\\
&\left.-2qf^2(-q^5,-q^{15})\right). \qquad (12.2.43)
\end{aligned}$$

(f)

We have:

$$(F_1;z)=\frac{9\cdot 57600}{12}=43200$$

$$(F_2;z)=\frac{9\cdot 57600}{12}=43200$$

$$(F_3;z)=\frac{2\cdot 57600}{12}=9600$$

$$(F_4; z) = \frac{2 \cdot 57600}{12} = 9600$$

$$(F_5; z) = \frac{6 \cdot 28800}{12} = 14400$$

$$(F_6; z) = \frac{7 \cdot 28800}{12} = 16800$$

And obtain:

(((1/15 * sqrt(12 * (4800*9))))^1/8

Input:

$$\sqrt[8]{\frac{1}{15} \sqrt{12 (4800 \times 9)}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Approximate form
- Step-by-step solution

$$\sqrt{2} \sqrt[8]{3}$$

Decimal approximation:

- More digits

1.622389603610977569320981470004102150530979016760707997198...

1.622389603610977569320981470004102150530979016760707997198

This value 1,62238... is in the range of the golden ratio value. It can be defined a golden number. We define golden numbers those in the range that goes from 1.6 to 1,675, i.e. an interval of 1.61803398

We note that:

(((1/15 * sqrt(12 * (4800*9))))^1/8 *(1.7848+0.88137)

Input interpretation:

$$\sqrt[8]{\frac{1}{15} \sqrt{12 (4800 \times 9)}} (1.7848 + 0.88137)$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Fewer digits
- More digits

4.325566489459480065996521165880837030681180325116896840890...

This result 4,32556...is a good approximation to the value of Cosmological Constant 4.33×10^{-66} eV^2 in natural units

(((1/12 * sqrt(12 * (4800*2))))^1/7

Input:

$$\sqrt[7]{\frac{1}{12}\sqrt{12\,(4800\times2)}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Approximate form
- Step-by-step solution

$$2^{5/14}\sqrt[7]{5}$$

Decimal approximation:

- More digits

1.6119945549594201073913153211214978786915283106333086588891...

Open code

1.6119945549594201073913153211214978786915283106333086588891

This value 1,61199... is in the range of the golden ratio value. It can be defined a golden number. We define golden numbers those in the range that goes from 1.6 to 1,675, i.e. an interval of 1.61803398

Note that:

(((1/12 * sqrt(12 * (4800*2))))^1/7 * ((2.7268-0.69897)*(1.328))

Input interpretation:

$$\sqrt[7]{\frac{1}{12}\sqrt{12\,(4800\times2)}}\;((2.7268-0.69897)\times1.328)$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Fewer digits
- More digits

4.3410340196131032438211274984523837535648715823132481714425...

This result 4,3410...is a good approximation to the value of Cosmological Constant 4.33×10^{-66} eV^2 in natural units

(((1/12 * sqrt(12 * (4800*3))))^1/7

Input:

$$\sqrt[7]{\frac{1}{12}\sqrt{12(4800\times 3)}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Approximate form
- Step-by-step solution

$$2^{2/7}\sqrt[14]{3}\sqrt[7]{5}$$

Decimal approximation:

- More digits

1.6593634412490599984688949756668868298654395024190413167 67...

1.659363441249059998468894975666886829865439502419041316767

where 1,6593634... is very near to the 14th root of the following Ramanujan's class invariant $Q = (G_{505}/G_{101/5})^3 = 1164{,}2696$ i.e. 1,65578...

Note that

(((1/12 * sqrt(12 * (4800*3))))^1/7 * 2 *1.3057

where 1.3057 is a Hausdorff dimension

Input interpretation:

$$\sqrt[7]{\frac{1}{12}\sqrt{12(4800\times 3)}}\times 2\times 1.3057$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Fewer digits
- More digits

4.333261690477795280001672339456508267510608716617084494607...

This result 4,33326...is practically equal to the value of Cosmological Constant 4.33×10^{-66} eV^2 in natural units.

(((1/10 * sqrt(12 * (2400*7))))^1/8

Input:

$$\sqrt[8]{\frac{1}{10}\sqrt{12(2400\times 7)}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

$2^{5/16} \sqrt[8]{3} \sqrt[16]{7}$

Decimal approximation:

- More digits

1.608905950768348836938596240641201705808003330039853405286...

Open code

1.608905950768348836938596240641201705808003330039853405286

This value 1,6089059... is in the range of the golden ratio value. It can be defined a golden number. We define golden numbers those in the range that goes from 1.6 to 1,675, thus an interval of 1.61803398

Note that:

(((1/10 * sqrt(12 * (2400*7))))^1/8 * ((2.7268-0.69897)*(1.328))

Where 0.69897, 1.328 and 2.7268 are Hausdorff dimensions

Input interpretation:

$$\sqrt[8]{\frac{1}{10}\sqrt{12\,(2400\times 7)}}\;((2.7268-0.69897)\times 1.328)$$

Open code

Result:

- Fewer digits
- More digits

4.332716537506659331628209120267747017157718425578262756158...

4.3327165375066593316282091202677470171577184255782627

Continued fraction:

- Linear form

$$4+\cfrac{1}{3+\cfrac{1}{179+\cfrac{1}{1+\cfrac{1}{4+\cfrac{1}{4+\cfrac{1}{5+\cfrac{1}{3+\cfrac{1}{14+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{7+\cfrac{1}{5+\cfrac{1}{2+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{9+\cfrac{1}{63+\cfrac{1}{3+\cfrac{1}{4+\cfrac{1}{\ldots}}}}}}}}}}}}}}}}}}}}}$$

Possible closed forms:

- More

$$\frac{355\,822\,487\,\pi}{258\,001\,949} \approx 4.33271653750665933118808$$

Enlarge Data Customize A Plaintext Interactive

$$\text{root of } 40x^5+44x^4-785x^3-385x^2-1132x-600 \text{ near } x=4.33272 \approx$$

$$4.33271653750665933150753$$

$$\frac{333\,548\,\pi^2-76\,103}{236\,260\,\pi} \approx 4.33271653750665933135824$$

This result 4,3327… is practically equal to the value of Cosmological Constant 4.33×10^{-66} eV^2 in natural units.

Now, we have:

16 * (((((2400*18))/900)))))^1/8

Input:

$$16\sqrt[8]{\frac{2400\times18}{900}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Approximate form
- Step-by-step solution

$$16\sqrt{2}\,\sqrt[8]{3}$$

Decimal approximation:

- More digits

25.958233657775641109135703520065634408495664268171327955 17...

25.958233657775641109135703520065634408495664268171327955 17

16 * (((4800*3))/300))^1/8

Input:

$$16 \sqrt[8]{\frac{4800 \times 3}{300}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Approximate form
- Step-by-step solution

$$16 \sqrt{2} \sqrt[8]{3}$$

Decimal approximation:

- More digits

25.958233657775641109135703520065634408495664268171327955 17...

16 * (((2400*7))/350))^1/8

Input:

$$16 \sqrt[8]{\frac{2400 \times 7}{350}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Approximate form
- Step-by-step solution

$$16 \sqrt{2} \sqrt[8]{3}$$

Decimal approximation:

- More digits

25.958233657775641109135703520065634408495664268171327955 17...

Open code

16 *((((2400*4))/200))^1/8

Input:

$$16 \sqrt[8]{\frac{2400 \times 4}{200}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Approximate form
- Step-by-step solution

$$16 \sqrt{2} \sqrt[8]{3}$$

Decimal approximation:

- More digits

25.958233657775641109135703520065634408495664268171327955 17...

Open code

Continued fraction:

- Linear form

$$25+\cfrac{1}{1+\cfrac{1}{22+\cfrac{1}{1+\cfrac{1}{16+\cfrac{1}{2+\cfrac{1}{5+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{39+\cfrac{1}{1+\cfrac{1}{6+\cfrac{1}{\ldots}}}}}}}}}}}}}}}}}}}}}$$

Possible closed forms:

- More

$$16\sqrt{2}\sqrt[8]{3} \approx$$

25.95823365777564110913570352006563440849566426817132795517651 44

Enlarge Data Customize A Plaintext Interactive

$$\frac{637200200\pi}{77117091} \approx 25.958233657775641063 88$$

$$\pi \text{ root of } 95x^4+59x^3-6939x^2-726x+3646 \text{ near } x=8.26276 \approx$$

25.95823365777564110903113

This result 25,9582 ≈ 26 is the critical dimension of the bosonic string.

In the context of string theory the meaning is more restricted: the *critical dimension* is the dimension at which string theory is consistent assuming a constant dilaton background without additional confounding permutations from background radiation effects. The precise number may be determined by the required cancellation of conformal anomaly on the worldsheet; it is 26 for the bosonic string theory and 10 for superstring theory. (from Wikipedia).

Now:

(27*2+12) * 16 * (((((2400*18))/900)))))^1/8

Input:

$$(27\times 2+12)\times 16\sqrt[8]{\frac{2400\times 18}{900}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Approximate form
- Step-by-step solution

$1056\sqrt{2}\sqrt[8]{3}$

Decimal approximation:

- More digits

1713.243421413192313202956432324331870960713841699307645041...

Open code

1713.243421413192313202956432324331870960713841699307645041

(27*2+12) * 16 * (((4800*3))/300))^1/8

Input:

$(27\times 2+12)\times 16\sqrt[8]{\frac{4800\times 3}{300}}$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Approximate form
- Step-by-step solution

$1056\sqrt{2}\sqrt[8]{3}$

Decimal approximation:

- More digits

1713.243421413192313202956432324331870960713841699307645041...

(27*2+12) * 16 * (((2400*7))/350))^1/8

Input:

$(27\times 2+12)\times 16\sqrt[8]{\frac{2400\times 7}{350}}$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Approximate form
- Step-by-step solution

$1056\sqrt{2}\sqrt[8]{3}$

Decimal approximation:

- More digits

1713.243421413192313202956432324331870960713841699307645041...

Open code

(27*2+12) *16 *((((2400*4))/200))^1/8

Input:

$(27\times 2+12)\times 16\sqrt[8]{\frac{2400\times 4}{200}}$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Approximate form
- Step-by-step solution

$1056\sqrt{2}\sqrt[8]{3}$

Decimal approximation:

- More digits

1713.243421413192313202956432324331870960713841699307645041...

Open code

This result is very near to the mass of candidate glueball $f_0(1710)$ meson.

Continued fraction:

- Linear form

$$1713+\cfrac{1}{4+\cfrac{1}{9+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{119+\cfrac{1}{3+\cfrac{1}{2+\cfrac{1}{663+\cfrac{1}{3+\cfrac{1}{2+\cfrac{1}{5+\cfrac{1}{20+\cfrac{1}{11+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{5+\cfrac{1}{2+\cfrac{1}{10+\cfrac{1}{\ldots}}}}}}}}}}}}}}}}}}}$$

Possible closed forms:

- More

$1056\sqrt{2}\sqrt[8]{3} \approx$
1713.24342141319231320295643232433187096071384169930764504164995

Enlarge Data Customize A Plaintext Interactive

$\frac{1091422\pi}{979} - \frac{5502619}{979\pi} \approx 1713.243421413192313261385$

π root of $4x^5 - 2180x^4 - 744x^3 - 1486x^2 + 558x + 2287$ near $x = 545.342$ $\approx$
1713.243421413192313222933

Now:

(1713.2434214131923132029564323243318709607138416993076)^1/3

Input interpretation:

$\sqrt[3]{1713.2434214131923132029564323243318709607138416993076}$

Open code

- Enlarge Data Customize A Plaintext Interactive
  Result:
  More digits
  11.965743554321136571146417712828078608206842272098138...

This result 11,9657 is very near to the values of black hole entropies 11,8458 and 12,1904

(2Pi)/((8(sqrt5))) * (1713.2434214131923132029564323243318709607138416993076)^1/3

Input interpretation:

$$\frac{2\pi}{8\sqrt{5}} \sqrt[3]{1713.2434214131923132029564323243318709607138416993076}$$

Open code

- Enlarge Data Customize A Plaintext Interactive
  Result:
  More digits
  4.2028565794125370233026911521072716605184884943405582...

This result 4,2028 is in the range of the mass of DM particle that is between 4 – 4.2 eV

(1713.2434214131923132029564323243318709607138416993076)^1/15

Input interpretation:

$$\sqrt[15]{1713.2434214131923132029564323243318709607138416993076}$$

Open code

- Enlarge Data Customize A Plaintext Interactive
  Result:
  More digits
  1.64281227111847641604539420823322219271934307659689796...

1.64281227111847641604539420823322219271934307659689796

$1.642812... \approx \zeta(2) = \frac{\pi^2}{6} = 1.6449$

- Continued fraction:
  Linear form

$$1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{112+\cfrac{1}{1+\cfrac{1}{11+\cfrac{1}{17+\cfrac{1}{1+\cfrac{1}{14+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{8+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{\cdots}}}}}}}}}}}}}}}}}}}}}$$

Possible closed forms:

- More

$$\frac{1}{744}\left(-120\,e^{\pi}+846\,\pi-10\log(\pi)+47\log(2\,\pi)+1003\tan^{-1}(\pi)\right)\approx$$

1.642812271118476416038276

Enlarge Data Customize A Plaintext Interactive

$$\frac{695\,760\,768\,\pi}{1\,330\,521\,421}\approx 1.64281227111847641613729$$

$$\text{root of } 30\,x^5-184\,x^4+147\,x^3+920\,x^2-1155\,x-256 \text{ near } x=1.64281 \approx$$

1.64281227111847641622559

-

Now:

1.64281227111847641604539420823322219271934307659689796* (1.3057+1.328)

Where 1,3057 and 1,328 are a Hausdorff dimensions

Input interpretation:

1.64281227111847641604539420823322219271934307659689796 (1.3057 + 1.328)

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- More digits

4.326674678444731336938754726223837288964933860833250157252...

