On some new mathematical connections between various equations of the f(T) teleparallel gravity and cosmology, the Rogers-Ramanujan continued fractions and the Ramanujan's mock theta functions. II

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Abstract

In this research thesis, we have described the new possible mathematical connections between some equations of various topics concerning the f(T) teleparallel gravity and cosmology, the Rogers-Ramanujan continued fractions and the Ramanujan's mock theta functions.

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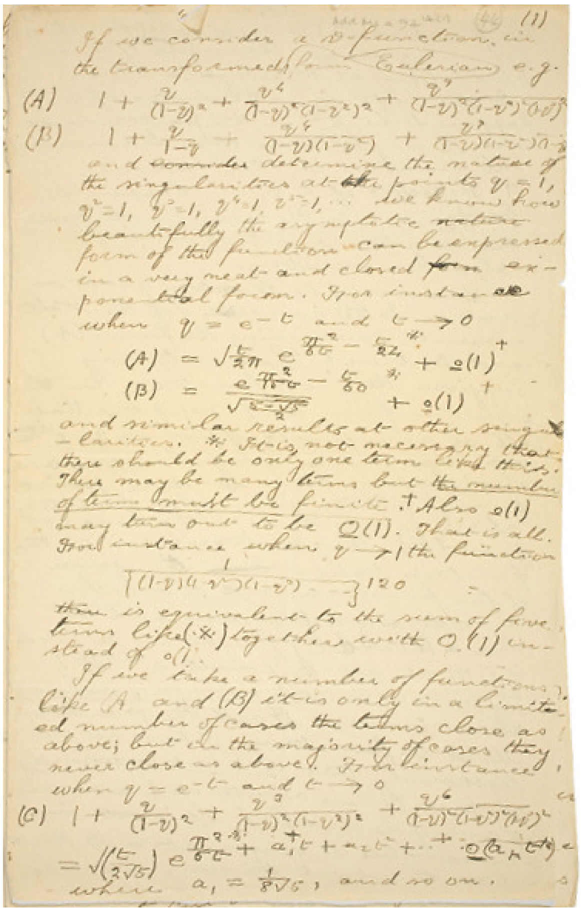


(1)

If we consider a ϑ-function in the transformed Eulerian form e.g.

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

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

and ~~consider~~ determine the nature of the singularities at the points $q = 1$, $q^2=1$, $q^3=1$, $q^4=1$, $q^5=1$, ... we know how beautifully the asymptotic ~~nature~~ form of the function can be expressed in a very neat and closed ~~form~~ exponential form. For instance when $q = e^{-t}$ and $t \to 0$

$$(A) = \sqrt{\frac{t}{2\pi}}\, e^{\frac{\pi^2}{6t} - \frac{t}{24}} + o(1)$$

$$(B) = \frac{e^{\frac{\pi^2}{15t} - \frac{t}{60}}}{\sqrt{\frac{5-\sqrt{5}}{2}}} + o(1)$$

and similar results at other singularities. * It is not necessary that there should be only one term like this. There may be many terms but the number of terms must be finite. † Also o(1) may turn out to be O(1). That is all. For instance when $q \to 1$ the function

$$\left\{\frac{1}{(1-q)(1-q^2)(1-q^3)\cdots}\right\}^{120}$$

is equivalent to the sum of five terms like (*) together with O(1) instead of o(1).

If we take a number of functions like (A) and (B) it is only in a limited number of cases the terms close as above; but in the majority of cases they never close as above. For instance when $q = e^{-t}$ and $t \to 0$

(C) $1 + \frac{q}{(1-q)^2} + \frac{q^3}{(1-q)^2(1-q^2)^2} + \frac{q^6}{(1-q)^2(1-q^2)^2(1-q^3)^2}$

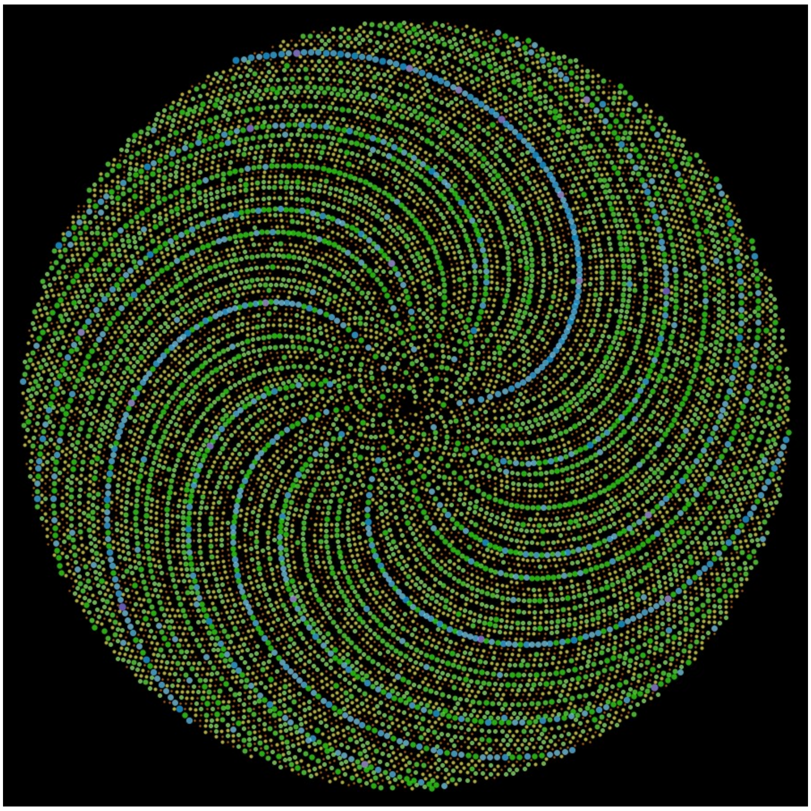
$= \sqrt{\left(\frac{t}{2\sqrt{5}}\right)}\, e^{\frac{\pi^2}{5t} + a_1 t + a_2 t^2 + \cdots + O(a_k t^k)}$

where $a_1 = \frac{1}{8\sqrt{5}}$, and so on.

https://www.billtoole.net/wordpress/all/ramanujans-mock-theta-functions-letter-to-hardy-1920/

Ulam spiral to appear on Sept. 2013 cover of Math Horizons

Bruce Torrence, Randolph-Macon College



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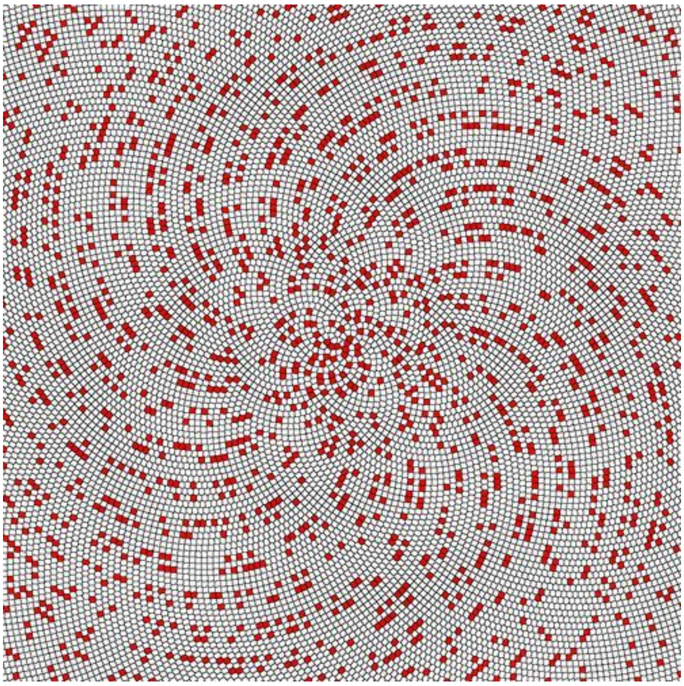

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Ramanujan mathematics applied to Cosmology

From:

f(T) teleparallel gravity and cosmology
Yi-Fu Cai, Salvatore Capozziello, Mariafelicia De Laurentis and Emmanuel N. Saridakis - arXiv:1511.07586v2 [gr-qc] 8 Sep 2016

Now, we have that:

Friedmann equations:

$$H^2 = \frac{8\pi G}{3}\rho_m - \frac{F(T)}{6} - 2f_T H^2 \,, \qquad (267)$$

$$\dot{H} = -\frac{4\pi G(\rho_m + p_m)}{1 + F_T - 12H^2 F_{TT}} \,. \qquad (268)$$

And:

$$t(T) = \pm\left(-\frac{4}{3T} - \frac{2}{3\sigma} + \frac{4\sqrt{T\sigma^3 + \sigma^4}}{3T\sigma^2}\right)^{1/2} \,, \qquad (417)$$

where we have kept the solution pair that gives the correct ($t = 0$ at $T = 0$) behavior. Notice that when $t > \sqrt{2/3\sigma}$ and $t < -\sqrt{2/3\sigma}$, we have assumed that the usual Einstein gravity, i.e. the TEGR, is the prevailing framework, thus negating the need to pursue an $f(T)$ action in that region. Furthermore, we assume the matter content of the universe to be dust, with an equation-of-state parameter $w_m \approx 0$. Inserting this matter fluid into the continuity equation, one can easily arrive at the usual dust evolution, namely $\rho_m = \rho_{mB} a_B^3/a^3$, with ρ_{mB} its value at the bouncing point.

Inserting the above expressions into (267) we obtain a differential equation for the reduced form $F(t)$, which can be easily solved analytically as

$$F(t) = \frac{4t}{(2+3\sigma t^2)M_P^2} \times \left[\frac{\rho_{mB}}{t} + \frac{6tM_P^2\sigma^2}{2+3t^2\sigma} + \sqrt{6\sigma}\rho_{mB}\,\mathrm{ArcTan}\left(\sqrt{\frac{3\sigma}{2}}t\right)\right]. \quad (418)$$

In order to present the above process more clearly, in Fig. 13 we numerically depict the reduced form of $F(T)$ that generates the dust-dominated bouncing solution as desired. We particularly choose the parameters as follows: $a_B = 1$, $\sigma = 7 \times 10^{-6} M_P^2$, and $\rho_{mB} = 1.41 \times 10^{-5} M_P^4$. We note that the value of σ mainly relies on the amplitude of the CMB spectrum, and that of ρ_{mB} depends on how fast the standard Einstein gravity is recovered in $f(T)$ gravity.

$M_P = 2.435\times10^{18}$ GeV/c^2.

sqrt(2/(3*7*10^-6*(2.435e+18)^2)

Input interpretation:

$$\sqrt{\frac{2}{3\times7\times10^{-6}\,(2.435\times10^{18})^2}}$$

Result:

$1.267378644452500290\ldots \times 10^{-16}$

t >1.267378644452500290 * 10^{-16} =1.26737864...*10^{-15} = t

σ = (7*10^-6*(2.435e+18)^2)

Input interpretation:

$7\times 10^{-6}(2.435\times 10^{18})^2$

Result:

41504575000000000000000000000000

Scientific notation:

4.1504575×10^{31}

$4.1504574*10^{31} = \sigma$

(1.41*10^-5*(2.435e+18)^4)

Input interpretation:

$1.41\times 10^{-5}(2.435\times 10^{18})^4$

Result:

495695498318812500000000000000000000000000000000000000000000000000000

Scientific notation:

$4.956954983188125\times 10^{68}$

$4.956954983...*10^{68} = \rho_{mB}$

Now, we have:

$$F(t) = \frac{4t}{(2+3\sigma t^2)M_P^2}\times\left[\frac{\rho_{mB}}{t}+\frac{6tM_P^2\sigma^2}{2+3t^2\sigma}+\sqrt{6\sigma}\rho_{mB}\,\mathrm{ArcTan}\left(\sqrt{\frac{3\sigma}{2}}t\right)\right] \quad (418)$$

$M_P = 2.435\times 10^{18}$ GeV/c^2 ; $4.956954983...*10^{68} = \rho_{mB}$; $4.1504574*10^{31} = \sigma$

$1.26737864...*10^{-15} = t$

(((((4*1.26737864e-15))))/((((((((2+3*4.1504574e+31*(1.26737864e-15)^2))))*(2.435e+18)^2)))))

Input interpretation:

$$\frac{4\times 1.26737864\times 10^{-15}}{\left(2+3\times 4.1504574\times 10^{31}\left(1.26737864\times 10^{-15}\right)^2\right)\left(2.435\times 10^{18}\right)^2}$$

Result:

$4.232696095349398242617708910532157483622211607855339... \times 10^{-54}$

4.232696095349398242617708910532157483622211607855339 9 × 10^-54

[(4.956954983e+68/1.26737864e-15)+(((6*1.26737864e-15)*(2.435e+18)^2*(4.1504574e+31)^2))/((2+3*(1.26737864e-15)^2*(4.1504574e+31)))

Input interpretation:

$$\frac{4.956954983\times 10^{68}}{1.26737864\times 10^{-15}}+\frac{\left(6\times 1.26737864\times 10^{-15}\right)\left(2.435\times 10^{18}\right)^2\left(4.1504574\times 10^{31}\right)^2}{2+3\left(1.26737864\times 10^{-15}\right)^2\times 4.1504574\times 10^{31}}$$

Result:

$7.756185201522382683231913146842507847354777515798093 4... \times 10^{83}$

7.7561852015223826832319131468425078473547775157980934 × 10^83

sqrt(6*(4.1504574e+31))* 4.956954983e+68 * atan(((sqrt((((3*4.1504574e+31*1.26737864e-15)/2))))))

Input interpretation:

$$\sqrt{6\times 4.1504574\times 10^{31}}\times 4.956954983\times 10^{68}\,\tan^{-1}\left(\sqrt{\frac{1}{2}\left(3\times 4.1504574\times 10^{31}\times 1.26737864\times 10^{-15}\right)}\right)$$

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

Result:

$1.2287356... \times 10^{85}$

(result in radians)

$1.2287356…*10^{85}$

In conclusion, we obtain:

4.2326960953493982426177089105321574836222116078553399 × 10^-54 (7.7561852015223826832319131468425078473547775157980934 × 10^83+1.2287356 × 10^85)

Input interpretation:

$4.2326960953493982426177089105321574836222116078553399 \times 10^{-54} (7.7561852015223826832319131468425078473547775157980934 \times 10^{83} + 1.2287356 \times 10^{85})$

Result:

$5.529160124509705806454223545807176357178237660430442\ldots \times 10^{31}$

5.52916... * 10^{31} = F(t)

Now, we perform the ln of this solution and obtain:

ln(5.5291601245097 × 10^31)

Input interpretation:

$\log(5.5291601245097 \times 10^{31})$

log(x) is the natural logarithm

Result:

73.09017381059644...

73.0901738...

The interesting fact is that this result is similar to the solution (value) of a Ramanujan 10th order mock theta function, where there is in the formula the golden ratio. Indeed:

exp(Pi*sqrt(n/5)) / (2*5^(1/4)*sqrt(phi*n)) (OEIS – sequence A053282)

where Phi = (1+sqrt(5))/2 is the golden ratio

exp(Pi*sqrt(exp(zeta2*2)/5)) / (2*5^(1/4)*sqrt((1+sqrt(5))/2*(exp(zeta2*2)))

where n = exp(ζ(2)*2)) = 26.83932422...

exp(Pi*sqrt(26.83932422/5)) / (2*5^(1/4)*sqrt((1+sqrt(5))/2*(26.83932422)))

Input interpretation:

$$\frac{\exp\left(\pi\sqrt{\frac{26.83932422}{5}}\right)}{2\sqrt[4]{5}\sqrt{\left(\frac{1}{2}\left(1+\sqrt{5}\right)\right)\times 26.83932422}}$$

Result:

73.5231546...

73.5231546...

Or:

Input:

$$\frac{\exp\left(\pi\sqrt{\frac{1}{5}\exp(\zeta(2)\times 2)}\right)}{2\sqrt[4]{5}\sqrt{\left(\frac{1}{2}\left(1+\sqrt{5}\right)\right)\exp(\zeta(2)\times 2)}}$$

$\zeta(s)$ is the Riemann zeta function

Exact result:

$$\frac{e^{\left(e^{\pi^2/6}\pi\right)/\sqrt{5}-\pi^2/6}}{\sqrt[4]{5}\sqrt{2\left(1+\sqrt{5}\right)}}$$

Decimal approximation:

73.52315460105073410675874464746263632739757703986126571698...