4.326674678444731336938754726223837288964933860833250157252

Continued fraction:

- Linear form

$$4+\cfrac{1}{3+\cfrac{1}{16+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{4+\cfrac{1}{1+\cfrac{1}{6+\cfrac{1}{1+\cfrac{1}{15+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{16+\cfrac{1}{290+\cfrac{1}{1+\cfrac{1}{25+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{\cdots}}}}}}}}}}}}}}}}}}}}$$

Possible closed forms:

- More

  $\frac{680299059\,\pi}{493964230} \approx 4.32667467844473133637773$

  Enlarge Data Customize A Plaintext Interactive

  $\text{root of } 7x^4 - 1904x^3 + 6234x^2 + 7790x + 1357 \text{ near } x = 4.32667 \approx$
  $4.32667467844473133371020$

  $\frac{1}{\text{root of } 1357x^4 + 7790x^3 + 6234x^2 - 1904x + 7 \text{ near } x = 0.231124} \approx$
  $4.32667467844473133371020$

Note that:

(4.32667 * 493964230)^1/4 * 8

Input interpretation:

$\sqrt[4]{4.32667\times 493964230}\times 8$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- More digits

  1720.094...

1720.094...

This result is very near to the mass of candidate glueball $f_0(1710)$ meson.

From this result, we can to obtain a good approximation to Pi:

ln(1720.094) * 1/(0.538*2.3296*1.8928)

where 0.538, 1.8928 and 2.3296 are Hausdorff dimensions

Input interpretation:

$$\log(1720.094)\times\frac{1}{0.538\times 2.3296\times 1.8928}$$

Open code

- $\log(x)$ is the natural logarithm

Enlarge Data Customize A Plaintext Interactive

Result:

- Fewer digits
- More digits

3.140477862417781310014896368569899207372512819308474946284...

Alternative representations:

- More

$$\frac{\log(1720.09)}{0.538\times 2.3296\times 1.8928}=\frac{\log_e(1720.09)}{2.37229}$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$\frac{\log(1720.09)}{0.538\times 2.3296\times 1.8928}=\frac{\log(a)\log_a(1720.09)}{2.37229}$$

Open code

$$\frac{\log(1720.09)}{0.538\times 2.3296\times 1.8928}=-\frac{\text{Li}_1(-1719.09)}{2.37229}$$

Series representations:

- More

$$\frac{\log(1720.09)}{0.538\times 2.3296\times 1.8928}=0.421533\log(1719.09)-0.421533\sum_{k=1}^{\infty}\frac{(-1)^k e^{-7.44955k}}{k}$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$\frac{\log(1720.09)}{0.538\times 2.3296\times 1.8928}=0.843066\, i\pi\left\lfloor\frac{\arg(1720.09-x)}{2\pi}\right\rfloor+0.421533\log(x)-0.421533\sum_{k=1}^{\infty}\frac{(-1)^k(1720.09-x)^k x^{-k}}{k}\quad\text{for } x<0$$

Open code

$$\frac{\log(1720.09)}{0.538 \times 2.3296 \times 1.8928} = 0.421533 \left\lfloor \frac{\arg(1720.09 - z_0)}{2\pi} \right\rfloor \log\left(\frac{1}{z_0}\right) + 0.421533 \log(z_0) + 0.421533 \left\lfloor \frac{\arg(1720.09 - z_0)}{2\pi} \right\rfloor \log(z_0) - 0.421533 \sum_{k=1}^{\infty} \frac{(-1)^k (1720.09 - z_0)^k z_0^{-k}}{k}$$

Open code

- $\arg(z)$ is the complex argument
- $\lfloor x \rfloor$ is the floor function
- i is the imaginary unit
- More information

Integral representations:

$$\frac{\log(1720.09)}{0.538 \times 2.3296 \times 1.8928} = 0.421533 \int_1^{1720.09} \frac{1}{t} \, dt$$

Open code

$$\frac{\log(1720.09)}{0.538 \times 2.3296 \times 1.8928} = \frac{0.210767}{i\pi} \int_{-i\infty+\gamma}^{i\infty+\gamma} \frac{e^{-7.44955 s} \Gamma(-s)^2 \Gamma(1+s)}{\Gamma(1-s)} \, ds \quad \text{for } -1 < \gamma < 0$$

And:

2 * ln(1720.094) * 1/(0.538*2.3296*1.8928)

Input interpretation:

$$2 \log(1720.094) \times \frac{1}{0.538 \times 2.3296 \times 1.8928}$$

Open code

- $\log(x)$ is the natural logarithm

Result:

- Fewer digits
- More digits

6.280955724835562620029792737139798414745025638616949892569...

6.2809557... ≈ 2π that is the length of a circle of radius equal to 1

Alternative representations:

- More

$$\frac{2 \log(1720.09)}{0.538 \times 2.3296 \times 1.8928} = \frac{2 \log_e(1720.09)}{2.37229}$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$\frac{2\log(1720.09)}{0.538\times 2.3296\times 1.8928} = \frac{2\log(a)\log_a(1720.09)}{2.37229}$$

Open code

$$\frac{2\log(1720.09)}{0.538\times 2.3296\times 1.8928} = -\frac{2\operatorname{Li}_1(-1719.09)}{2.37229}$$

Series representations:

- More

$$\frac{2\log(1720.09)}{0.538\times 2.3296\times 1.8928} = 0.843066\log(1719.09) - 0.843066\sum_{k=1}^{\infty}\frac{(-1)^k e^{-7.44955k}}{k}$$

Open code

$$\frac{2\log(1720.09)}{0.538\times 2.3296\times 1.8928} = 1.68613\, i\pi\left\lfloor\frac{\arg(1720.09-x)}{2\pi}\right\rfloor + 0.843066\log(x) - 0.843066\sum_{k=1}^{\infty}\frac{(-1)^k (1720.09-x)^k x^{-k}}{k} \quad \text{for } x < 0$$

Open code

$$\frac{2\log(1720.09)}{0.538\times 2.3296\times 1.8928} = 0.843066\left\lfloor\frac{\arg(1720.09-z_0)}{2\pi}\right\rfloor\log\left(\frac{1}{z_0}\right) + 0.843066\log(z_0) + 0.843066\left\lfloor\frac{\arg(1720.09-z_0)}{2\pi}\right\rfloor\log(z_0) - 0.843066\sum_{k=1}^{\infty}\frac{(-1)^k (1720.09-z_0)^k z_0^{-k}}{k}$$

Open code

- $\arg(z)$ is the complex argument
- $\lfloor x\rfloor$ is the floor function
- i is the imaginary unit
- More information

Integral representations:

$$\frac{2\log(1720.09)}{0.538\times 2.3296\times 1.8928} = 0.843066\int_1^{1720.09}\frac{1}{t}\,dt$$

Open code

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$$\frac{2\log(1720.09)}{0.538\times 2.3296\times 1.8928} = \frac{0.421533}{i\pi}\int_{-i\infty+\gamma}^{i\infty+\gamma} \frac{e^{-7.44955 s}\,\Gamma(-s)^2\,\Gamma(1+s)}{\Gamma(1-s)}\,ds$$
for $-1 < \gamma < 0$

And from the closed form:

$$\frac{680\,299\,059\,\pi}{493\,964\,230} \approx 4.32667467844473133637773$$

We obtain:

(((4.32667 * 493964230)^1/4 * 8)))^1/3

Input interpretation:

$$\sqrt[3]{\sqrt[4]{4.32667\times 493\,964\,230}\times 8}$$

Open code

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Result:

- More digits

11.98167...

This result 11,98 is very near to the values of black hole entropies 11,8458 and 12,1904

2 * (((4.32667 * 493964230)^1/4 * 8)))^1/3

Input interpretation:

$$2\sqrt[3]{\sqrt[4]{4.32667\times 493\,964\,230}\times 8}$$

Open code

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Result:

- More digits

23.96334...

23.963344472599296136826318934698537192209073618745205

Continued fraction:

- Linear form

$$23+\cfrac{1}{1+\cfrac{1}{26+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{4+\cfrac{1}{1+\cfrac{1}{55+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{6+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{\dots}}}}}}}}}}}}}}}}}}}}$$

Possible closed forms:

- More

$$\frac{7(8+31e+68e^2)}{-610-413e+258e^2} \approx 23.963344472599296 07252$$

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$\text{root of } 880x^3-20267x^2-18849x-19620 \text{ near } x=23.9633 \approx$

23.963344472599296152576

$$\frac{1}{\text{root of } 19620x^3+18849x^2+20267x-880 \text{ near } x=0.0417304} \approx$$

23.963344472599296152576

This result 23,963 is linked to the "Ramanujan function" (an elliptic modular function that satisfies the need for "conformal symmetry") that has 24 "modes" corresponding to the physical vibrations of a bosonic string and to the black hole entropy value 23,9078

Note that, from:

$\text{root of } 880x^3-20267x^2-18849x-19620 \text{ near } x=23.9633 \approx$

23.963344472599296152576

We obtain:

18849 / 11 = 1713,545454545454545454545455

18849 / 11

Exact result:

$\frac{18849}{11}$ (irreducible)

Decimal approximation:

- More digits

1713.545454545454545454545454545454545454545454545454545454...

1713.545454545454545454545454545454545454545454545454545454

This result is very near to the mass of candidate glueball $f_0(1710)$ meson.

Continued fraction:

- Linear form

$$1713 + \cfrac{1}{1 + \cfrac{1}{1 + \cfrac{1}{5 + \cfrac{1}{\dots}}}}$$

Open code

Possible closed forms:

- More

$\frac{62830\, \mathcal{W}_{\mathrm{Wad}}}{11} \approx$ 1713.54545454545454545454545454545454545454545454545454545454545

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$\frac{18849}{11} \approx$ 1713.54545454545454545454545454545454545454545454545454545454545

$\frac{30\,(48\, \mathcal{L}_{\mathrm{Li}} + 29)}{160\, \mathcal{L}_{\mathrm{Li}} - 17} \approx 1713.54545454545454545409103$

- $\mathcal{W}_{\mathrm{Wad}}$ is the Wadsworth constant
- $\mathcal{L}_{\mathrm{Li}}$ is Liouville's constant

Thence ,we have the following mathematical connection:

$$\eta_{50}^{18}\eta_{10,2}^{4}\eta_{10,3}\eta_{20,2}\eta_{20,4}\eta_{100,50} \times \left(-\eta_{50,5}\eta_{50,10}^{2}\eta_{50,15}\eta_{50,25}\eta_{100,40} + \eta_{50,5}\eta_{50,10}\eta_{50,15}\eta_{50,20}\eta_{50,25}\eta_{100,40} - \eta_{50,15}^{2}\eta_{50,20}^{2}\eta_{50,25}\eta_{100,20} + 2\eta_{50,5}\eta_{50,15}\eta_{50,20}^{2}\eta_{50,25}\eta_{100,40} - 2\eta_{50,5}^{2}\eta_{50,20}\eta_{50,25}\eta_{100,30}\eta_{100,40}^{2} + \eta_{50,5}^{2}\eta_{50,15}\eta_{50,20}\eta_{100,40}^{2}\eta_{100,50}\right) \quad /$$

$$q^{451/30}\eta_{50}^{18}\eta_{10,2}^{4}\eta_{10,3}\eta_{20,2}\eta_{20,4}\eta_{50,10}\eta_{50,15}\eta_{50,20}^{2}\eta_{50,25}/\eta_{100}^{2}) \quad -$$

$$(\eta_{10}^{2}\eta_{100}^{16}\eta_{10,1}^{2}\eta_{10,2}^{4}\eta_{20,8}^{2}\eta_{50,10}\eta_{50,15}\eta_{50,20}^{2}\eta_{50,25}\eta_{100,50}^{9} \quad /$$

$q^{451/30}\eta_{50}^{18}\eta_{10,2}^{4}\eta_{10,3}\eta_{20,2}\eta_{20,4}\eta_{50,10}\eta_{50,15}\eta_{50,20}^{2}\eta_{50,25}/\eta_{100}^{2})$ =

$= 43200 / \; q^{451/30}\eta_{50}^{18}\eta_{10,2}^{4}\eta_{10,3}\eta_{20,2}\eta_{20,4}\eta_{50,10}\eta_{50,15}\eta_{50,20}^{2}\eta_{50,25}/\eta_{100}^{2}$

$$= \frac{f^2(-q,-q^9)f(-q^8,-q^{12})(q^{10};q^{10})_\infty(q^{20};q^{20})_\infty}{f(-q^3,-q^7)f(-q^2,-q^{18})f(-q^4,-q^{16})} \qquad \text{(a)}$$

((2400*18))/900 = 48

Input:

$\frac{2400\times 18}{900}$

Open code

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Result:

- Step-by-step solution

48

Thence:

$(q^{451/30}\eta_{50}^{18}\eta_{10,2}^{4}\eta_{10,3}\eta_{20,2}\eta_{20,4}\eta_{50,10}\eta_{50,15}\eta_{50,20}^{2}\eta_{50,25}/\eta_{100}^{2}) = 900$ and

$$\left(\frac{f^2(-q,-q^9)f(-q^8,-q^{12})(q^{10};q^{10})_\infty(q^{20};q^{20})_\infty}{f(-q^3,-q^7)f(-q^2,-q^{18})f(-q^4,-q^{16})}\right) = 48$$

The expression is:

$43200 / (q^{451/30}\eta_{50}^{18}\eta_{10,2}^{4}\eta_{10,3}\eta_{20,2}\eta_{20,4}\eta_{50,10}\eta_{50,15}\eta_{50,20}^{2}\eta_{50,25}/\eta_{100}^{2}) =$

$$= \left(\frac{f^2(-q,-q^9)f(-q^8,-q^{12})(q^{10};q^{10})_\infty(q^{20};q^{20})_\infty}{f(-q^3,-q^7)f(-q^2,-q^{18})f(-q^4,-q^{16})}\right) = 48$$

Note that 2400 * 18 = 43200; 43200 / 900 = 48 and 43200 / 1200 = 36.

Thence:

((((2400*18))/1200)))*48

Input:

$$\frac{2400 \times 18}{1200} \times 48$$

Open code

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Result:

- Step-by-step solution

1728

That is: 36 * 48 = 1728.