73.5231546…

Property:

$$\frac{e^{\left(e^{\pi^2/6}\pi\right)/\sqrt{5}-\pi^2/6}}{\sqrt[4]{5}\sqrt{2\left(1+\sqrt{5}\right)}}$$ is a transcendental number

Alternate form:

$$\frac{1}{2}\sqrt{\frac{1}{10}\left(5-\sqrt{5}\right)}\,e^{\left(e^{\pi^2/6}\pi\right)/\sqrt{5}-\pi^2/6}$$

Alternative representations:

$$\frac{\exp\left(\pi\sqrt{\frac{1}{5}\exp(\zeta(2)\,2)}\right)}{2\sqrt[4]{5}\sqrt{\frac{1}{2}\exp(\zeta(2)\,2)\left(1+\sqrt{5}\right)}} = \frac{\exp\left(\pi\sqrt{\frac{1}{5}\exp(2\,\zeta(2,\,1))}\right)}{2\sqrt[4]{5}\sqrt{\frac{1}{2}\exp(2\,\zeta(2,\,1))\left(1+\sqrt{5}\right)}}$$

$$\frac{\exp\left(\pi\sqrt{\frac{1}{5}\exp(\zeta(2)\,2)}\right)}{2\sqrt[4]{5}\sqrt{\frac{1}{2}\exp(\zeta(2)\,2)\left(1+\sqrt{5}\right)}} = \frac{\exp\left(\pi\sqrt{\frac{1}{5}\exp\left(\frac{2\,\zeta\left(2,\frac{1}{2}\right)}{3}\right)}\right)}{2\sqrt[4]{5}\sqrt{\frac{1}{2}\exp\left(\frac{2\,\zeta\left(2,\frac{1}{2}\right)}{3}\right)\left(1+\sqrt{5}\right)}}$$

$$\frac{\exp\left(\pi\sqrt{\frac{1}{5}\exp(\zeta(2)\,2)}\right)}{2\sqrt[4]{5}\sqrt{\frac{1}{2}\exp(\zeta(2)\,2)\left(1+\sqrt{5}\right)}} = \frac{\exp\left(\pi\sqrt{\frac{1}{5}\exp\left(\left(\zeta(2,\,n)+\sum_{k=1}^{n-1}\frac{1}{k^2}\right)2\right)}\right)}{2\sqrt[4]{5}\sqrt{\frac{1}{2}\exp\left(\left(\zeta(2,\,n)+\sum_{k=1}^{n-1}\frac{1}{k^2}\right)2\right)\left(1+\sqrt{5}\right)}}$$

for $(n \in \mathbb{Z}$ and $n > 0)$

$\zeta(s,\,a)$ is the generalized Riemann zeta function

$\mathbb{Z}$ is the set of integers

Series representations:

$$\frac{\exp\left(\pi\sqrt{\frac{1}{5}\exp(\zeta(2)\,2)}\right)}{2\sqrt[4]{5}\sqrt{\frac{1}{2}\exp(\zeta(2)\,2)\left(1+\sqrt{5}\right)}} = \exp\left(\pi\exp\left(i\,\pi\left\lfloor\frac{\arg\left(-x+\frac{1}{5}\exp(2\,\zeta(2))\right)}{2\,\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{5}\right)^k x^{-k}\,(-5\,x+\exp(2\,\zeta(2)))^k\left(-\frac{1}{2}\right)_k}{k!}\right) \Bigg/ \left(2\sqrt[4]{5}\,\exp\left(i\,\pi\left\lfloor\frac{\arg\left(-x+\frac{1}{2}\exp(2\,\zeta(2))\left(1+\sqrt{5}\right)\right)}{2\,\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k\,x^{-k}\left(-\frac{1}{2}\right)_k\left(-x+\frac{1}{2}\exp(2\,\zeta(2))\left(1+\sqrt{5}\right)\right)^k}{k!}\right) \text{ for } (x \in \mathbb{R} \text{ and } x < 0)$$

$$\frac{\exp\left(\pi\sqrt{\frac{1}{5}\exp(\zeta(2)\,2)}\right)}{2\sqrt[4]{5}\sqrt{\frac{1}{2}\exp(\zeta(2)\,2)\left(1+\sqrt{5}\right)}} =$$

$$\left(\exp\left(\pi\left(\frac{1}{z_0}\right)^{1/2\left\lfloor\arg\left(\frac{1}{5}\exp(2\,\zeta(2))-z_0\right)/(2\pi)\right\rfloor} z_0^{1/2\left(1+\left\lfloor\arg\left(\frac{1}{5}\exp(2\,\zeta(2))-z_0\right)/(2\pi)\right\rfloor\right)} \sum_{k=0}^{\infty}\frac{\left(-\frac{1}{5}\right)^k\left(-\frac{1}{2}\right)_k\left(\exp(2\,\zeta(2))-5\,z_0\right)^k z_0^{-k}}{k!}\right)\right.$$

$$\left.\left(\frac{1}{z_0}\right)^{-1/2\left\lfloor\arg\left(\frac{1}{2}\exp(2\,\zeta(2))\left(1+\sqrt{5}\right)-z_0\right)/(2\pi)\right\rfloor} z_0^{-1/2-1/2\left\lfloor\arg\left(\frac{1}{2}\exp(2\,\zeta(2))\left(1+\sqrt{5}\right)-z_0\right)/(2\pi)\right\rfloor}\right) \Big/$$

$$\left(2\sqrt[4]{5}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(\frac{1}{2}\exp(2\,\zeta(2))\left(1+\sqrt{5}\right)-z_0\right)^k z_0^{-k}}{k!}\right)$$

Integral representations:

$$\frac{\exp\left(\pi\sqrt{\frac{1}{5}\exp(\zeta(2)\,2)}\right)}{2\sqrt[4]{5}\sqrt{\frac{1}{2}\exp(\zeta(2)\,2)\left(1+\sqrt{5}\right)}} = \frac{\exp\left(\pi\sqrt{\frac{1}{5}\exp\left(\frac{4}{3\,\Gamma(2)}\int_0^\infty t\,\operatorname{csch}(t)\,dt\right)}\right)}{2\sqrt[4]{5}\sqrt{\frac{1}{2}\exp\left(\frac{4}{3\,\Gamma(2)}\int_0^\infty t\,\operatorname{csch}(t)\,dt\right)\left(1+\sqrt{5}\right)}}$$

$$\frac{\exp\left(\pi\sqrt{\frac{1}{5}\exp(\zeta(2)\,2)}\right)}{2\sqrt[4]{5}\sqrt{\frac{1}{2}\exp(\zeta(2)\,2)\left(1+\sqrt{5}\right)}} = \frac{\exp\left(\pi\sqrt{\frac{1}{5}\exp\left(\frac{2}{\Gamma(2)}\int_0^\infty \frac{t}{-1+e^t}\,dt\right)}\right)}{2\sqrt[4]{5}\sqrt{\frac{1}{2}\exp\left(\frac{2}{\Gamma(2)}\int_0^\infty \frac{t}{-1+e^t}\,dt\right)\left(1+\sqrt{5}\right)}}$$

$$\frac{\exp\left(\pi\sqrt{\frac{1}{5}\exp(\zeta(2)\,2)}\right)}{2\sqrt[4]{5}\sqrt{\frac{1}{2}\exp(\zeta(2)\,2)\left(1+\sqrt{5}\right)}} = \frac{\exp\left(\pi\sqrt{\frac{1}{5}\exp\left(\frac{4}{\Gamma(3)}\int_0^\infty t^2\operatorname{csch}^2(t)\,dt\right)}\right)}{2\sqrt[4]{5}\sqrt{\frac{1}{2}\exp\left(\frac{4}{\Gamma(3)}\int_0^\infty t^2\operatorname{csch}^2(t)\,dt\right)\left(1+\sqrt{5}\right)}}$$

$\Gamma(x)$ is the gamma function

$\operatorname{csch}(x)$ is the hyperbolic cosecant function

Thence, we have the following new mathematical connection:

$$\ln\left(\frac{4t}{(2+3\sigma t^2)M_P^2}\times\left[\frac{\rho_{mB}}{t}+\frac{6tM_P^2\sigma^2}{2+3t^2\sigma}+\sqrt{6\sigma}\rho_{mB}\,\mathrm{ArcTan}\left(\sqrt{\frac{3\sigma}{2}}t\right)\right]\right) = 73.0901738... \cong$$

$$\cong \left(\frac{\exp\left(\pi\sqrt{\frac{1}{5}\exp(\zeta(2)\times 2)}\right)}{2\sqrt[4]{5}\sqrt{\left(\frac{1}{2}\left(1+\sqrt{5}\right)\right)\exp(\zeta(2)\times 2)}}\right) = 73.5231546\ldots$$

We observe that in this connection there is the golden ratio, which therefore plays a fundamental role in the bouncing solutions.

Now, we have that:

	x_{BF}	$\langle x\rangle$	$\tilde{x}$	68% CL	95% CL
Ω_m	0.286	0.286	0.287	(0.274, 0.299)	(0.264, 0.311)
h	0.719	0.722	0.722	(0.712, 0.734)	(0.702, 0.745)
n	1.616	1.610	1.615	(1.581, 1.636)	(1.547, 1.667)

TABLE IV: Constraints on the tanh-model parameters of (508). The columns correspond to: 1.) Parameter name, 2.) Best-fit value, 3.) Mean value, 4.) Median value, 5.), 6.) 68% and 95% confidence levels respectively. From [476].

	x_{BF}	$\langle x \rangle$	$\tilde{x}$	68% CL	95% CL
Ω_m	0.284	0.286	0.287	(0.276, 0.297)	(0.265, 0.308)
h	0.724	0.731	0.731	(0.723, 0.740)	(0.713, 0.749)
n	1.152	0.757	0.736	(0.577, 0.939)	(0.514, 1.103)
p	0.814	-0.110	-0.100	(-0.263, 0.046)	(-0.395, 0.131)

TABLE V: The same as Table IV but for the exp model of (509). From [476].

$H_0 = 1$

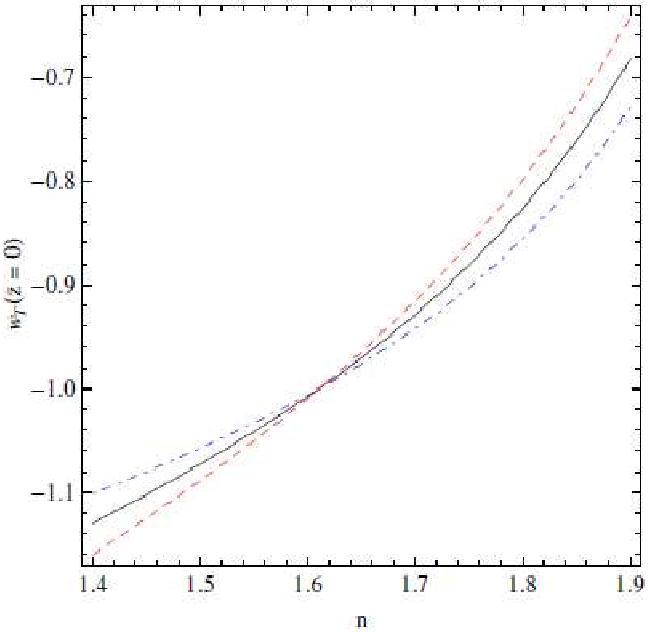

FIG. 16: *Today's value of the torsion-induced, effective dark-energy equation-of-state parameter, for the tanh model in (508), for* $\Omega_{m0} = 0.20$ *(dashed-dotted blue),* $\Omega_{m0} = 0.25$ *(solid-black), and* $\Omega_{m0} = 0.30$ *(dashed-red). From [476].*

respectively for the tanh and exp models. Note that h is the Hubble constant H_0 in units of 100 $\mathrm{kms^{-1}Mpc^{-1}}$, and today's radiation density parameter is set to be

$$\Omega_r = \omega_\gamma h^{-2}(1 + 0.2271 N_{eff}) \ ,$$

with $(\omega_\gamma, N_{eff}) = (2.469 \times 10^{-5}, 3.04)$ in agreement with WMAP7 data [169] (note that the data are not up-to-date since here we are interested in demonstrating the procedure of data analysis rather than to investigate the latest observational constraints).

2.649e-5*(100 km s^-1 Mpc^-1)^-2*(1+0.2271*3.04) = 4.264e+30 s^2 = Ω_r

ω_γ = 2.649e-5; N_{eff} = 3.04

100 km s^-1 Mpc^-1 = h = H_0

100 km/s/Mpc (kilometers per second per megaparsec)

0.1 km/s/kpc (kilometers per second per kiloparsec)

3.241×10^{-18} per second

≈ 1.5 × Hubble parameter (≈ 70 km/s/Mpc)

(recall that $T = -6H^2$)

$T_0 = -6H_0^2$

H (Hubble parameter) = 1.0000000000000000021978021978022

-6*(100 km s^-1 Mpc^-1)^2

-6.302e-35 s^{-2} = T_0

-6*(1.0000000000000000021978021978022)^2

-6.00000000000000002637362637362640002898200700398508392706 = T

$\rho_m = \rho_{mB} a_B^3 / a^3$

$a_B = 1$

a →0 = 1/4096 = 0.000244140625

4.956954983...*10^{68} = ρ_{mB}

$\Lambda = 1$

- Model I

  Let us first consider the case where [617]

$$f(T, \mathcal{T}) - \alpha T^n \mathcal{T} + \Lambda, \tag{846}$$

which describes a simple departure from GR, where α, $n \neq 0$ and Λ are arbitrary constants. In the case of a dust perfect fluid, this ansatz becomes $f(T, \mathcal{T}) = \alpha T^n \rho_m + \Lambda$. One thus obtains straightforwardly $f = \alpha\left(-6H^2\right)^n \rho_m + \Lambda$, $f_T = n\alpha\rho_m\left(-6H^2\right)^{n-1}$, $f_{TT} = \alpha n(n-1)\left(-6H^2\right)^{n-2}$, $f_{T\mathcal{T}} = \alpha n\left(-6H^2\right)^{n-1}$, and $f_{\mathcal{T}} = \alpha\left(-6H^2\right)^n$. Hence, inserting these into (844) one can acquire

the matter energy density as a function of the Hubble function as

$$\rho_m = \frac{3H^2 + \Lambda/2}{1 + \alpha(n + 1/2)\left(-6H^2\right)^n}. \tag{847}$$

Therefore, substituting the above expression into

(845) and (839), we extract the time-variation of the Hubble function, and of the dark-energy equation-of-state parameter, as functions of H, namely

$$\dot{H} = -\frac{3H^2\left(6H^2+\Lambda\right)\left[\alpha 6^n\left(-H^2\right)^n+1\right]\left[\alpha 6^n(2n+1)\left(-H^2\right)^n+2\right]}{\alpha^2 36^n(2n+1)(-H^2)^{2n}[6(n+1)H^2+\Lambda n]-\alpha 2^{n+1}3^n(-H^2)^n[6(n-2)(2n+1)H^2+\Lambda n(2n-1)]+24H^2},$$

$$w_{DE} = -\frac{3H^2\left[\alpha 6^n(2n+1)\left(-H^2\right)^n+2\right]\left\{\alpha_1\alpha_3\left(-H^2\right)^n H^2+\alpha_4-\alpha_2\left(-H^2\right)^{2n}\left[6(n-1)H^2+\Lambda(n-2)\right]+4\Lambda\right\}}{\left[\alpha_1(2n+1)(-H^2)^{n+1}+\Lambda\right]\left\{\alpha_2(-H^2)^{2n}[6(n+1)H^2+\Lambda n]-\alpha_1(-H^2)^n[\alpha_5 H^2+\alpha_6]+24H^2\right\}},$$

where for convenience we have defined the parameters $\alpha_1 = \alpha 2^{n+1} 3^n$, $\alpha_2 = \alpha^2 36^n (2n+1)$, $\alpha_3 = 6[n(2n-1)+1]$, $\alpha_4 = \Lambda(2n^2+n+3)$, $\alpha_5 = 6(n-2)(2n+1)$, and $\alpha_6 = \Lambda n(2n-1)$. Note that relations (847) and (848) hold for every α, including $\alpha = 0$ (in which case we obtain the GR expressions), while (849) holds for $\alpha \neq 0$, since for $\alpha = 0$ the effective dark energy sector does not exist at all (both ρ_{DE} and p_{DE} are zero).