Now:

[(36*48)]^1/3

Input:

$$\sqrt[3]{36 \times 48}$$

Open code

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Exact result:

12

2 * [(36*48)]^1/3

Input:

$$2\sqrt[3]{36 \times 48}$$

Open code

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Exact result:

- Step-by-step solution

24

And that:

1 / [(36*48)]^1/3

Input:

$$\frac{1}{\sqrt[3]{36 \times 48}}$$

Open code

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Exact result:

- Step-by-step solution

$\frac{1}{12}$

Decimal approximation:

- More digits

0.083333333333333333333333333333333333333333333333333333333...

Possible closed forms:

- More

$\frac{1}{12} \approx 0.08333333333333333333333333333333333333333333333333333333333333$

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$\frac{5\, \mathcal{W}_{\text{Wad}}}{18} \approx$

0.08333333333333333333333333333333333333333333333333333333333333

$\frac{\mathcal{W}_{\text{Wad}}}{2\, \mathcal{W}_{\text{Wad}} + 3} \approx$

0.08333333333333333333333333333333333333333333333333333333333333

- $\mathcal{W}_{\text{Wad}}$ is the Wadsworth constant

Thence:

From the Chapter: **Transformation Formulas: 10th Order Mock Theta Functions**, we have developed the following Lemma:

Lemma 12.2.18. *If $f(a,b)$ is defined by (12.1.5), then*

$$\begin{aligned}
&-\frac{f(-q^5,-q^{45})f(-q^{40},-q^{60})f(-q^{50},-q^{50})}{f^2(-q^{20},-q^{30})} \\
&\times \left(q^6 f(-q^{10},-q^{40}) - q^4 f(-q^{20},-q^{30})\right) \\
&-\frac{f(-q^{50},-q^{50})}{f(-q^{10},-q^{40})} \\
&\times \left(q^3 f(-q^{15},-q^{35})f(-q^{20},-q^{80}) - 2q^2 f(-q^5,-q^{45})f(-q^{40},-q^{60})\right) \\
&-2q\frac{f^2(-q^5,-q^{45})f(-q^{40},-q^{60})(q^{50};q^{50})_\infty(q^{100};q^{100})_\infty}{f(-q^{15},-q^{35})f(-q^{10},-q^{90})f(-q^{20},-q^{80})} \\
&+\frac{f^2(-q^5,-q^{45})f(-q^{40},-q^{60})(q^{50};q^{50})^3_\infty}{f(-q^{25},-q^{25})f(-q^{10},-q^{90})f(-q^{20},-q^{80})f(-q^{30},-q^{70})} \\
&=\frac{f^2(-q,-q^9)f(-q^8,-q^{12})(q^{10};q^{10})_\infty(q^{20};q^{20})_\infty}{f(-q^3,-q^7)f(-q^2,-q^{18})f(-q^4,-q^{16})}. \qquad (12.2.37)
\end{aligned}$$

and, as new result:

$$36 * \left(\frac{f^2(-q,-q^9) f(-q^8,-q^{12}) (q^{10};q^{10})_\infty (q^{20};q^{20})_\infty}{f(-q^3,-q^7) f(-q^2,-q^{18}) f(-q^4,-q^{16})} \right) = 1728$$

$$2 \times \sqrt[3]{36 * \left(\frac{f^2(-q,-q^9) f(-q^8,-q^{12}) (q^{10};q^{10})_\infty (q^{20};q^{20})_\infty}{f(-q^3,-q^7) f(-q^2,-q^{18}) f(-q^4,-q^{16})} \right)} = 24$$

$$\sqrt[15]{36 * \left(\frac{f^2(-q,-q^9) f(-q^8,-q^{12}) (q^{10};q^{10})_\infty (q^{20};q^{20})_\infty}{f(-q^3,-q^7) f(-q^2,-q^{18}) f(-q^4,-q^{16})} \right)} = 1.6437518 \ldots$$

1.6437518295172257623084979362309795173834925899454752004 11

We note that:

The result 1728 is very near to the mass of candidate glueball $f_0(1710)$ 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

The value 24 is linked to the "Ramanujan function" (an elliptic modular function that satisfies the need for "conformal symmetry") that has 24 "modes" corresponding to the physical vibrations of a bosonic string.

$$1.64375 \approx \zeta(2) = \frac{\pi^2}{6} = 1.6449$$

Continued fraction:

- Linear form

$$1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{4+\cfrac{1}{5+\cfrac{1}{2+\cfrac{1}{20+\cfrac{1}{1+\cfrac{1}{8+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{9+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{9+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{\dots}}}}}}}}}}}}}}}}}}}}}}$$

Open code

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Possible closed forms:

- More

$2^{2/5}\sqrt[5]{3} \approx$

1.64375182951722576230849793623097951738349258994547520041102976

$4\sqrt{\frac{3139915}{18593681}} \approx 1.64375182951722583645$

$\frac{e^{\frac{3}{4}+\frac{29}{2e}-4e+\frac{9}{4\pi}-\frac{13\pi}{4}}\pi^{8e-7}\cos^6(e\pi)}{\sin^{5/2}(e\pi)} \approx 1.64375182951722576 53822$

And

$$\frac{1}{2}\left(\sqrt[16]{36*\left(\frac{f^2(-q,-q^9)f(-q^8,-q^{12})(q^{10};q^{10})_\infty(q^{20};q^{20})_\infty}{f(-q^3,-q^7)f(-q^2,-q^{18})f(-q^4,-q^{16})}\right)}+\right.$$

$$\left.\sqrt[15]{36*\left(\frac{f^2(-q,-q^9)f(-q^8,-q^{12})(q^{10};q^{10})_\infty(q^{20};q^{20})_\infty}{f(-q^3,-q^7)f(-q^2,-q^{18})f(-q^4,-q^{16})}\right)}\right)=$$

$= 1.618615670181102435516227417163352011810811958816290019893$

Indeed:

1/2(1728^1/16 + 1728^1/15)

Input:

$$\frac{1}{2}\left(\sqrt[16]{1728}+\sqrt[15]{1728}\right)$$

Open code

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Result:

- Approximate form
- Step-by-step solution

$$\frac{1}{2}\left(2^{3/8}\times 3^{3/16}+2^{2/5}\sqrt[5]{3}\right)$$

Decimal approximation:

- More digits

1.618615670181102435516227417163352011810811958816290019893...

Open code

Continued fraction:

- Linear form

$$1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{4+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{8+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{\ldots}}}}}}}}}}}}}}}}}}}}}}}$$

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Possible closed forms:

- More

$$\frac{222645775\pi}{432136142}\approx 1.61861567018110243523041$$

$$\sqrt{\frac{1}{13}(-4081+1787e+565\pi-3632\log(2))}\approx 1.618615670181102425449$$

root of $865x^3+22920x^2-98833x+96256$ near $x=1.61862$ ≈ 1.6186156701811024355 22943

Alternate forms:

$$\frac{3^{3/16}}{2^{5/8}} + \frac{\sqrt[5]{3}}{2^{3/5}}$$

Open code

$$\frac{3^{3/16}\left(1 + \sqrt[40]{2}\,\sqrt[80]{3}\right)}{2^{5/8}}$$

$$\begin{aligned}
&\text{root of } 1\,125\,899\,906\,842\,624\,x^{80} - 6\,755\,399\,441\,055\,744\,x^{75} +\\
&18\,999\,560\,927\,969\,280\,x^{70} - 33\,249\,231\,623\,946\,240\,x^{65} -\\
&148\,434\,069\,749\,760\,x^{64} + 40\,522\,501\,041\,684\,480\,x^{60} -\\
&862\,105\,077\,106\,606\,080\,x^{59} - 36\,470\,250\,937\,516\,032\,x^{55} -\\
&63\,055\,126\,806\,354\,984\,960\,x^{54} + 25\,073\,297\,519\,542\,272\,x^{50} -\\
&819\,369\,563\,241\,893\,068\,800\,x^{49} + 7\,827\,577\,896\,960\,x^{48} -\\
&13\,432\,123\,671\,183\,360\,x^{45} - 3\,374\,567\,517\,567\,791\,923\,200\,x^{44} -\\
&162\,923\,206\,347\,325\,440\,x^{43} + 5\,666\,677\,173\,780\,480\,x^{40} -\\
&5\,580\,889\,105\,880\,926\,126\,080\,x^{39} + 32\,199\,776\,876\,321\,832\,960\,x^{38} -\\
&1\,888\,892\,391\,260\,160\,x^{35} - 4\,140\,497\,702\,729\,117\,859\,840\,x^{34} -\\
&540\,848\,566\,163\,252\,183\,040\,x^{33} - 206\,391\,214\,080\,x^{32} +\\
&495\,834\,252\,705\,792\,x^{30} - 1\,440\,211\,855\,454\,219\,796\,480\,x^{29} +\\
&1\,502\,565\,913\,250\,900\,213\,760\,x^{28} - 3\,051\,287\,708\,958\,720\,x^{27} -\\
&101\,420\,642\,598\,912\,x^{25} - 233\,772\,701\,611\,504\,435\,200\,x^{24} -\\
&883\,163\,826\,121\,628\,712\,960\,x^{23} - 224\,679\,926\,543\,155\,200\,x^{22} +\\
&15\,846\,975\,406\,080\,x^{20} - 16\,755\,940\,501\,114\,060\,800\,x^{19} +\\
&115\,227\,272\,119\,319\,101\,440\,x^{18} - 587\,549\,251\,716\,710\,400\,x^{17} +\\
&2\,720\,977\,920\,x^{16} - 1\,828\,497\,162\,240\,x^{15} - 466\,134\,667\,451\,228\,160\,x^{14} -\\
&2\,969\,021\,418\,242\,088\,960\,x^{13} - 97\,492\,325\,961\,139\,200\,x^{12} -\\
&4\,456\,961\,832\,960\,x^{11} + 146\,932\,807\,680\,x^{10} - 3\,812\,563\,516\,078\,080\,x^{9} +\\
&10\,475\,755\,128\,455\,040\,x^{8} - 797\,636\,990\,891\,520\,x^{7} + 3\,064\,161\,260\,160\,x^{6} -\\
&7\,346\,640\,384\,x^{5} - 4\,449\,309\,082\,560\,x^{4} - 1\,717\,277\,189\,760\,x^{3} -\\
&112\,495\,430\,880\,x^{2} - 2\,295\,825\,120\,x + 157\,837\,977 \quad \text{near } x = 1.61862
\end{aligned}$$

Minimal polynomial:

$$1125899906842624x^{80} - 6755399441055744x^{75} + 18999560927969280x^{70} - 33249231623946240x^{65} - 148434069749760x^{64} + 40522501041684480x^{60} - 862105077106606080x^{59} - 36470250937516032x^{55} - 63055126806354984960x^{54} + 25073297519542272x^{50} - 819369563241893068800x^{49} + 7827577896960x^{48} - 13432123671183360x^{45} - 3374567517567791923200x^{44} - 162923206347325440x^{43} + 5666677173780480x^{40} - 5580889105880926126080x^{39} + 32199776876321832960x^{38} - 1888892391260160x^{35} - 4140497702729117859840x^{34} - 540848566163252183040x^{33} - 206391214080x^{32} + 495834252705792x^{30} - 1440211855454219796480x^{29} + 1502565913250900213760x^{28} - 3051287708958720x^{27} - 101420642598912x^{25} - 233772701611504435200x^{24} - 883163826121628712960x^{23} - 224679926543155200x^{22} + 15846975406080x^{20} - 16755940501114060800x^{19} + 115227272119319101440x^{18} - 587549251716710400x^{17} + 2720977920x^{16} - 1828497162240x^{15} - 466134667451228160x^{14} - 2969021418242088960x^{13} - 97492325961139200x^{12} - 4456961832960x^{11} + 146932807680x^{10} - 3812563516078080x^{9} + 10475755128455040x^{8} - 797636990891520x^{7} + 3064161260160x^{6} - 7346640384x^{5} - 4449309082560x^{4} - 1717277189760x^{3} - 112495430880x^{2} - 2295825120x + 157837977$$

This result 1.618615670181102435516227417163352011810811958816290019893 is a very good approximation to the golden ratio!

Note that;

(1.2683+1.3057) * (36*48)^1/15

Input interpretation:

$(1.2683 + 1.3057)\sqrt[15]{36 \times 48}$

Open code

- Units »

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Result:

- Fewer digits
- More digits

4.231017209177339112182073687858541277745109926519653165857...

Continued fraction:

- Linear form

$$4+\cfrac{1}{4+\cfrac{1}{3+\cfrac{1}{23+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{4+\cfrac{1}{7+\cfrac{1}{4+\cfrac{1}{4+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{5+\cfrac{1}{2+\cfrac{1}{23+\cfrac{1}{1+\cfrac{1}{6+\cfrac{1}{1+\cfrac{1}{\cdots}}}}}}}}}}}}}}}}}}}}}}$$

Open code

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Possible closed forms:

- More

$$\frac{7}{12}\pi\cot^2\left(\frac{6353638}{10915619}\right)\approx 4.23101720917733911265645$$

$$\frac{1163+800e+823e^2}{4(45+161e+10e^2)}\approx 4.23101720917733911234656$$

$$\frac{3249590579\pi}{2412868912}\approx 4.23101720917733911201642$$

This result 4.2310172091773391121820736878585412777451099265196531 is in the range of the mass of DM particle that is between 4 – 4.2 eV

We have also that:

((((36*48)^1/16)))^(((2*0.6309)/2/((2*1.4649))))

where 0.6309 and 1.4649 are Hausdorff dimensions

Input interpretation:

$$\sqrt[16]{36\times 48}^{\left(\frac{2\times 0.6309}{2}\right)/(2\times 1.4649)}$$

Open code

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Result:

- Fewer digits
- More digits

1.1055364740621548755838609729321480751231119978697651411 49...

1.1055364740621548755838609729321480751231119978697651...

Continued fraction:

- Linear form

$$1+\cfrac{1}{9+\cfrac{1}{2+\cfrac{1}{9+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{20+\cfrac{1}{2+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{8+\cfrac{1}{10+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{70+\cfrac{1}{3+\cfrac{1}{8+\cfrac{1}{\ldots}}}}}}}}}}}}}}}}}}}}}$$

Open code

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Possible closed forms:

- More

$$\frac{37978575}{3480694\,\pi^2} \approx 1.10553647406215491166$$

$$\frac{2\,(126-8\,e+51\,e^2)}{331-859\,e+389\,e^2} \approx 1.1055364740621548746068$$

$$\frac{2091103816\,\pi}{5942270147} \approx 1.10553647406215487557171703$$

This result 1.105536474062... is practically (as absolute value) equal to the value of the Cosmological Constant $1.1056 * 10^{-52}$

Analyzing the minimal polynomial

If we take a random coefficient, for example 883163826121628712960 and divide it by 1728, we obtain:

883163826121628712960 / 1728 = 511090177153720320;

511090177153720320 / 1728 = 295769778445440;

295769778445440 / 1728 = 171163066230;

And:

32199776876321832960 / 1728 = 18634130136760320;

18634130136760320 / 1728 = 10783640125440;

10783640125440 / 1728 = 6240532480;

And:

16755940501114060800 / 1728 = 9696724827033600;

9696724827033600 / 1728 = 5611530571200;

5611530571200 / 1728 = 3247413525

And:

1502565913250900213760 / 1728 = 869540459057233920;

869540459057233920 / 1728 = 503206284176640;

503206284176640 / 1728 = 291207340380

And so on...

We note that each coefficient is divisible three times by 1728. What is the meaning behind this sort of division performed three times for the same number, in this case 1728?

If we take the results of above divisions and multiply them, and then divide twice by 1728, we obtain:

(171163066230*6240532480*3247413525*291207340380)/1728/1728

Input:

$$\frac{\frac{171\,163\,066\,230 \times 6240\,532\,480 \times 3\,247\,413\,525 \times 291\,207\,340\,380}{1728}}{1728}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

338 286 091 664 464 205 403 826 008 962 137 500

Scientific notation:

$3.382860916644642054038260089621375 \times 10^{35}$

338286091664464205403826008962137500

If we divide them two by two and multiply them together, dividing them by two, we obtain:

1/2*(291207340380/171163066230)*(6240532480/3247413525)

Input:

$$\frac{1}{2} \times \frac{291\,207\,340\,380}{171\,163\,066\,230} \times \frac{6\,240\,532\,480}{3\,247\,413\,525}$$

Open code

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Exact result:

- Step-by-step solution

$$\frac{465\,971\,504\,116\,873\,216}{285\,044\,746\,797\,832\,185}$$

Decimal approximation:

- More digits

1.634731070653139328564984223149181366613791398608107505038...

Open code

1.634731070653139328564984223149181366613791398608107505038

$$1.63473 \approx \zeta(2) = \frac{\pi^2}{6} = 1.6449$$

Continued fraction:

- Linear form

$$1 + \cfrac{1}{1 + \cfrac{1}{1 + \cfrac{1}{1 + \cfrac{1}{2 + \cfrac{1}{1 + \cfrac{1}{4 + \cfrac{1}{2 + \cfrac{1}{1 + \cfrac{1}{66 + \cfrac{1}{1 + \cfrac{1}{2 + \cfrac{1}{1 + \cfrac{1}{11 + \cfrac{1}{4 + \cfrac{1}{2 + \cfrac{1}{1 + \cfrac{1}{2 + \cfrac{1}{7 + \cfrac{1}{3 + \cfrac{1}{1 + \cfrac{1}{5 + \cfrac{1}{\ldots}}}}}}}}}}}}}}}}}}}}}}}$$

Possible closed forms:

- More

$$\frac{5\,(800\,C_{MRB} + 1801)}{97\,C_{MRB} + 5950} \approx 1.634731070653139243735$$

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$$\left(\frac{20\,059\,855}{10\,416\,761}\right)^{3/4} \approx 1.634731070653139364884$$

$$\frac{2\,391\,052\,016\,\pi}{4\,595\,074\,739} \approx 1.63473107065313932858 9552$$

•

Note that:

1.634731070653139328564984223149181366613791398608107505038 * 2*1.328

Where 1.328 is a Hausdorff dimension

Input interpretation:

1.634731070653139328564984223149181366613791398608107505038 × 2 × 1.328

Open code

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Result:

• More digits

4.341845723654738056668598096684225709726229954703133533380...

This result is very near to the value of Cosmological Constant 4.33×10^{-66} eV^2 in natural units

Furthermore:

(171163066230*6240532480*3247413525*291207340380) =

= 1010116857132623485908538001544799180800000

We have:

1/8 * ln(171163066230*6240532480*3247413525*291207340380)

Input:

$$\frac{1}{8} \log(171\,163\,066\,230 \times 6\,240\,532\,480 \times 3\,247\,413\,525 \times 291\,207\,340\,380)$$

Open code

• log(x) is the natural logarithm

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Exact result:

$$\frac{\log(1\,010\,116\,857\,132\,623\,485\,908\,538\,001\,544\,799\,180\,800\,000)}{8}$$

Decimal approximation:

• More digits

12.08982999125520665379144464145768376445038282072930206319...

Property:

$$\frac{\log(1\,010\,116\,857\,132\,623\,485\,908\,538\,001\,544\,799\,180\,800\,000)}{8}$$

is a transcendental number

Alternate forms:

$$\frac{7\log(2)}{4} + \frac{7\log(3)}{8} + \frac{5\log(5)}{8} + \frac{\log(221)}{4} + \frac{\log(184\,700\,609\,004\,437\,094\,738\,068\,977)}{8}$$

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$$\frac{1}{8}(14\log(2) + 7\log(3) + 5\log(5) + \log(7) + \log(11) + 2\log(13) + 2\log(17) + \log(31) + \log(37) + \log(179) + \log(181) + \log(443) + \log(330\,233) + \log(441\,223\,243))$$

$$\frac{7\log(2)}{4} + \frac{7\log(3)}{8} + \frac{5\log(5)}{8} + \frac{\log(7)}{8} + \frac{\log(11)}{8} + \frac{\log(13)}{4} + \frac{\log(17)}{4} + \frac{\log(31)}{8} + \frac{\log(37)}{8} + \frac{\log(179)}{8} + \frac{\log(181)}{8} + \frac{\log(443)}{8} + \frac{\log(330\,233)}{8} + \frac{\log(441\,223\,243)}{8}$$

Continued fraction:

- Linear form

$$12 + \cfrac{1}{11 + \cfrac{1}{7 + \cfrac{1}{1 + \cfrac{1}{1 + \cfrac{1}{3 + \cfrac{1}{5 + \cfrac{1}{3 + \cfrac{1}{1 + \cfrac{1}{2 + \cfrac{1}{4 + \cfrac{1}{1 + \cfrac{1}{6 + \cfrac{1}{7 + \cfrac{1}{1 + \cfrac{1}{1 + \cfrac{1}{9 + \cfrac{1}{1 + \cfrac{1}{2 + \cfrac{1}{2 + \cfrac{1}{2 + \cfrac{1}{\cdots}}}}}}}}}}}}}}}}}}}}}$$

Series representations:

- More

$$\frac{1}{8}\log(171\,163\,066\,230 \times 6\,240\,532\,480 \times 3\,247\,413\,525 \times 291\,207\,340\,380) = \frac{\log(1\,010\,116\,857\,132\,623\,485\,908\,538\,001\,544\,799\,180\,799\,999)}{8} - \frac{1}{8}\sum_{k=1}^{\infty}\frac{\left(-\frac{1}{1\,010\,116\,857\,132\,623\,485\,908\,538\,001\,544\,799\,180\,799\,999}\right)^k}{k}$$

Open code

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$$\frac{1}{8}\log(171\,163\,066\,230\times 6\,240\,532\,480\times 3\,247\,413\,525\times 291\,207\,340\,380)=$$
$$\frac{1}{4} i\pi \left\lfloor \frac{\arg(1\,010\,116\,857\,132\,623\,485\,908\,538\,001\,544\,799\,180\,800\,000-x)}{2\pi} \right\rfloor + \frac{\log(x)}{8} - \frac{1}{8}\sum_{k=1}^{\infty} \frac{(-1)^k (1\,010\,116\,857\,132\,623\,485\,908\,538\,001\,544\,799\,180\,800\,000-x)^k x^{-k}}{k} \quad \text{for } x<0$$

Open code

$$\frac{1}{8}\log(171\,163\,066\,230\times 6\,240\,532\,480\times 3\,247\,413\,525\times 291\,207\,340\,380)=$$
$$\frac{1}{4} i\pi \left\lfloor \frac{\pi-\arg\left(\frac{1}{z_0}\right)-\arg(z_0)}{2\pi} \right\rfloor + \frac{\log(z_0)}{8} - \frac{1}{8}\sum_{k=1}^{\infty} \frac{(-1)^k (1\,010\,116\,857\,132\,623\,485\,908\,538\,001\,544\,799\,180\,800\,000-z_0)^k z_0^{-k}}{k}$$

Integral representations:

$$\frac{1}{8}\log(171\,163\,066\,230\times 6\,240\,532\,480\times 3\,247\,413\,525\times 291\,207\,340\,380)= \frac{1}{8}\int_1^{1\,010\,116\,857\,132\,623\,485\,908\,538\,001\,544\,799\,180\,800\,000} \frac{1}{t}\,dt$$

Open code

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$$\frac{1}{8}\log(171\,163\,066\,230\times 6\,240\,532\,480\times 3\,247\,413\,525\times 291\,207\,340\,380)=$$
$$-\frac{i}{16\pi}\int_{-i\infty+\gamma}^{i\infty+\gamma} \frac{1\,010\,116\,857\,132\,623\,485\,908\,538\,001\,544\,799\,180\,799\,999^{-s}\,\Gamma(-s)^2\,\Gamma(1+s)}{\Gamma(1-s)}\,ds \quad \text{for } -1<\gamma<0$$

This value 12,0898 is very near to the value of black hole entropy 12.1904

And:

1/Pi * ln(171163066230*6240532480*3247413525*291207340380)

Input:

$$\frac{1}{\pi}\log(171\,163\,066\,230\times 6\,240\,532\,480\times 3\,247\,413\,525\times 291\,207\,340\,380)$$

Open code

- $\log(x)$ is the natural logarithm

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Exact result:

$$\frac{\log(1\,010\,116\,857\,132\,623\,485\,908\,538\,001\,544\,799\,180\,800\,000)}{\pi}$$

Decimal approximation:

- More digits

30.786499267982590397960261983255081816178386552416399923 38...

Decimal approximation:

- More digits

30.786499267982590397960261983255081816178386552416399923 38...

Open code

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Alternate forms:

$$\frac{14\log(2)+7\log(3)+5\log(5)+2\log(221)+\log(184\,700\,609\,004\,437\,094\,738\,068\,977)}{\pi}$$

$$\frac{1}{\pi}(14\log(2)+7\log(3)+5\log(5)+\log(7)+\log(11)+2\log(13)+2\log(17)+\log(31)+\log(37)+\log(179)+\log(181)+\log(443)+\log(330\,233)+\log(441\,223\,243))$$

$$\frac{14\log(2)}{\pi}+\frac{7\log(3)}{\pi}+\frac{5\log(5)}{\pi}+\frac{\log(7)}{\pi}+\frac{\log(11)}{\pi}+\frac{2\log(13)}{\pi}+\frac{2\log(17)}{\pi}+\frac{\log(31)}{\pi}+\frac{\log(37)}{\pi}+\frac{\log(179)}{\pi}+\frac{\log(181)}{\pi}+\frac{\log(443)}{\pi}+\frac{\log(330\,233)}{\pi}+\frac{\log(441\,223\,243)}{\pi}$$

Continued fraction:

- Linear form

$$30+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{6+\cfrac{1}{7+\cfrac{1}{46+\cfrac{1}{2+\cfrac{1}{3+\cfrac{1}{2+\cfrac{1}{5+\cfrac{1}{2+\cfrac{1}{23+\cfrac{1}{1+\cfrac{1}{16+\cfrac{1}{5+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{17+\cfrac{1}{2+\cfrac{1}{\ldots}}}}}}}}}}}}}}}}}}}}}$$

Series representations:

- More

$$\frac{\log(171\,163\,066\,230 \times 6\,240\,532\,480 \times 3\,247\,413\,525 \times 291\,207\,340\,380)}{\pi} = \frac{\log(1\,010\,116\,857\,132\,623\,485\,908\,538\,001\,544\,799\,180\,799\,999)}{\pi} - \frac{\sum_{k=1}^{\infty} \frac{\left(-\frac{1}{1\,010\,116\,857\,132\,623\,485\,908\,538\,001\,544\,799\,180\,799\,999}\right)^k}{k}}{\pi}$$

Open code

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$$\frac{\log(171\,163\,066\,230 \times 6\,240\,532\,480 \times 3\,247\,413\,525 \times 291\,207\,340\,380)}{\pi} = 2\,i \left\lfloor \frac{\arg(1\,010\,116\,857\,132\,623\,485\,908\,538\,001\,544\,799\,180\,800\,000 - x)}{2\,\pi} \right\rfloor + \frac{\log(x)}{\pi} - \frac{\sum_{k=1}^{\infty} \frac{(-1)^k (1\,010\,116\,857\,132\,623\,485\,908\,538\,001\,544\,799\,180\,800\,000 - x)^k x^{-k}}{k}}{\pi} \quad \text{for } x < 0$$

Open code

$$\frac{\log(171\,163\,066\,230 \times 6\,240\,532\,480 \times 3\,247\,413\,525 \times 291\,207\,340\,380)}{\pi} = 2\,i \left\lfloor \frac{\pi - \arg\left(\frac{1}{z_0}\right) - \arg(z_0)}{2\,\pi} \right\rfloor + \frac{\log(z_0)}{\pi} - \frac{\sum_{k=1}^{\infty} \frac{(-1)^k (1\,010\,116\,857\,132\,623\,485\,908\,538\,001\,544\,799\,180\,800\,000 - z_0)^k z_0^{-k}}{k}}{\pi}$$