$\alpha = 2$; $n = 2$; $\alpha_1 = 2*2^3*3^2 = 144$; $\alpha_2 = 2^2*36^2(2*2+1) = 25920$;
$\alpha_3 = ((6(2(2*2-1)+1)) = 42$; $\alpha_4 = 1(2*2^2+2+3) = 13$; $\alpha_5 = 0$; $\alpha_6 = 6$
$H^2 = 1.00000000000000000439560439560440000483033450066418065451 0 \approx 1$
$\Lambda = 1$

$$w_{DE} = -\frac{3H^2\left[\alpha 6^n(2n+1)(-H^2)^n+2\right]\left\{\alpha_1\alpha_3(-H^2)^n H^2+\alpha_4-\alpha_2(-H^2)^{2n}\left[6(n-1)H^2+\Lambda(n-2)\right]+4\Lambda\right\}}{\left[\alpha_1(2n+1)(-H^2)^{n-1}+\Lambda\right]\left\{\alpha_2(-H^2)^{2n}[6(n+1)H^2+\Lambda n]-\alpha_1(-H^2)^n[\alpha_5 H^2+\alpha_6]+24H^2\right\}},$$

3((2*6^2(4+1)(-1^2)^2+2))(((144*42*1+13-25920*1(6(2-1)*1+1*0)+4)))

((144(2*2+1)*1+1))(((25920*1*(6(2+1)*1+1)-144*1(0+6)+24*1)))

3((2*6^2(4+1)(-1^2)^2+2))*(((((144*42*1+13-25920*1(6(2-1)*1+1*0)+4)))))

Input:

$3(2\times 6^2(4+1)(-1^2)^2+2)(144\times 42\times 1+13-25920\times 1(6(2-1)\times 1+1\times 0)+4)$

Result:

-162 308 130

-162308130

((144(2*2+1)*1+1))(((((25920*1*(6(2+1)*1+2)-144*1(0+6)+24*1)))))

Input:

$(144(2\times 2+1)\times 1+1)(25920\times 1(6(2+1)\times 1+2)-144\times 1(0+6)+24\times 1)$

Result:

373 160 760

373160760

Scientific notation:

3.7316076×10^8

-(-162308130 / 373160760)

Input:

$$-\left(-\frac{162\,308\,130}{373\,160\,760}\right)$$

Exact result:

$$\frac{5\,410\,271}{12\,438\,692}$$

Decimal approximation:

0.4349549775812440729298546824698288212297563119980782545 30...

0.434954977...

((((-(-162308130 / 373160760)))))^1/64

Input:

$$\sqrt[64]{-\left(-\frac{162\,308\,130}{373\,160\,760}\right)}$$

Result:

$$\frac{\sqrt[64]{\frac{5\,410\,271}{3\,109\,673}}}{\sqrt[32]{2}}$$

Decimal approximation:

0.9870762267642511054579686405784388513844172017559219218 69...

0.9870762267…

result very near to the dilaton value **0.989117352243** = $\boldsymbol{\phi}$

Alternate forms:

$$\frac{\sqrt[64]{5\,410\,271}\;2^{31/32}\times 3\,109\,673^{63/64}}{6\,219\,346}$$

root of $12\,438\,692\,x^{64} - 5\,410\,271$ near $x = 0.987076$

log base 0.98707622676425110 ((((-(-162308130 / 373160760)))))

Input interpretation:

$$\log_{0.98707622676425110}\left(-\left(-\frac{162\,308\,130}{373\,160\,760}\right)\right)$$

$\log_b(x)$ is the base- b logarithm

Result:

64.0000000000000...

64

Alternative representation:

$$\log_{0.987076226764251100000}\left(-\frac{-162\,308\,130}{373\,160\,760}\right) = \frac{\log\left(\frac{162\,308\,130}{373\,160\,760}\right)}{\log(0.987076226764251100000)}$$

$\log(x)$ is the natural logarithm

Series representations:

$$\log_{0.987076226764251100000}\left(-\frac{-162\,308\,130}{373\,160\,760}\right) = -\frac{\sum_{k=1}^{\infty}\frac{(-1)^k\left(-\frac{7\,028\,421}{12\,438\,692}\right)^k}{k}}{\log(0.987076226764251100000)}$$

$$\log_{0.987076226764251100000}\left(-\frac{-162\,308\,130}{373\,160\,760}\right) = -76.8767832163647931\log\left(\frac{5\,410\,271}{12\,438\,692}\right) - 1.00000000000000000000\log\left(\frac{5\,410\,271}{12\,438\,692}\right)\sum_{k=0}^{\infty}(-0.0129237732357489000000)^k\,G(k)$$

$$\text{for }\left(G(0)=0\text{ and }G(k)=\frac{(-1)^{1+k}\,k}{2\,(1+k)\,(2+k)}+\sum_{j=1}^{k}\frac{(-1)^{1+j}\,G(-j+k)}{1+j}\right)$$

Integral representations:

$$\log(z) = \int_1^z \frac{1}{t}\,dt$$

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

Now:

$$\xi(\frac{1}{2}+\frac{1}{2}it)=\Xi(\frac{1}{2}t),$$

t = 0.25 and ξ = 0.496403

From:

$$\int_0^\infty \left\{ e^{-z} - 4\pi \int_0^\infty \frac{xe^{-3z-\pi x^2 e^{-4z}}}{e^{2\pi x}-1}\, dx \right\} \cos tz\, dz$$
$$= \frac{1}{8\sqrt{\pi}} \Gamma\left(\frac{-1+it}{4}\right) \Gamma\left(\frac{-1-it}{4}\right) \Xi(\frac{1}{2}t). \qquad (12)$$

We obtain, adding (29+2)/10^3 , where 29 and 2 are Lucas numbers:

(29+2)/10^3+1/((8*sqrt(Pi)))*gamma ((-1+i*0.25)/4) * gamma ((-1-i*0.25)/4) * 0.25584

Input:

$$\frac{29+2}{10^3} + \frac{1}{8\sqrt{\pi}} \Gamma\left(\frac{1}{4}(-1+i\times 0.25)\right) \Gamma\left(\frac{1}{4}(-1-i\times 0.25)\right) \times 0.25584$$

$\Gamma(x)$ is the gamma function

i is the imaginary unit

Result:

0.434981...

0.434981…

Alternate form:

0.434981

Alternative representations:

$$\frac{29+2}{10^3} + \frac{\Gamma\left(\frac{1}{4}(-1+i\,0.25)\right)\Gamma\left(\frac{1}{4}(-1-i\,0.25)\right)0.25584}{8\sqrt{\pi}} = \frac{31}{10^3} + \frac{0.25584\left(-1+\frac{1}{4}(-1-0.25\,i)\right)!\left(-1+\frac{1}{4}(-1+0.25\,i)\right)!}{8\sqrt{\pi}}$$

$$\frac{29+2}{10^3}+\frac{\Gamma\left(\frac{1}{4}(-1+i\,0.25)\right)\Gamma\left(\frac{1}{4}(-1-i\,0.25)\right)0.25584}{8\sqrt{\pi}}=$$
$$\frac{31}{10^3}+\frac{1}{8\sqrt{\pi}}0.25584\exp\left(-\log G\left(\frac{1}{4}(-1-0.25\,i)\right)+\log G\left(1+\frac{1}{4}(-1-0.25\,i)\right)\right)$$
$$\exp\left(-\log G\left(\frac{1}{4}(-1+0.25\,i)\right)+\log G\left(1+\frac{1}{4}(-1+0.25\,i)\right)\right)$$

$$\frac{29+2}{10^3}+\frac{\Gamma\left(\frac{1}{4}(-1+i\,0.25)\right)\Gamma\left(\frac{1}{4}(-1-i\,0.25)\right)0.25584}{8\sqrt{\pi}}=$$
$$\frac{31}{10^3}+\frac{0.25584\,G\left(1+\frac{1}{4}(-1-0.25\,i)\right)G\left(1+\frac{1}{4}(-1+0.25\,i)\right)}{G\left(\frac{1}{4}(-1-0.25\,i)\right)G\left(\frac{1}{4}(-1+0.25\,i)\right)(8\sqrt{\pi})}$$