Integral representations:

$$\frac{\log(171\,163\,066\,230 \times 6\,240\,532\,480 \times 3\,247\,413\,525 \times 291\,207\,340\,380)}{\pi} = \frac{1}{\pi} \int_1^{1\,010\,116\,857\,132\,623\,485\,908\,538\,001\,544\,799\,180\,800\,000} \frac{1}{t}\,dt$$

Open code

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$$\frac{\log(171\,163\,066\,230 \times 6\,240\,532\,480 \times 3\,247\,413\,525 \times 291\,207\,340\,380)}{\pi} = -\frac{i}{2\,\pi^2} \int_{-i\,\infty+\gamma}^{i\,\infty+\gamma} \frac{1\,010\,116\,857\,132\,623\,485\,908\,538\,001\,544\,799\,180\,799\,999^{-s}\,\Gamma(-s)^2\,\Gamma(1+s)}{\Gamma(1-s)}\,ds \quad \text{for } -1 < \gamma < 0$$

This result 30,7864 is very near to the values of black hole entropies 30,5963 and 30,7812

We have, from the sum of the coefficients:

(883163826121628712960+32199776876321832960+16755940501114060800+1502565913250900213760)

Input:

$883\,163\,826\,121\,628\,712\,960 + 32\,199\,776\,876\,321\,832\,960 + 16\,755\,940\,501\,114\,060\,800 + 1\,502\,565\,913\,250\,900\,213\,760$

Open code

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Result:

$2\,434\,685\,456\,749\,964\,820\,480$

Scientific notation:

$2.43468545674996482048 \times 10^{21}$

Now:

1/4*ln (883163826121628712960+32199776876321832960+16755940501114060800+1502565913250900213760)

Input:

$\frac{1}{4} \log(883\,163\,826\,121\,628\,712\,960 + 32\,199\,776\,876\,321\,832\,960 + 16\,755\,940\,501\,114\,060\,800 + 1\,502\,565\,913\,250\,900\,213\,760)$

Open code

- $\log(x)$ is the natural logarithm

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Exact result:

$$\frac{\log(2\,434\,685\,456\,749\,964\,820\,480)}{4}$$

Decimal approximation:

- More digits

12.311026131298221621009747292524286786730735322200906687 61...

Open code

Property:

$\frac{\log(2\,434\,685\,456\,749\,964\,820\,480)}{4}$ is a transcendental number

Continued fraction:

- Linear form

$$12+\cfrac{1}{3+\cfrac{1}{4+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{5+\cfrac{1}{5+\cfrac{1}{1+\cfrac{1}{92238+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{4+\cfrac{1}{1+\cfrac{1}{8+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{2+\cfrac{1}{4+\cfrac{1}{12+\cfrac{1}{\ldots}}}}}}}}}}}}}}}}}}}}}$$

Series representations:

- More

$$\frac{1}{4}\log(883163826121628712960+32199776876321832960+16755940501114060800+1502565913250900213760)=\frac{\log(2434685456749964820479)}{4}-\frac{1}{4}\sum_{k=1}^{\infty}\frac{\left(-\frac{1}{2434685456749964820479}\right)^k}{k}$$

Open code

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$$\frac{1}{4}\log(883163826121628712960+32199776876321832960+16755940501114060800+1502565913250900213760)=\frac{1}{2}i\pi\left\lfloor\frac{\arg(2434685456749964820480-x)}{2\pi}\right\rfloor+\frac{\log(x)}{4}-\frac{1}{4}\sum_{k=1}^{\infty}\frac{(-1)^k(2434685456749964820480-x)^k x^{-k}}{k}\quad\text{for } x<0$$

Open code

$$\frac{1}{4}\log(883163826121628712960+32199776876321832960+16755940501114060800+1502565913250900213760)=\frac{1}{2}i\pi\left\lfloor\frac{\pi-\arg\left(\frac{1}{z_0}\right)-\arg(z_0)}{2\pi}\right\rfloor+\frac{\log(z_0)}{4}-\frac{1}{4}\sum_{k=1}^{\infty}\frac{(-1)^k(2434685456749964820480-z_0)^k z_0^{-k}}{k}$$

Integral representations:

$$\frac{1}{4}\log(883\,163\,826\,121\,628\,712\,960 + 32\,199\,776\,876\,321\,832\,960 + 16\,755\,940\,501\,114\,060\,800 + 1\,502\,565\,913\,250\,900\,213\,760) = \frac{1}{4}\int_1^{2\,434\,685\,456\,749\,964\,820\,480}\frac{1}{t}\,dt$$

Open code

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$$\frac{1}{4}\log(883\,163\,826\,121\,628\,712\,960 + 32\,199\,776\,876\,321\,832\,960 + 16\,755\,940\,501\,114\,060\,800 + 1\,502\,565\,913\,250\,900\,213\,760) = -\frac{i}{8\pi}\int_{-i\,\infty+\gamma}^{i\,\infty+\gamma}\frac{2\,434\,685\,456\,749\,964\,820\,479^{-s}\,\Gamma(-s)^2\,\Gamma(1+s)}{\Gamma(1-s)}\,ds \quad \text{for } -1<\gamma<0$$

This result 12,31 is very near to the values of black hole entropies 12,1904 and 12,5664

1/((sqrt(5)+1)/2))*ln (883163826121628712960+32199776876321832960+16755940501114060800+1502565913250900213760)

Input:

$$\frac{1}{\frac{1}{2}(\sqrt{5}+1)}\log(883\,163\,826\,121\,628\,712\,960 + 32\,199\,776\,876\,321\,832\,960 + 16\,755\,940\,501\,114\,060\,800 + 1\,502\,565\,913\,250\,900\,213\,760)$$

Open code

- $\log(x)$ is the natural logarithm

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Exact result:

$$\frac{2\log(2\,434\,685\,456\,749\,964\,820\,480)}{1+\sqrt{5}}$$

Decimal approximation:

- More digits

30.434530342121706390852242060893429980923868581884750762 36...

Open code

Property:

$$\frac{2\log(2\,434\,685\,456\,749\,964\,820\,480)}{1+\sqrt{5}} \text{ is a transcendental number}$$

Series representations:

- More

$$\frac{1}{\frac{1}{2}\left(\sqrt{5}+1\right)}\log(883\,163\,826\,121\,628\,712\,960+32\,199\,776\,876\,321\,832\,960+16\,755\,940\,501\,114\,060\,800+1\,502\,565\,913\,250\,900\,213\,760)=\frac{2\log(2\,434\,685\,456\,749\,964\,820\,479)}{1+\sqrt{5}}-\frac{2\sum_{k=1}^{\infty}\frac{\left(-\frac{1}{2\,434\,685\,456\,749\,964\,820\,479}\right)^k}{k}}{1+\sqrt{5}}$$

Open code

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$$\frac{1}{\frac{1}{2}\left(\sqrt{5}+1\right)}\log(883\,163\,826\,121\,628\,712\,960+32\,199\,776\,876\,321\,832\,960+16\,755\,940\,501\,114\,060\,800+1\,502\,565\,913\,250\,900\,213\,760)=\frac{4\,i\,\pi\left\lfloor\frac{\arg(2\,434\,685\,456\,749\,964\,820\,480-x)}{2\,\pi}\right\rfloor}{1+\sqrt{5}}+\frac{2\log(x)}{1+\sqrt{5}}-\frac{2\sum_{k=1}^{\infty}\frac{(-1)^k\,(2\,434\,685\,456\,749\,964\,820\,480-x)^k\,x^{-k}}{k}}{1+\sqrt{5}}\quad\text{for } x<0$$

Open code

$$\frac{1}{\frac{1}{2}\left(\sqrt{5}+1\right)}\log(883\,163\,826\,121\,628\,712\,960+32\,199\,776\,876\,321\,832\,960+16\,755\,940\,501\,114\,060\,800+1\,502\,565\,913\,250\,900\,213\,760)=\frac{1}{1+\sqrt{5}}\,2\left(\log(z_0)+\left\lfloor\frac{\arg(2\,434\,685\,456\,749\,964\,820\,480-z_0)}{2\,\pi}\right\rfloor\left(\log\left(\frac{1}{z_0}\right)+\log(z_0)\right)-\sum_{k=1}^{\infty}\frac{(-1)^k\,(2\,434\,685\,456\,749\,964\,820\,480-z_0)^k\,z_0^{-k}}{k}\right)$$

Integral representations:

$$\frac{1}{\frac{1}{2}\left(\sqrt{5}+1\right)}\log(883\,163\,826\,121\,628\,712\,960+32\,199\,776\,876\,321\,832\,960+16\,755\,940\,501\,114\,060\,800+1\,502\,565\,913\,250\,900\,213\,760)=\frac{2}{1+\sqrt{5}}\int_1^{2\,434\,685\,456\,749\,964\,820\,480}\frac{1}{t}\,dt$$

Open code

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$$\frac{1}{\frac{1}{2}\left(\sqrt{5}+1\right)}\log(883\,163\,826\,121\,628\,712\,960+32\,199\,776\,876\,321\,832\,960+16\,755\,940\,501\,114\,060\,800+1\,502\,565\,913\,250\,900\,213\,760)=-\frac{i}{\pi+\sqrt{5}\,\pi}\int_{-i\,\infty+\gamma}^{i\,\infty+\gamma}\frac{2\,434\,685\,456\,749\,964\,820\,479^{-s}\,\Gamma(-s)^2\,\Gamma(1+s)}{\Gamma(1-s)}\,ds \text{ for } -1<\gamma<0$$

Open code

This result 30,4345 is very near to the value of black hole entropy 30,4615

1/(((sqrt(5)+1)/2))^2*ln (883163826121628712960+32199776876321832960+16755940501114060800+1502565913250900213760)

Input:

$$\frac{1}{\left(\frac{1}{2}\left(\sqrt{5}+1\right)\right)^2}\log(883\,163\,826\,121\,628\,712\,960+32\,199\,776\,876\,321\,832\,960+16\,755\,940\,501\,114\,060\,800+1\,502\,565\,913\,250\,900\,213\,760)$$

Open code

- $\log(x)$ is the natural logarithm

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Exact result:

$$\frac{4\log(2\,434\,685\,456\,749\,964\,820\,480)}{\left(1+\sqrt{5}\right)^2}$$

Decimal approximation:

- More digits

18.809574183071180093186747109203717165999072706918875988 09...

Open code

Property:

$$\frac{4\log(2\,434\,685\,456\,749\,964\,820\,480)}{\left(1+\sqrt{5}\right)^2} \text{ is a transcendental number}$$

Series representations:

- More

$$\frac{1}{\left(\frac{1}{2}\left(\sqrt{5}+1\right)\right)^2}\log(883\,163\,826\,121\,628\,712\,960+32\,199\,776\,876\,321\,832\,960+16\,755\,940\,501\,114\,060\,800+1\,502\,565\,913\,250\,900\,213\,760)=\frac{2\log(2\,434\,685\,456\,749\,964\,820\,479)}{3+\sqrt{5}}-\frac{2\sum_{k=1}^{\infty}\frac{\left(-\frac{1}{2\,434\,685\,456\,749\,964\,820\,479}\right)^k}{k}}{3+\sqrt{5}}$$

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$$\frac{1}{\left(\frac{1}{2}\left(\sqrt{5}+1\right)\right)^2}\log(883\,163\,826\,121\,628\,712\,960+32\,199\,776\,876\,321\,832\,960+16\,755\,940\,501\,114\,060\,800+1\,502\,565\,913\,250\,900\,213\,760)=\frac{4\,i\,\pi\left\lfloor\frac{\arg(2\,434\,685\,456\,749\,964\,820\,480-x)}{2\,\pi}\right\rfloor}{3+\sqrt{5}}+\frac{2\log(x)}{3+\sqrt{5}}-\frac{2\sum_{k=1}^{\infty}\frac{(-1)^k\,(2\,434\,685\,456\,749\,964\,820\,480-x)^k\,x^{-k}}{k}}{3+\sqrt{5}}\quad\text{for } x<0$$

Open code

$$\frac{1}{\left(\frac{1}{2}\left(\sqrt{5}+1\right)\right)^2}\log(883\,163\,826\,121\,628\,712\,960+32\,199\,776\,876\,321\,832\,960+16\,755\,940\,501\,114\,060\,800+1\,502\,565\,913\,250\,900\,213\,760)=\frac{1}{\left(1+\sqrt{5}\right)^2}4\left(\log(z_0)+\left\lfloor\frac{\arg(2\,434\,685\,456\,749\,964\,820\,480-z_0)}{2\,\pi}\right\rfloor\left(\log\left(\frac{1}{z_0}\right)+\log(z_0)\right)-\sum_{k=1}^{\infty}\frac{(-1)^k\,(2\,434\,685\,456\,749\,964\,820\,480-z_0)^k\,z_0^{-k}}{k}\right)$$

Integral representations:

$$\frac{1}{\left(\frac{1}{2}\left(\sqrt{5}+1\right)\right)^2}\log(883\,163\,826\,121\,628\,712\,960+32\,199\,776\,876\,321\,832\,960+16\,755\,940\,501\,114\,060\,800+1\,502\,565\,913\,250\,900\,213\,760)=\frac{2}{3+\sqrt{5}}\int_1^{2\,434\,685\,456\,749\,964\,820\,480}\frac{1}{t}\,dt$$

Open code

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$$\frac{1}{\left(\frac{1}{2}\left(\sqrt{5}+1\right)\right)^2}\log(883\,163\,826\,121\,628\,712\,960+32\,199\,776\,876\,321\,832\,960+16\,755\,940\,501\,114\,060\,800+1\,502\,565\,913\,250\,900\,213\,760)=-\frac{i}{3\,\pi+\sqrt{5}\,\pi}\int_{-i\,\infty+\gamma}^{i\,\infty+\gamma}\frac{2\,434\,685\,456\,749\,964\,820\,479^{-s}\,\Gamma(-s)^2\,\Gamma(1+s)}{\Gamma(1-s)}\,ds\quad\text{for } -1<\gamma<0$$

This result 18,809 is very near to the value of black hole entropy 18,7328

From the product of the coefficients, we have:

(883163826121628712960*32199776876321832960*16755940501114060800*1502565913250900213760)

Input:

883 163 826 121 628 712 960 × 32 199 776 876 321 832 960 × 16 755 940 501 114 060 800 × 1 502 565 913 250 900 213 760

Open code

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Result:

715 972 722 289 651 672 191 964 120 401 066 036 877 700 897 580 713 653 423 988 346 007 419 931 852 800 000

Decimal approximation:

- More digits

$7.1597272228965167219196412040106603687770089758071365... \times 10^{80}$

7.1597272228965167219196412040106603687770089758071365 × 10^80

Note that:

(7.1597272228965167219196412040106603687770089758071365× 10^80)^(1.2619)*12

Where 1,2619 is a Hausdorff dimension

Input interpretation:

$(7.1597272228965167219196412040106603687770089758071365 \times 10^{80})^{1.2619} \times 12$

Open code

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Result:

- More digits

$1.28818... \times 10^{103}$

This result is in the range of SMBHs entropy contained within the cosmic event horizon 1,2 * 10^{103}

And:

(7.1597272228965167219196412040106603687770089758071365 × 10^80)*(4.92906*10^6)*(0.081816) 2*(1.08753)

Where 4,92906*10^6 , 0,081816 and 1,08753 are results of Ramanujan mock theta functions (see previous our papers)

Input interpretation:

$7.1597272228965167219196412040106603687770089758071365 \times 10^{80} \times 4.92906 \times 10^6 \times 0.081816 (2 \times 1.08753)$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

628 015 070 798 111 317 317 306 604 060 620 207 918 155 286 213 607 529 609 853 910 374 240 000 000 000 000 000 000

Scientific notation:

$6.2801507079811131731730660406062020791815528621360752960985391037424 \times 10^{86}$

6.2801507079811131731730660406062020791815528621360752 × 10^86

This result is practically equal to the Dark Matter entropy contained within the cosmic event horizon 6 * 10^{86} . Furthermore, this is a multiple of length of a circle with radius equal to 1: 2π

1/(5Pi)*ln (883163826121628712960*32199776876321832960*16755940501114060800*1502565913250900213760)

Input:

$$\frac{1}{5\pi} \log(883\,163\,826\,121\,628\,712\,960 \times 32\,199\,776\,876\,321\,832\,960 \times 16\,755\,940\,501\,114\,060\,800 \times 1\,502\,565\,913\,250\,900\,213\,760)$$

Open code

- log(x) is the natural logarithm

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Exact result:

$$\frac{1}{5\pi} \log(715\,972\,722\,289\,651\,672\,191\,964\,120\,401\,066\,036\,877\,700\,897\,580\,713\,653\,423\,988\,346\,007\,419\,931\,852\,800\,000)$$

Decimal approximation:

- More digits

11.852286394270331426082818250405054173576289675430382816 43...

Series representations:

- More

$$\frac{1}{5\pi}\log(883\,163\,826\,121\,628\,712\,960 \times 32\,199\,776\,876\,321\,832\,960 \times 16\,755\,940\,501\,114\,060\,800 \times 1\,502\,565\,913\,250\,900\,213\,760) = \frac{2}{5}\,i\left\lfloor\frac{1}{2\pi}\arg(715\,972\,722\,289\,651\,672\,191\,964\,120\,401\,066\,036\,877\,700\,897\,580\,713\,653\,423\,988\,346\,007\,419\,931\,852\,800\,000 - x)\right\rfloor + \frac{\log(x)}{5\pi} - \frac{1}{5\pi}\left(\sum_{k=1}^{\infty}\frac{1}{k}(-1)^k (715\,972\,722\,289\,651\,672\,191\,964\,120\,401\,066\,036\,877\,700\,897\,580\,713\,653\,423\,988\,346\,007\,419\,931\,852\,800\,000 - x)^k x^{-k}\right) \text{ for } x < 0$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$\frac{1}{5\pi}\log(883\,163\,826\,121\,628\,712\,960 \times 32\,199\,776\,876\,321\,832\,960 \times 16\,755\,940\,501\,114\,060\,800 \times 1\,502\,565\,913\,250\,900\,213\,760) = \frac{1}{5\pi}\left(\log(z_0) + \left\lfloor\frac{1}{2\pi}\arg(715\,972\,722\,289\,651\,672\,191\,964\,120\,401\,066\,036\,877\,700\,897\,580\,713\,653\,423\,988\,346\,007\,419\,931\,852\,800\,000 - z_0)\right\rfloor \left(\log\left(\frac{1}{z_0}\right) + \log(z_0)\right) - \sum_{k=1}^{\infty}\frac{1}{k}(-1)^k (715\,972\,722\,289\,651\,672\,191\,964\,120\,401\,066\,036\,877\,700\,897\,580\,713\,653\,423\,988\,346\,007\,419\,931\,852\,800\,000 - z_0)^k z_0^{-k}\right)$$

Open code

$$\frac{1}{5\pi}\log(883\,163\,826\,121\,628\,712\,960 \times 32\,199\,776\,876\,321\,832\,960 \times 16\,755\,940\,501\,114\,060\,800 \times 1\,502\,565\,913\,250\,900\,213\,760) = \frac{1}{5\pi}\log(715\,972\,722\,289\,651\,672\,191\,964\,120\,401\,066\,036\,877\,700\,897\,580\,713\,653\,423\,988\,346\,007\,419\,931\,852\,799\,999) - \frac{1}{5\pi}\left(\sum_{k=1}^{\infty}\frac{1}{k}(-(1/715\,972\,722\,289\,651\,672\,191\,964\,120\,401\,066\,036\,877\,700\,897\,580\,713\,653\,423\,988\,346\,007\,419\,931\,852\,799\,999))^k\right)$$

Integral representations:

$$\frac{1}{5\pi}\log(883\,163\,826\,121\,628\,712\,960 \times 32\,199\,776\,876\,321\,832\,960 \times 16\,755\,940\,501\,114\,060\,800 \times 1\,502\,565\,913\,250\,900\,213\,760) = \frac{1}{5\pi}\int_1^{715\,972\,722\,289\,651\,672\,191\,964\,120\,401\,066\,036\,877\,700\,897\,580\,713\,653\,423\,988\,346\,007\,419\,931\,852\,800\,000} \frac{1}{t}\,dt$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$\frac{1}{5\pi}\log(883\,163\,826\,121\,628\,712\,960 \times 32\,199\,776\,876\,321\,832\,960 \times 16\,755\,940\,501\,114\,060\,800 \times 1\,502\,565\,913\,250\,900\,213\,760) = -\frac{i}{10\pi^2}\int_{-i\infty+\gamma}^{i\infty+\gamma} \frac{1}{\Gamma(1-s)} 715\,972\,722\,289\,651\,672\,191\,964\,120\,401\,066\,036\,877\,700\,897\,580\,713\,653\,423\,988\,346\,007\,419\,931\,852\,799\,999^{-s}\,\Gamma(-s)^2\,\Gamma(1+s)\,ds$$

for $-1 < \gamma < 0$

This result 11,8522 is very near to the value of black hole entropy 11,8458

1/8 ln (883163826121628712960*32199776876321832960*16755940501114060800*1502565913250900213760)

Input:

$$\frac{1}{8}\log(883\,163\,826\,121\,628\,712\,960 \times 32\,199\,776\,876\,321\,832\,960 \times 16\,755\,940\,501\,114\,060\,800 \times 1\,502\,565\,913\,250\,900\,213\,760)$$

Open code

- $\log(x)$ is the natural logarithm

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Exact result:

$$\frac{1}{8}\log(715\,972\,722\,289\,651\,672\,191\,964\,120\,401\,066\,036\,877\,700\,897\,580\,713\,653\,423\,988\,346\,007\,419\,931\,852\,800\,000)$$

Decimal approximation:

- More digits

23.27190991530120804982513730073263854804359154017397188308...

Open code

Property:

$\frac{1}{8}\log($
715 972 722 289 651 672 191 964 120 401 066 036 877 700 897 580 713 653 423 988 346 007 419 931 852 800 000) is a transcendental number

Series representations:

- More

$$\frac{1}{8}\log(883\,163\,826\,121\,628\,712\,960 \times 32\,199\,776\,876\,321\,832\,960 \times 16\,755\,940\,501\,114\,060\,800 \times 1\,502\,565\,913\,250\,900\,213\,760) = \frac{1}{8}\log(715\,972\,722\,289\,651\,672\,191\,964\,120\,401\,066\,036\,877\,700\,897\,580\,713\,653\,423\,988\,346\,007\,419\,931\,852\,799\,999) - \frac{1}{8}\sum_{k=1}^{\infty}\frac{1}{k}(-(1/715\,972\,722\,289\,651\,672\,191\,964\,120\,401\,066\,036\,877\,700\,897\,580\,713\,653\,423\,988\,346\,007\,419\,931\,852\,799\,999))^k$$

Open code

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$$\frac{1}{8}\log(883\,163\,826\,121\,628\,712\,960 \times 32\,199\,776\,876\,321\,832\,960 \times 16\,755\,940\,501\,114\,060\,800 \times 1\,502\,565\,913\,250\,900\,213\,760) = \frac{1}{4} i \pi \left\lfloor \frac{1}{2\pi}\arg(715\,972\,722\,289\,651\,672\,191\,964\,120\,401\,066\,036\,877\,700\,897\,580\,713\,653\,423\,988\,346\,007\,419\,931\,852\,800\,000 - x) \right\rfloor + \frac{\log(x)}{8} - \frac{1}{8}\sum_{k=1}^{\infty}\frac{1}{k}(-1)^k (715\,972\,722\,289\,651\,672\,191\,964\,120\,401\,066\,036\,877\,700\,897\,580\,713\,653\,423\,988\,346\,007\,419\,931\,852\,800\,000 - x)^k x^{-k} \quad \text{for } x < 0$$

Open code

$$\frac{1}{8}\log(883\,163\,826\,121\,628\,712\,960 \times 32\,199\,776\,876\,321\,832\,960 \times 16\,755\,940\,501\,114\,060\,800 \times 1\,502\,565\,913\,250\,900\,213\,760) = \frac{1}{4} i \pi \left\lfloor \frac{\pi - \arg\left(\frac{1}{z_0}\right) - \arg(z_0)}{2\pi} \right\rfloor + \frac{\log(z_0)}{8} - \frac{1}{8}\sum_{k=1}^{\infty}\frac{1}{k}(-1)^k (715\,972\,722\,289\,651\,672\,191\,964\,120\,401\,066\,036\,877\,700\,897\,580\,713\,653\,423\,988\,346\,007\,419\,931\,852\,800\,000 - z_0)^k z_0^{-k}$$

Integral representations:

$$\frac{1}{8}\log(883\,163\,826\,121\,628\,712\,960\times 32\,199\,776\,876\,321\,832\,960\times 16\,755\,940\,501\,114\,060\,800\times 1\,502\,565\,913\,250\,900\,213\,760)=\frac{1}{8}\int_1^{715\,972\,722\,289\,651\,672\,191\,964\,120\,401\,066\,036\,877\,700\,897\,580\,713\,653\,423\,988\,346\,007\,419\,931\,852\,800\,000}\frac{1}{t}\,dt$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$\frac{1}{8}\log(883\,163\,826\,121\,628\,712\,960\times 32\,199\,776\,876\,321\,832\,960\times 16\,755\,940\,501\,114\,060\,800\times 1\,502\,565\,913\,250\,900\,213\,760)=-\frac{i}{16\pi}\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{1}{\Gamma(1-s)}\,715\,972\,722\,289\,651\,672\,191\,964\,120\,401\,066\,036\,877\,700\,897\,580\,713\,653\,423\,988\,346\,007\,419\,931\,852\,799\,999^{-s}\,\Gamma(-s)^2\,\Gamma(1+s)\,ds$$

for $-1<\gamma<0$

This result 23,2719 is very near to the value of black hole entropy 23,3621

Now, from the sum of the coefficients:

(883163826121628712960+32199776876321832960+16755940501114060800+1502565913250900213760)

we obtain also:

6121628712960+32199776876321832960+16755940501114060800+1502565913250900213760))))^1/16

Input:

$(883\,163\,826\,121\,628\,712\,960+32\,199\,776\,876\,321\,832\,960+16\,755\,940\,501\,114\,060\,800+1\,502\,565\,913\,250\,900\,213\,760)\,\hat{}\,(1/16)$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Approximate form
- Step-by-step solution

$2\sqrt[8]{2}\;3^{9/16}\sqrt[16]{471\,858\,352\,615}$

Decimal approximation:

- More digits

21.709642850302600143125741401947350462284311835362238176 90...

This result 21,7096 is very near to the value of black hole entropy 21,7656

Now, we have calculated good approximations to golden ratio:

1/2 * ((((2434685456749964820480)^1/101+(2434685456749964820480)^1/103))))

Where 101 and 103 are twin prime numbers

Input:

$$\frac{1}{2}\left(\sqrt[101]{2434685456749964820480}+\sqrt[103]{2434685456749964820480}\right)$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Approximate form
- Step-by-step solution

$$\frac{1}{2}\left(2^{18/103}\times 3^{9/103}\sqrt[103]{471858352615}+2^{18/101}\times 3^{9/101}\sqrt[101]{471858352615}\right)$$

Decimal approximation:

- More digits

1.620675358633664283243745225518245534726135348078671427781...

Open code

Alternate forms:

$$\frac{3^{9/103}\sqrt[103]{471858352615}}{2^{85/103}}+\frac{3^{9/101}\sqrt[101]{471858352615}}{2^{83/101}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$\frac{3^{9/103}\sqrt[103]{471858352615}\left(1+2^{36/10403}\times 3^{18/10403}\times 471858352615^{2/10403}\right)}{2^{85/103}}$$

Continued fraction:

- Linear form

$$1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{82+\cfrac{1}{2+\cfrac{1}{4+\cfrac{1}{4+\cfrac{1}{2+\cfrac{1}{4+\cfrac{1}{2+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{3+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{\ldots}}}}}}}}}}}}}}}}}}}}}}$$

And from the product of the coefficients:

((((883163826121628712960*32199776876321832960*16755940501114060800*1502565913250900213760))))^1/387

Where 387 = 394 – 7 that are two values of the following mock theta function of order 10, for n = 10 (the value 7) and n = 43 (the value 394):

$$\psi(q) = \sum_{n \geq 0} \frac{q^{(n+1)(n+2)/2}}{(q; q^2)_{n+1}}$$

Input:

$(883\,163\,826\,121\,628\,712\,960 \times 32\,199\,776\,876\,321\,832\,960 \times 16\,755\,940\,501\,114\,060\,800 \times 1\,502\,565\,913\,250\,900\,213\,760)$ ^ $(1/387)$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

$$2^{2/9} \sqrt[9]{3}\ 5^{5/387} \times 221^{2/387} \sqrt[387]{184\,700\,609\,004\,437\,094\,738\,068\,977}$$

Decimal approximation:

- More digits

1.617809499074550678031612164949056918541467923599060657841...

Open code

Alternate form:

- Step-by-step solution

$$2^{2/9} \sqrt[9]{3}\ 5^{5/387} \times 221^{2/387} \sqrt[387]{184\,700\,609\,004\,437\,094\,738\,068\,977}$$

Continued fraction:

- Linear form

$$1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{4+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{15+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{2+\cfrac{1}{\dots}}}}}}}}}}}}}}}}}}}}}}$$

All 387th roots of 7159727222896516721919641204010660368777008975807136534239883460074199318527800000:

- More roots
- More digits
- Polar form

$2^{2/9}\sqrt[9]{3}\ 5^{5/387} \times 221^{2/387}\sqrt[387]{184\,700\,609\,004\,437\,094\,738\,068\,977}\ e^{0} \approx 1.61781$

(real, principal root)

Open code

Enlarge Data Customize A Plaintext Interactive

$2^{2/9}\sqrt[9]{3}\ 5^{5/387} \times 221^{2/387}\sqrt[387]{184\,700\,609\,004\,437\,094\,738\,068\,977}\ e^{(2 i \pi)/387}$

$\approx 1.61760 + 0.026265\, i$

Open code

$2^{2/9}\sqrt[9]{3}\ 5^{5/387} \times 221^{2/387}\sqrt[387]{184\,700\,609\,004\,437\,094\,738\,068\,977}\ e^{(4 i \pi)/387}$

$\approx 1.61696 + 0.05252\, i$

Open code

$2^{2/9}\sqrt[9]{3}\ 5^{5/387} \times 221^{2/387}\sqrt[387]{184\,700\,609\,004\,437\,094\,738\,068\,977}\ e^{(2 i \pi)/129}$

$\approx 1.61589 + 0.07877\, i$

Open code

$2^{2/9}\sqrt[9]{3}\ 5^{5/387} \times 221^{2/387}\sqrt[387]{184\,700\,609\,004\,437\,094\,738\,068\,977}\ e^{(8 i \pi)/387}$

$\approx 1.61440 + 0.10499\, i$

Open code

From the two results:

1.6206753586336642832437452255182455347261353480786714277781

1.6178094990745506780316121649490569185414679235990606578841

We obtain another more precise approximation to golden ratio:

(1.6206753586336642832437452255182455347261353480786714277781+1.6178094990745506780316121649490569185414679235990606578841)/((sqrt((1.2683+0.69897+ 1.2108+1.1056)/2))+0.538+(1/16)^((6*10^86)))

Where 1.2683, 0,69897, 1,2108 and 0,538 are a Hausdorff dimensions, while 1.1056 is the value of Cosmological Constant and 6 * 10^{86} is the value of Dark Matter entropy contained within cosmic event horizon

Input interpretation:

$$(1.6206753586336642832437452255182455347261353480786714277781 + 1.6178094990745506780316121649490569185414679235990606578841) / \left(\sqrt{\frac{1}{2}(1.2683 + 0.69897 + 1.2108 + 1.1056)} + 0.538 + \left(\frac{1}{16}\right)^{6\times 10^{86}}\right)$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Fewer digits
- More digits

1.618028147651811091138026448546081563286125751484548779631...

1.6180281476518110911380264485460815632861257514845487

Continued fraction:

- Linear form

$$1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{7+\cfrac{1}{14+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{11+\cfrac{1}{4+\cfrac{1}{\ldots}}}}}}}}}}}}}}}}}}}}}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Possible closed forms:

More

- $\frac{9}{4}\pi\cot^2\left(\frac{24\,352\,319}{21\,655\,253}\right) \approx 1.61802814765181109\,08937$

$\frac{4\,697\,618\,552\,\pi}{9\,120\,980\,963} \approx 1.6180281476518110911\,49437$

$\frac{-12\,776 - 55\,127\,e + 26\,652\,e^2}{7800\,e} \approx 1.618028147651811091\,29717$

This result 1.6180281476518110911380264485460815632861257514845487 is a very good approximation, practically very close to the value of golden ratio!

Now, we have:

0.538+1/1.9340 ln(((883163826121628712960+32199776876321832960+16755940501114060800+1502565913250900213760)))

where 0.538 and 1.9340 are Hausdorff dimensions

Input interpretation:

$$0.538 + \frac{1}{1.9340}\log(883\,163\,826\,121\,628\,712\,960 + 32\,199\,776\,876\,321\,832\,960 + 16\,755\,940\,501\,114\,060\,800 + 1\,502\,565\,913\,250\,900\,213\,760)$$

Open code

- $\log(x)$ is the natural logarithm

Enlarge Data Customize A Plaintext Interactive

Result:

- Fewer digits
- More digits

26.000308441154543166514472166544543509267291255844688081 93...

Series representations:

- More

$$0.538 + \frac{1}{1.934}\log(883\,163\,826\,121\,628\,712\,960 + 32\,199\,776\,876\,321\,832\,960 + 16\,755\,940\,501\,114\,060\,800 + 1\,502\,565\,913\,250\,900\,213\,760) = 0.538 + 0.517063\log(2\,434\,685\,456\,749\,964\,820\,479) - 0.517063\sum_{k=1}^{\infty}\frac{\left(-\frac{1}{2\,434\,685\,456\,749\,964\,820\,479}\right)^k}{k}$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$0.538 + \frac{1}{1.934}\log(883\,163\,826\,121\,628\,712\,960 + 32\,199\,776\,876\,321\,832\,960 + 16\,755\,940\,501\,114\,060\,800 + 1\,502\,565\,913\,250\,900\,213\,760) = 0.538 + 1.03413\,i\,\pi\left\lfloor\frac{\arg(2\,434\,685\,456\,749\,964\,820\,480 - x)}{2\,\pi}\right\rfloor + 0.517063\log(x) - 0.517063\sum_{k=1}^{\infty}\frac{(-1)^k\,(2\,434\,685\,456\,749\,964\,820\,480 - x)^k\,x^{-k}}{k} \quad \text{for } x < 0$$

Open code

$$0.538 + \frac{1}{1.934}\log(883\,163\,826\,121\,628\,712\,960 + 32\,199\,776\,876\,321\,832\,960 + 16\,755\,940\,501\,114\,060\,800 + 1\,502\,565\,913\,250\,900\,213\,760) = 0.538 + 0.517063\left\lfloor\frac{\arg(2\,434\,685\,456\,749\,964\,820\,480 - z_0)}{2\,\pi}\right\rfloor\log\left(\frac{1}{z_0}\right) + 0.517063\log(z_0) + 0.517063\left\lfloor\frac{\arg(2\,434\,685\,456\,749\,964\,820\,480 - z_0)}{2\,\pi}\right\rfloor\log(z_0) - 0.517063\sum_{k=1}^{\infty}\frac{(-1)^k\,(2\,434\,685\,456\,749\,964\,820\,480 - z_0)^k\,z_0^{-k}}{k}$$

Integral representations:

$$0.538 + \frac{1}{1.934}\log(883\,163\,826\,121\,628\,712\,960 + 32\,199\,776\,876\,321\,832\,960 + 16\,755\,940\,501\,114\,060\,800 + 1\,502\,565\,913\,250\,900\,213\,760) = 0.538 + 0.517063\int_1^{2\,434\,685\,456\,749\,964\,820\,480}\frac{1}{t}\,dt$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$0.538 + \frac{1}{1.934}\log(883163826121628712960 + 32199776876321832960 + 16755940501114060800 + 1502565913250900213760) = 0.538 + \frac{0.258532}{i\pi}\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{2434685456749964820479^{-s}\,\Gamma(-s)^2\,\Gamma(1+s)}{\Gamma(1-s)}\,ds$$

for $-1 < \gamma < 0$

Continued fraction:

- Linear form

$$26 + \cfrac{1}{3242 + \cfrac{1}{9 + \cfrac{1}{7 + \cfrac{1}{1 + \cfrac{1}{1 + \cfrac{1}{2 + \cfrac{1}{5 + \cfrac{1}{2 + \cfrac{1}{1 + \cfrac{1}{10 + \cfrac{1}{1 + \cfrac{1}{6 + \cfrac{1}{4 + \cfrac{1}{3 + \cfrac{1}{1 + \cfrac{1}{2 + \cfrac{1}{6 + \cfrac{1}{1 + \cfrac{1}{1 + \cfrac{1}{5 + \cfrac{1}{\dots}}}}}}}}}}}}}}}}}}}}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Possible closed forms:

- More

$\text{root of } 220x^4 - 5718x^3 - 65x^2 + 303x - 283 \text{ near } x = 26.0003 \approx 26.000308441154543164478 3$

$\frac{1}{10}\sqrt{-815 + 19702e + 4679\pi + 233\log(2)} \approx 26.00030844115454316641099$

$\frac{1}{\text{root of } 283x^4 - 303x^3 + 65x^2 + 5718x - 220 \text{ near } x = 0.0384611} \approx 26.00030844115454316644783$

The result 26.000308441154543166514472166544543509267291255844688 in the context of string theory is a good approximation to the value of the *critical dimension* that is 26 for the bosonic string theory

and:

(1.2083+1.5236)+1/8*
ln(((883163826121628712960*32199776876321832960*16755940501114060800*1
502565913250900213760)))

Where 1.2083 and 1.5236 are Hausdorff dimensions:

$$3\frac{\log(\varphi)}{\log\left(\frac{3+\sqrt{13}}{2}\right)} \qquad \log_2\left(\frac{1+\sqrt[3]{73-6\sqrt{87}}+\sqrt[3]{73+6\sqrt{87}}}{3}\right)$$

Input interpretation:

$$(1.2083+1.5236)+\frac{1}{8}\log(883\,163\,826\,121\,628\,712\,960\times 32\,199\,776\,876\,321\,832\,960\times 16\,755\,940\,501\,114\,060\,800\times 1\,502\,565\,913\,250\,900\,213\,760)$$

Open code

- $\log(x)$ is the natural logarithm

Enlarge Data Customize A Plaintext Interactive

Result:

- Fewer digits
- More digits

26.00380991530120804982513730073263854804359154017397188308...

Series representations:

- More

$$(1.2083+1.5236)+\frac{1}{8}\log(883\,163\,826\,121\,628\,712\,960\times 32\,199\,776\,876\,321\,832\,960\times 16\,755\,940\,501\,114\,060\,800\times 1\,502\,565\,913\,250\,900\,213\,760) = 2.7319+0.125\log(715\,972\,722\,289\,651\,672\,191\,964\,120\,401\,066\,036\,877\,700\,897\,580\,713\,653\,423\,988\,346\,007\,419\,931\,852\,799\,999) - 0.125\sum_{k=1}^{\infty}\frac{1}{k}(-(1/715\,972\,722\,289\,651\,672\,191\,964\,120\,401\,066\,036\,877\,700\,897\,580\,713\,653\,423\,988\,346\,007\,419\,931\,852\,799\,999))^k$$

Open code

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$$(1.2083 + 1.5236) + \frac{1}{8}\log(883\,163\,826\,121\,628\,712\,960 \times 32\,199\,776\,876\,321\,832\,960 \times 16\,755\,940\,501\,114\,060\,800 \times 1\,502\,565\,913\,250\,900\,213\,760) = 2.7319 + \frac{1}{4} i\pi \left\lfloor \frac{1}{2\pi}\arg(715\,972\,722\,289\,651\,672\,191\,964\,120\,401\,066\,036\,877\,700\,897\,580\,713\,653\,423\,988\,346\,007\,419\,931\,852\,800\,000 - x)\right\rfloor + \frac{\log(x)}{8} - \frac{1}{8}\sum_{k=1}^{\infty}\frac{1}{k}(-1)^k (715\,972\,722\,289\,651\,672\,191\,964\,120\,401\,066\,036\,877\,700\,897\,580\,713\,653\,423\,988\,346\,007\,419\,931\,852\,800\,000 - x)^k x^{-k} \quad \text{for } x < 0$$

Open code

$$(1.2083 + 1.5236) + \frac{1}{8}\log(883\,163\,826\,121\,628\,712\,960 \times 32\,199\,776\,876\,321\,832\,960 \times 16\,755\,940\,501\,114\,060\,800 \times 1\,502\,565\,913\,250\,900\,213\,760) = 2.7319 + \frac{1}{4} i\pi \left\lfloor -\frac{1}{2\pi}(-\pi + \arg(715\,972\,722\,289\,651\,672\,191\,964\,120\,401\,066\,036\,877\,700\,897\,580\,713\,653\,423\,988\,346\,007\,419\,931\,852\,800\,000 / z_0) + \arg(z_0))\right\rfloor + \frac{\log(z_0)}{8} - \frac{1}{8}\sum_{k=1}^{\infty}\frac{1}{k}(-1)^k (715\,972\,722\,289\,651\,672\,191\,964\,120\,401\,066\,036\,877\,700\,897\,580\,713\,653\,423\,988\,346\,007\,419\,931\,852\,800\,000 - z_0)^k z_0^{-k}$$