Series representations:

$$\frac{29+2}{10^3}+\frac{\Gamma\left(\frac{1}{4}(-1+i\,0.25)\right)\Gamma\left(\frac{1}{4}(-1-i\,0.25)\right)0.25584}{8\sqrt{\pi}}=$$
$$\frac{31}{1000}+\frac{0.03198\,\Gamma(-0.25-0.0625\,i)\,\Gamma(-0.25+0.0625\,i)}{\exp\left(\pi\,\mathcal{A}\left\lfloor\frac{\arg(\pi-x)}{2\pi}\right\rfloor\right)\sqrt{x}\,\sum_{k=0}^{\infty}\frac{(-1)^k(\pi-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}}\quad \text{for } (x\in\mathbb{R} \text{ and } x<0)$$

$$\frac{29+2}{10^3}+\frac{\Gamma\left(\frac{1}{4}(-1+i\,0.25)\right)\Gamma\left(\frac{1}{4}(-1-i\,0.25)\right)0.25584}{8\sqrt{\pi}}=$$
$$\left(0.031\left(\sqrt{-1+\pi}\sum_{k=0}^{\infty}(-1+\pi)^{-k}\binom{\frac{1}{2}}{k}+1.03161\sum_{k_1=0}^{\infty}\sum_{k_2=0}^{\infty}\frac{\left(-\frac{1}{4}-0.0625\,i-z_0\right)^{k_1}\left(-\frac{1}{4}+0.0625\,i-z_0\right)^{k_2}\Gamma^{(k_1)}(z_0)\,\Gamma^{(k_2)}(z_0)}{k_1!\,k_2!}\right)\right)\Big/\left(\sqrt{-1+\pi}\sum_{k=0}^{\infty}(-1+\pi)^{-k}\binom{\frac{1}{2}}{k}\right)$$
$$\text{for } (z_0\notin\mathbb{Z} \text{ or } z_0>0)$$

$$\frac{29+2}{10^3}+\frac{\Gamma\left(\frac{1}{4}(-1+i\,0.25)\right)\Gamma\left(\frac{1}{4}(-1-i\,0.25)\right)0.25584}{8\sqrt{\pi}}=$$
$$\left(0.031\left(-16\sqrt{-1+\pi}\sum_{k=0}^{\infty}(-1+\pi)^{-k}\binom{\frac{1}{2}}{k}+i^2\sqrt{-1+\pi}\sum_{k=0}^{\infty}(-1+\pi)^{-k}\binom{\frac{1}{2}}{k}-264.093\right.\right.$$
$$\left.\left.\sum_{k_1=0}^{\infty}\sum_{k_2=0}^{\infty}\frac{(-0.25-0.0625\,i)^{k_1}\,(-0.25+0.0625\,i)^{k_2}\,\Gamma^{(k_1)}(1)\,\Gamma^{(k_2)}(1)}{k_1!\,k_2!}\right)\right)\Big/$$
$$\left((-4+i)(4+i)\sqrt{-1+\pi}\sum_{k=0}^{\infty}(-1+\pi)^{-k}\binom{\frac{1}{2}}{k}\right)$$

Integral representations:

$$\frac{29+2}{10^3}+\frac{\Gamma\left(\frac{1}{4}(-1+i\,0.25)\right)\Gamma\left(\frac{1}{4}(-1-i\,0.25)\right)0.25584}{8\sqrt{\pi}}=\frac{1}{\sqrt{\pi}}$$
$$0.03198\left(\csc((-0.125-0.03125\,i)\pi)\csc((-0.125+0.03125\,i)\pi)\right.$$
$$\left.\left(\int_0^{\infty}t^{-1.25-0.0625\,i}\sin(t)\,dt\right)\int_0^{\infty}t^{-1.25+0.0625\,i}\sin(t)\,dt+0.969356\sqrt{\pi}\right)$$

$$\frac{29+2}{10^3}+\frac{\Gamma\left(\frac{1}{4}(-1+i\,0.25)\right)\Gamma\left(\frac{1}{4}(-1-i\,0.25)\right)0.25584}{8\sqrt{\pi}}=$$
$$\frac{1}{\sqrt{\pi}}0.03198\left(\left(\int_0^{\infty}e^{-t}\,t^{-1.25-0.0625\,i}\left(1-e^t\sum_{k=0}^{n}\frac{(-t)^k}{k!}\right)dt\right)\right.$$
$$\int_0^{\infty}e^{-t}\,t^{-1.25+0.0625\,i}\left(1-e^t\sum_{k=0}^{n}\frac{(-t)^k}{k!}\right)dt+$$
$$\left.0.969356\sqrt{\pi}\right)\quad\text{for }(n\in\mathbb{Z}\text{ and }0\le n<0.25)$$

$$\frac{29+2}{10^3}+\frac{\Gamma\left(\frac{1}{4}(-1+i\,0.25)\right)\Gamma\left(\frac{1}{4}(-1-i\,0.25)\right)0.25584}{8\sqrt{\pi}}=$$
$$\frac{31}{1000}+\frac{0.12792\,\pi^2\,\mathcal{A}^2}{\sqrt{\pi}\oint_L e^t\,t^{0.25+0.0625\,i}\,dt\oint_L e^t\,t^{1/4-0.0625\,i}\,dt}$$

csc(x) is the cosecant function

Thence, we obtain:

$$\frac{29+2}{10^3}+\left(\int_0^\infty \left\{e^{-z}-4\pi\int_0^\infty \frac{xe^{-3z-\pi x^2 e^{-4z}}}{e^{2\pi x}-1}\,dx\right\}\cos tz\,dz\right)=$$

$$=\frac{29+2}{10^3}+\left(\frac{1}{8\sqrt{\pi}}\Gamma\left(\frac{-1+it}{4}\right)\Gamma\left(\frac{-1-it}{4}\right)\Xi(\tfrac{1}{2}t)\right)=0.434981\ldots\approx$$

$$\approx\left(-\frac{3H^2\left[\alpha 6^n(2n+1)\left(-H^2\right)^n+2\right]\left\{\alpha_1\alpha_3\left(-H^2\right)^n H^2+\alpha_4-\alpha_2\left(-H^2\right)^{2n}\left[6(n-1)H^2+\Lambda(n-2)\right]+4\Lambda\right\}}{\left[\alpha_1(2n+1)(-H^2)^{n+1}+\Lambda\right]\left\{\alpha_2(-H^2)^{2n}[6(n+1)H^2+\Lambda n]-\alpha_1(-H^2)^n[\alpha_5H^2+\alpha_6]+24H^2\right\}}\right)=$$

$= 0.434954977...$

And

$$\frac{\zeta(1-s)}{4\cos\frac{1}{2}\pi s}\frac{\alpha^{\frac{1}{2}(s-1)}}{s-1-t}+\frac{\zeta(-s)}{8\sin\frac{1}{2}\pi s}\frac{\alpha^{\frac{1}{2}(s+1)}}{s+1-t}+\alpha^{\frac{1}{2}(s+1)}\int_0^\infty\!\!\int_0^\infty\left\{\frac{\alpha xy}{1!(s+3-t)}-\frac{(\alpha xy)^3}{3!(s+7-t)}\right.$$

$$\left.+\frac{(\alpha xy)^5}{5!(s+11-t)}-\cdots\right\}\frac{x^s\,dx\,dy}{(e^{2\pi x}-1)(e^{2\pi y}-1)}+\frac{\zeta(1-s)}{4\cos\frac{1}{2}\pi s}\frac{\beta^{\frac{1}{2}(s-1)}}{s-1+t}+\frac{\zeta(-s)}{8\sin\frac{1}{2}\pi s}\frac{\beta^{\frac{1}{2}(s+1)}}{(s+1+t)}$$

$$+\beta^{\frac{1}{2}(s+1)}\int_0^\infty\!\!\int_0^\infty\left\{\frac{\beta xy}{1!(s+3+t)}-\frac{(\beta xy)^3}{3!(s+7+t)}+\frac{(\beta xy)^5}{5!(s+11+t)}-\cdots\right\}\frac{x^s\,dx\,dy}{(e^{2\pi x}-1)(e^{2\pi y}-1)}$$

$$=\left(\frac{\alpha}{\beta}\right)^{\frac{1}{4}t}\frac{2^{\frac{1}{2}(s-3)}\Gamma\{\frac{1}{4}(s-1+t)\}\Gamma\{\frac{1}{4}(s-1-t)\}}{\pi\quad(s+1)^2-t^2}\times\xi\left(\frac{1+s+t}{2}\right)\xi\left(\frac{1+s-t}{2}\right).\ (16)$$