Integral representations:

$$(1.2083 + 1.5236) + \frac{1}{8}\log(883\,163\,826\,121\,628\,712\,960 \times 32\,199\,776\,876\,321\,832\,960 \times 16\,755\,940\,501\,114\,060\,800 \times 1\,502\,565\,913\,250\,900\,213\,760) = 2.7319 + 0.125 \int_1^{715\,972\,722\,289\,651\,672\,191\,964\,120\,401\,066\,036\,877\,700\,897\,580\,713\,653\,423\,988\,346\,007\,419\,931\,852\,800\,000} \frac{1}{t}\, dt$$

Open code

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$$(1.2083 + 1.5236) + \frac{1}{8}\log(883\,163\,826\,121\,628\,712\,960 \times 32\,199\,776\,876\,321\,832\,960 \times 16\,755\,940\,501\,114\,060\,800 \times 1\,502\,565\,913\,250\,900\,213\,760) = 2.7319 + \frac{1}{16 i\pi}\int_{-i\infty+\gamma}^{i\infty+\gamma} \frac{1}{\Gamma(1-s)} 715\,972\,722\,289\,651\,672\,191\,964\,120\,401\,066\,036\,877\,700\,897\,580\,713\,653\,423\,988\,346\,007\,419\,931\,852\,799\,999^{-s}\,\Gamma(-s)^2\,\Gamma(1+s)\, ds \quad \text{for } -1 < \gamma < 0$$

Continued fraction:

- Linear form

$$26+\cfrac{1}{262+\cfrac{1}{2+\cfrac{1}{8+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{3+\cfrac{1}{6+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{25+\cfrac{1}{7+\cfrac{1}{5+\cfrac{1}{2+\cfrac{1}{3+\cfrac{1}{9+\cfrac{1}{\ldots}}}}}}}}}}}}}}}}}}}}}$$

Open code

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Possible closed forms:

- More

$$\frac{10}{9}\pi \operatorname{csch}^2\left(\frac{13\,627\,782}{37\,997\,993}\right) \approx 26.0038099153012080483702$$

$$\pi \text{ root of } 164x^4 - 821x^3 - 5219x^2 + 6455x - 94 \text{ near } x = 8.27727 \approx$$

$$26.00380991530120852894$$

$$\frac{21\,092\,636\,833\,\pi}{2\,548\,260\,164} \approx 26.0038099153012080498274838$$

The result 26.003809915301208049825137300732638548043591540173971 in the context of string theory is a very good approximation to the value of the *critical dimension* that is 26 for the bosonic string theory.

Appendix A

From:

Three-dimensional AdS gravity and extremal CFTs at c = 8m
Spyros D. Avramis, Alex Kehagias and Constantina Mattheopoulou

Received: September 7, 2007 - Accepted: October 28, 2007 - Published: November 9, 2007

m	L_0	d	S	S_{BH}
3	1	196883	12.1904	12.5664
	2	21296876	16.8741	17.7715
	3	842609326	20.5520	21.7656
4	2/3	139503	11.8458	11.8477
	5/3	69193488	18.0524	18.7328
	8/3	6928824200	22.6589	23.6954
5	1/3	20619	9.9340	9.3664
	4/3	86645620	18.2773	18.7328
	7/3	24157197490	23.9078	24.7812

m	L_0	d	S	S_{BH}
6	1	42987519	17.5764	17.7715
	2	40448921875	24.4233	25.1327
	3	8463511703277	29.7668	30.7812
7	2/3	7402775	15.8174	15.6730
	5/3	33934039437	24.2477	24.7812
	8/3	16953652012291	30.4615	31.3460
8	1/3	278511	12.5372	11.8477
	4/3	13996384631	23.3621	23.6954
	7/3	19400406113385	30.5963	31.3460

Table 1: Degeneracies, microscopic entropies and semiclassical entropies for the first few values of m and L_0.

Phenomenological consequences of superfluid dark matter with baryon-phonon coupling
Lasha Berezhiani - Max-Planck-Institut fur Physik, Fohringer Ring 6, 80805 Munchen, Germany
Benoit Famaey - Universite de Strasbourg, CNRS UMR 7550, Observatoire astronomique de Strasbourg, - 11 rue de l'Universite, F-67000 Strasbourg, France
Justin Khoury - Center for Particle Cosmology, Department of Physics and Astronomy, University of Pennsylvania, Philadelphia PA 19104, USA - (Dated: November 17, 2017)

Using (22) this translates to an upper bound on the mass of the DM particle:

$$m \lesssim 4.2 \left(\frac{\sigma/m}{\text{cm}^2/\text{g}}\right)^{1/4} \text{eV}\,. \tag{24}$$

Smaller and less massive galaxies result in a somewhat weaker bound.

The bound (24) on the DM particle mass is the main result of this Section. It shows that for values of σ/m satisfying the merging-cluster bound $\sim 1\,\text{cm}^2/\text{g}$ [85–88], m must be somewhat below 4 eV. The dependence on the

The value of the mass of DM particle is between 4 – 4.2 eV

Appendix B

From Wikipedia:

Order 10

Ramanujan (1988, p. 9) listed four order-10 mock theta functions in his lost notebook, and stated some relations between them, which were proved by Choi (1999, 2000, 2002, 2007).

$$\phi(q) = \sum_{n\geq 0} \frac{q^{n(n+1)/2}}{(q;q^2)_{n+1}} \qquad \psi(q) = \sum_{n\geq 0} \frac{q^{(n+1)(n+2)/2}}{(q;q^2)_{n+1}} \qquad X(q) = \sum_{n\geq 0} \frac{(-1)^n q^{n^2}}{(-q;q)_{2n}}$$

$$\chi(q) = \sum_{n\geq 0} \frac{(-1)^n q^{(n+1)^2}}{(-q;q)_{2n+1}}$$

For the second mock theta function, we have take the sequence A053282 in the OEIS:

A053282 Coefficients of the '10th order' mock theta function psi(q).

0, 1, 1, 2, 2, 2, 4, 4, 4, 6, 7, 8, 10, 11, 12, 16, 18, 20, 24, 26, 30, 36, 40, 44, 52, 58, 64, 74, 82, 91, 104, 116, 128, 144, 159, 176, 198, 218, 240, 268, 294, 324, 360, 394, 432, 478, 524, 572, 630, 688, 752, 826, 900, 980, 1072, 1168, 1270, 1386, 1505, 1634 (list; graph; refs; listen; history; text; internal format)

OFFSET 0,4

COMMENTS Number of partitions (d1,d2,...,dm) of n such that 0 < d1/1 <= d2/2 <= ... <= dm/m. - Seiichi Manyama, Mar 17 2018

REFERENCES Srinivasa Ramanujan, The Lost Notebook and Other Unpublished Papers, Narosa Publishing House, New Delhi, 1988, p. 9

LINKS Vaclav Kotesovec, Table of n, a(n) for n = 0..10000 (terms 0..1000 from Seiichi Manyama)
Youn-Seo Choi, Tenth order mock theta functions in Ramanujan's lost notebook, Inventiones Mathematicae, 136 (1999) p. 497-569.

FORMULA G.f.: psi(q) = Sum_{n >= 0} q^((n+1)(n+2)/2)/((1-q)(1-q^3)...(1-q^(2n+1))).
a(n) ~ exp(Pi*sqrt(n/5)) / (2*5^(1/4)*sqrt(phi*n)), where phi = A001622 = (1+sqrt(5))/2 is the golden ratio. - Vaclav Kotesovec, Jun 12 2019

We take the second function:

$$\psi(q) = \sum_{n\geq 0} \frac{q^{(n+1)(n+2)/2}}{(q;q^2)_{n+1}}$$

We have that:

-1/q+ [sum (((q^((24+1)(24+2)/2))) / (((((q^(((24+1)(24+2)/2)+1))))))], n=0...n

$$-\frac{1}{q} + \sum_{n=0}^{n} \frac{q^{(24+1)\times(24+2)/2}}{q^{(24+1)\times(24+2)/2+1}}$$

Result:

$$\frac{n+1}{q} - \frac{1}{q}$$

And

-1/0.461538+ [sum (((0.461538^((24+1)(24+2)/2))) / (((((0.461538^(((24+1)(24+2)/2)+1))))))], n=0...n

Input interpretation:

$$-\frac{1}{0.461538} + \sum_{n=0}^{n} \frac{0.461538^{(24+1)\times(24+2)/2}}{0.461538^{(24+1)\times(24+2)/2+1}}$$

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Result:

$$2.16667(n+1) - 2.16667$$

Values:

- Less

n	$2.16667\,(n+1) - 2.16667$
1	2.16667
2	4.33334
3	6.50001
4	8.66668
5	10.8333
6	13.
7	15.1667
8	17.3334
9	19.5
10	21.6667
11	23.8334
12	26.
13	28.1667
14	30.3334
15	32.5

For n = 24, q = 0,461538 we have 24 * 2.16667 = 52,00008 (note that for n = 12, the result is 26).

The expression is:

[24 * (((0.461538^((24+1)(24+2)/2))) / ((((((0.461538^(((24+1)(24+2)/2)+1)))))))]

Input interpretation:

$$24 \times \frac{0.461538^{(24+1)\times(24+2)/2}}{0.461538^{(24+1)\times(24+2)/2+1}}$$

Open code

Result:

- More digits

52.000052000052000052000052000052000052000052000052000052000052000...

Open code

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Repeating decimal:

$52.\overline{000052}$ (period 6)

For n = 60, q = 0,0337 we have:

[60 * (((0.0337^((60+1)(60+2)/2))) / (((((0.0337^(((60+1)(60+2)/2)+1))))))]

Input:

$$60 \times \frac{0.0337^{(60+1)\times(60+2)/2}}{0.0337^{(60+1)\times(60+2)/2+1}}$$

Open code

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Result:

- More digits

1780.415430267062314540059347181008902077151335311572700296...

Thence:

[(((60 * (((0.0337^((60+1)(60+2)/2))) / (((0.0337^(((60+1)(60+2)/2)+1)))]))) - ((([(((24 * (((0.461538^((24+1)(24+2)/2))) / (((((0.461538^(((24+1)(24+2)/2)+1)))]

Input interpretation:

$$60 \times \frac{0.0337^{(60+1)\times(60+2)/2}}{0.0337^{(60+1)\times(60+2)/2+1}} - 24 \times \frac{0.461538^{(24+1)\times(24+2)/2}}{0.461538^{(24+1)\times(24+2)/2+1}}$$

Open code

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Result:

- More digits

1728.415378267010314488059295180956902025151283311520700244...

This result is very near to the mass of candidate glueball $f_0(1710)$ 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

2((((((([(((((60*(((0.0337^((60+1)(60+2)/2))) / (((0.0337^(((60+1)(60+2)/2)+1))))) - (((((24*(((0.461538^((24+1)(24+2)/2))) / (((0.461538^(((24+1)(24+2)/2)+1)))))])))))))))^1/3

Input interpretation:

$$2\sqrt[3]{60\times\frac{0.0337^{(60+1)\times(60+2)/2}}{0.0337^{(60+1)\times(60+2)/2+1}}-24\times\frac{0.461538^{(24+1)\times(24+2)/2}}{0.461538^{(24+1)\times(24+2)/2+1}}}$$

Open code

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Result:

- More digits

24.0019...

This value is linked to the "Ramanujan function" (an elliptic modular function that satisfies the need for "conformal symmetry") that has 24 "modes" corresponding to the physical vibrations of a bosonic string.

For n = 18 and q = 0.75, we obtain:

[18 * (((0.75^((18+1)(18+2)/2))) / (((((0.75^(((18+1)(18+2)/2)+1))))))]

Input:

$$18\times\frac{0.75^{(18+1)\times(18+2)/2}}{0.75^{(18+1)\times(18+2)/2+1}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

24

For n = 27 and q = 0.3648649, we obtain:

[27 * (((0.3648649^((27+1)(27+2)/2))) / (((((0.3648649^(((27+1)(27+2)/2)+1))))))]

Input interpretation:

$$27\times\frac{0.3648649^{(27+1)\times(27+2)/2}}{0.3648649^{(27+1)\times(27+2)/2+1}}$$

Open code

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Result:

- More digits

73.9999287407476027428234395799650774848443903483179664582...

Note that:

[27 * (((0.3648649^((27+1)(27+2)/2))) / (((((0.3648649^(((27+1)(27+2)/2)+1)))))]))) * ((([18 * (((0.75^((18+1)(18+2)/2))) / (((((0.75^(((18+1)(18+2)/2)+1))))]

Input interpretation:

$$27\times\frac{0.3648649^{(27+1)\times(27+2)/2}}{0.3648649^{(27+1)\times(27+2)/2+1}}\left(18\times\frac{0.75^{(18+1)\times(18+2)/2}}{0.75^{(18+1)\times(18+2)/2+1}}\right)$$

Open code

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Result:

- More digits
  1775.99982897779424658277625499191618596362653683596311949 9...

And

[((27 * (((0.3648649^((27+1)(27+2)/2))) / (((0.3648649^(((27+1)(27+2)/2)+1))))))]^1/3 * [((((((18 * (((0.75^((18+1)(18+2)/2))) / (((((0.75^(((18+1)(18+2)/2)+1))))))))]^1/3

Input interpretation:

$$\sqrt[3]{27\times\frac{0.3648649^{(27+1)\times(27+2)/2}}{0.3648649^{(27+1)\times(27+2)/2+1}}}\ \sqrt[3]{18\times\frac{0.75^{(18+1)\times(18+2)/2}}{0.75^{(18+1)\times(18+2)/2+1}}}$$

Open code

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Result:

- More digits
  12.1101...

And

Input interpretation:

$$2\left(\sqrt[3]{27\times\frac{0.3648649^{(27+1)\times(27+2)/2}}{0.3648649^{(27+1)\times(27+2)/2+1}}}\ \sqrt[3]{18\times\frac{0.75^{(18+1)\times(18+2)/2}}{0.75^{(18+1)\times(18+2)/2+1}}}\right)$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- More digits
  24.2202...

Where 12.1101 is very near to the value of black hole entropy 12,19 and 24,2202 is a value that is linked to the "Ramanujan function" (an elliptic modular function that satisfies the need for "conformal symmetry") that has 24 "modes" corresponding to the physical vibrations of a bosonic string.

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