$$\left(\begin{array}{l}\frac{\zeta(1-s)}{4\cos\frac{1}{2}\pi s}\frac{\alpha^{\frac{1}{2}(s-1)}}{s-1-t}+\frac{\zeta(-s)}{8\sin\frac{1}{2}\pi s}\frac{\alpha^{\frac{1}{2}(s+1)}}{s+1-t}+\alpha^{\frac{1}{2}(s+1)}\int_0^\infty\int_0^\infty\left\{\frac{\alpha xy}{1!(s+3-t)}-\frac{(\alpha xy)^3}{3!(s+7-t)}\right.\\ \left.+\frac{(\alpha xy)^5}{5!(s+11-t)}-\cdots\right\}\frac{x^s\,dx\,dy}{(e^{2\pi x}-1)(e^{2\pi y}-1)}+\frac{\zeta(1-s)}{4\cos\frac{1}{2}\pi s}\frac{\beta^{\frac{1}{2}(s-1)}}{s-1+t}+\frac{\zeta(-s)}{8\sin\frac{1}{2}\pi s}\frac{\beta^{\frac{1}{2}(s+1)}}{(s+1+t)}\\ +\beta^{\frac{1}{2}(s+1)}\int_0^\infty\int_0^\infty\left\{\frac{\beta xy}{1!(s+3+t)}-\frac{(\beta xy)^3}{3!(s+7+t)}+\frac{(\beta xy)^5}{5!(s+11+t)}-\cdots\right\}\frac{x^s\,dx\,dy}{(e^{2\pi x}-1)(e^{2\pi y}-1)}\end{array}\right)-\left(\frac{89+7+}{10^3}\right)=$$

$$=\left(\left(\frac{\alpha}{\beta}\right)^{\frac{1}{4}t}\frac{2^{\frac{1}{2}(s-3)}\Gamma\{\frac{1}{4}(s-1+t)\}\Gamma\{\frac{1}{4}(s-1-t)\}}{\pi\quad(s+1)^2-t^2}\times\xi\left(\frac{1+s+t}{2}\right)\xi\left(\frac{1+s-t}{2}\right)\right)-\left(\frac{89+7+2}{10^3}\right)=$$

$= 0.435212... \approx$

$$\approx\left(\frac{3H^2\left[\alpha 6^n(2n+1)\left(-H^2\right)^n+2\right]\left\{\alpha_1\alpha_3\left(-H^2\right)^nH^2+\alpha_4-\alpha_2\left(-H^2\right)^{2n}\left[6(n-1)H^2+\Lambda(n-2)\right]+4\Lambda\right\}}{\left[\alpha_1(2n+1)(-H^2)^{n+1}+\Lambda\right]\left\{\alpha_2(-H^2)^{2n}\left[6(n+1)H^2+\Lambda n\right]-\alpha_1(-H^2)^n\left[\alpha_5H^2+\alpha_6\right]+24H^2\right\}}\right)=$$

$= 0.434954977...$

Thus, we have obtained two new mathematical connections between the dark-energy-equation-of-state parameter as function of H and the above Ramanujan equations concerning Riemann's function.

Further, we have, performing the following calculations and integration:

-((64*2^2+139)*16) + integrate [(((((-(-162308130 / 373160760)))))^1/64]x, [0, 128Pi]

Input:

$$-((64\times 2^2+139)\times 16)+\int_0^{128\pi}\sqrt[64]{-\left(-\frac{162\,308\,130}{373\,160\,760}\right)}\,x\,dx$$

Result:

$$4096 \sqrt[64]{\frac{5410271}{3109673}}\, 2^{31/32}\, \pi^2 - 6320 \approx 73486.9$$

73486.9

Computation result:

$$-((64 \times 2^2 + 139)\, 16) + \int_0^{128\pi} \sqrt[64]{-\frac{-162308130}{373160760}}\, x\, dx =$$

$$4096 \sqrt[64]{\frac{5410271}{3109673}}\, 2^{31/32}\, \pi^2 - 6320$$

Alternate forms:

$$16 \left(256 \sqrt[64]{\frac{5410271}{3109673}}\, 2^{31/32}\, \pi^2 - 395\right)$$

$$\frac{16 \left(256 \times 2^{31/32} \times 3109673^{63/64} \sqrt[64]{5410271}\, \pi^2 - 1228320835\right)}{3109673}$$

Thence, we have the following mathematical connection:

$$\left(-((64 \times 2^2 + 139) \times 16) + \int_0^{128\pi} \sqrt[64]{-\left(-\frac{162308130}{373160760}\right)}\, x\, dx \right) = 73486.9 \Rightarrow$$

$$\Rightarrow -3927 + 2 \left(\sqrt[13]{\begin{array}{c} N \exp\left[\int d\hat{\sigma} \left(-\frac{1}{4u^2} \mathbf{P}_i D \mathbf{P}_i\right)\right] |Bp\rangle_{\text{NS}} \\ \int [d\mathbf{X}^\mu] \exp\left\{\int d\hat{\sigma} \left(-\frac{1}{4v^2} D\mathbf{X}^\mu D^2 \mathbf{X}^\mu\right)\right\} |\mathbf{X}^\mu, \mathbf{X}^i = 0\rangle_{\text{NS}} \end{array} +} \right) =$$

$$-3927 + 2 \sqrt[13]{2.2983717437 \times 10^{59} + 2.0823329825883 \times 10^{59}}$$

$$= 73490.8437525.... \Rightarrow$$

(the boundary state corresponding to the NSNS-sector of N Dp-branes in the limit of u → ∞)

$$\Rightarrow \left(A(r) \times \frac{1}{B(r)}\left(-\frac{1}{\phi(r)}\right) \times \frac{1}{e^{\Lambda(r)}}\right) \Rightarrow$$

$$\Rightarrow \left(-0.000029211892 \times \frac{1}{0.0003644621}\left(-\frac{1}{0.0005946833}\right) \times \frac{1}{0.00183393}\right) =$$

$$= 73491.78832548118710549159572042220548025195726563413398700\ldots$$

$$= 73491.7883254\ldots \Rightarrow$$

(the ratio concerning the general asymptotically flat solution of the equations of motion of the p-brane)

$$\left(\begin{array}{c} I_{21} \ll \int\limits_{-\infty}^{+\infty} \exp\left(-\left(\frac{t}{H}\right)^2\right) \Big| \sum\limits_{\lambda \leq P^{1-\varepsilon_2}} \frac{a(\lambda)}{\sqrt{\lambda}} B(\lambda) \lambda^{-i(T+t)} \Big|^2 dt \ll \\ \ll H \left\{ \left(\frac{4}{\varepsilon_2 \log T}\right)^{2r} (\log T)(\log X)^{-2\beta} + (\varepsilon_2^{-2r} (\log T)^{-2r} + \varepsilon_2^{-r} h_1^r (\log T)^{-r}) T^{-\varepsilon_1} \right\} \end{array} \right) /$$

$$/(26 \times 4)^2 - 24 = \left(\frac{7.9313976505275 \times 10^8}{(26 \times 4)^2 - 24}\right) = 73493.30662\ldots$$

(the Karatsuba's equation concerning the zeros of a special type of function connected with Dirichlet series)

Let us first consider the case where [617]

$$f(T, \mathcal{T}) = \alpha T^n \mathcal{T} + \Lambda, \tag{846}$$

which describes a simple departure from GR, where α, $n \neq 0$ and Λ are arbitrary constants. In the case of a dust perfect fluid, this ansatz becomes $f(T, \mathcal{T}) = \alpha T^n \rho_m + \Lambda$. One thus obtains straightforwardly $f = \alpha\left(-6H^2\right)^n \rho_m + \Lambda$, $f_T = n\alpha\rho_m\left(-6H^2\right)^{n-1}$, $f_{TT} = \alpha n(n-1)\left(-6H^2\right)^{n-2}$, $f_{T\mathcal{T}} = \alpha n\left(-6H^2\right)^{n-1}$, and $f_{\mathcal{T}} = \alpha\left(-6H^2\right)^n$. Hence, inserting these into (844) one can acquire

We are interested in models that are able to describe the phantom-divide crossing. Two such models are [197]

$$F(T) \equiv f(T) - T = \alpha(-T)^n \tanh\left(\frac{T_0}{T}\right), \tag{508}$$

$$F(T) \equiv f(T) - T = \alpha(-T)^n \left[1 - \exp\left(-p\frac{T_0}{T}\right)\right], \tag{509}$$

where the subscript 0 marks the present value. In the first model (called "the tanh model") one must set $n > 3/2$ in order to obtain an effective dark-energy fluid with a positive-defined energy density, whereas for the second model (called "the exp model") the same requirement leads to $n > 1/2$. The parameter α can be expressed in terms of the present-day quantities as

$$\alpha_{tanh} = -\frac{\left(6H_0^2\right)^{1-n}(1-\Omega_{m0}-\Omega_{r0})}{2\text{sech}^2(1) + (1-2n)\tanh(1)}, \tag{510}$$

$$\alpha_{exp} = -\frac{\left(6H_0^2\right)^{1-n}(1-\Omega_{m0}-\Omega_{r0})}{1-2n-(1-2n+2p)e^p}, \tag{511}$$

for the tanh and exp model respectively.

H (Hubble parameter) = 1.00000000000000000021978021978022

-6*(100 km s^-1 Mpc^-1)^2

-6.302e-35 s^{-2} = T_0

-6*(1.00000000000000000021978021978022)^2

-6.000000000000000002637362637362640002898200700398508392706 = T

$$\rho_m = \rho_{mB} a_B^3 / a^3$$

$$a_B = 1$$

a →0 = 1/4096 = 0.000244140625

4.956954983...*10^{68} = ρ_{mB}

Λ = 1

α = 2

From:

$$F(T) \equiv f(T) - T = \alpha(-T)^n \tanh\left(\frac{T_0}{T}\right)$$

For n > 3/2; n = 1.8236681145196.., we obtain:

2*(-6.0000000000000000263736263736264)^1.8236681145196 tanh (-6.302e-35 / -6.0000000000000000263736263736264)

Where 1.8236681145196... is a value of a Ramanujan mock theta function

Input interpretation:

$$2\,(-6.0000000000000000263736263736264)^{1.8236681145196}\tanh\left(\frac{-6.302\times10^{-35}}{-6.0000000000000000263736263736264}\right)$$

tanh(x) is the hyperbolic tangent function

Result:

$4.68915... \times 10^{-34} -$
$2.90057... \times 10^{-34}\, i$

Polar coordinates:

$r = 5.51375\times10^{-34}$ (radius), $\theta = -31.7397°$ (angle)

5.51375 * 10^{-34} = F(T) (tanh model)

From:

$$F(T) \equiv f(T) - T = \alpha(-T)^n \left[1 - \exp\left(-p\frac{T_0}{T}\right)\right]$$

For n > 1/2;   n = 0.8730077, and p = 0.2, (with regard the numerical results of the background evolutions for the power-law f(T) gravity (386), the model parameter p is chosen to be 0.2)

we obtain:

2*(-6.0000000000000000263736263736264)^0.8730077*((((1-exp(-0.2*(-6.302e-35 / -6.0000000000000000263736263736264))))

Where 0.8730077 is a value of a Ramanujan mock theta function

Input interpretation:

$$2\,(-6.0000000000000000263736263736264)^{0.8730077}\left(1-\exp\left(-0.2\times\frac{-6.302\times 10^{-35}}{-6.0000000000000000263736263736264}\right)\right)$$

Result:

$-1.85011... \times 10^{-35} +$
$7.79945... \times 10^{-36}\, i$

Polar coordinates:

$r = 0$ (radius), $\theta = 0°$ (angle)

Input interpretation:

$-1.85011\times 10^{-35} + 7.79945\times 10^{-36}\, i$

i is the imaginary unit

Result:

$-1.85011... \times 10^{-35} +$
$7.79945... \times 10^{-36}\, i$

Polar coordinates:

$r = 2.00779\times 10^{-35}$ (radius), $\theta = 157.141°$ (angle)

$2.00779 * 10^{-35}$ = F(T) (exp model)

From the two results, we obtain:

(5.51375×10^-34 / 2.00779×10^-35)

Input interpretation:

$$\frac{5.51375\times 10^{-34}}{2.00779\times 10^{-35}}$$

Result:

27.461786342197142131398203995437769886292889196579323534 83...

27.4617

Or:

(((((2*(-6)^1.8236681145196 tanh (-6.302e-35 / -6)))))) / (((2*(-6)^0.8730077*((((1-exp(-0.2*(-6.302e-35 / -6)))))))))

Input interpretation:

$$\frac{2(-6)^{1.8236681145196}\tanh\left(\frac{-1}{-6}\times 6.302\times 10^{-35}\right)}{2(-6)^{0.8730077}\left(1-\exp\left(-0.2\left(\frac{-1}{-6}\times 6.302\times 10^{-35}\right)\right)\right)}$$

tanh(x) is the hyperbolic tangent function

Result:

$\tilde{\infty}$

$\tilde{\infty}$ is complex infinity

Decimal approximation:

$-27.1325\ldots + 4.23967\ldots i$

Input interpretation:

$-27.1325 + 4.23967 i$

i is the imaginary unit

Result:

$-27.1325\ldots + 4.23967\ldots i$

Polar coordinates:

$r = 27.4617$ (radius), $\theta = 171.119°$ (angle)

27.4617

We note that, from the following formula regarding the coefficients of the 3rd order mock theta function psi(q)

exp(Pi*sqrt(n/6)) / (4*sqrt(n))   (OEIS – sequence A053251)

we obtain for n = 24:

exp(Pi*sqrt(24/6)) / (4*sqrt(24))

Input:

$$\frac{\exp\left(\pi\sqrt{\frac{24}{6}}\right)}{4\sqrt{24}}$$

Exact result:

$$\frac{e^{2\pi}}{8\sqrt{6}}$$

Decimal approximation:

27.326694115706128862540681219858471603020973138509286343348...

27.326694115706….

Property:

$\frac{e^{2\pi}}{8\sqrt{6}}$ is a transcendental number

Series representations:

$$\frac{\exp\left(\pi\sqrt{\frac{24}{6}}\right)}{4\sqrt{24}} = \frac{\exp\left(\pi\sqrt{3}\sum_{k=0}^{\infty} 3^{-k}\binom{\frac{1}{2}}{k}\right)}{4\sqrt{23}\sum_{k=0}^{\infty} 23^{-k}\binom{\frac{1}{2}}{k}}$$

$$\frac{\exp\left(\pi\sqrt{\frac{24}{6}}\right)}{4\sqrt{24}} = \frac{\exp\left(\pi\sqrt{3}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{3}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)}{4\sqrt{23}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{23}\right)^k\left(-\frac{1}{2}\right)_k}{k!}}$$

$$\frac{\exp\left(\pi\sqrt{\frac{24}{6}}\right)}{4\sqrt{24}} = \frac{\exp\left(\pi\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(4-z_0)^k z_0^{-k}}{k!}\right)}{4\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(24-z_0)^k z_0^{-k}}{k!}}$$

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

We have the following new mathematical connection:

$$\left(\frac{2(-6)^{1.8236681145196}\tanh\left(\frac{-1}{-6}\times 6.302\times 10^{-35}\right)}{2(-6)^{0.8730077}\left(1-\exp\left(-0.2\left(\frac{-1}{-6}\times 6.302\times 10^{-35}\right)\right)\right)}\right) = 27.4617 \Rightarrow$$

$$\Rightarrow \left(\frac{\exp\left(\pi\sqrt{\frac{24}{6}}\right)}{4\sqrt{24}}\right) = 27.326694115706\ldots$$

Now, we have that:

$$\alpha_{tanh} = -\frac{\left(6H_0^2\right)^{1-n}\left(1-\Omega_{m0}-\Omega_{r0}\right)}{2\mathrm{sech}^2(1)+(1-2n)\tanh(\mathbf{1})}, \qquad (510)$$

4.264e+30 $s^2 = \Omega_r$

$$\Omega_{m0} = 0.25$$
$$n \simeq 1.6$$

(100 km s^-1 Mpc^-1) = H_0

-((((6*(100 km s^-1 Mpc^-1)^2))^(1-1.6)*(1-0.25-4.264e+30))) / (((2 sech^2(1)+(1-2*1.6) tanh(1))))

((6*(100 km s^-1 Mpc^-1)^2))^(1-1.6)
-3.314×10^20 seconds

(((-3.314×10^20 *(1-0.25-4.264e+30))) / (((2 sech^2(1)+(1-2*1.6) tanh(1))))

Input interpretation:

$$\frac{-3.314\times 10^{20}\left(1-0.25-4.264\times 10^{30}\right)}{2\,\mathrm{sech}^2(1)+(1-2\times 1.6)\tanh(1)}$$

sech(x) is the hyperbolic secant function

tanh(x) is the hyperbolic tangent function

Result:

$-1.69119\ldots\times 10^{51}$

-1.69119...*10^{51}

And:

$$\alpha_{exp} = -\frac{\left(6H_0^2\right)^{1-n}\left(1-\Omega_{m0}-\Omega_{r0}\right)}{1-2n-(1-2n+2p)e^p}$$

For p = 0.2:

(((-3.314×10^20 *(1-0.25-4.264e+30))) / (((1-2*1.6-(1-2*1.6+2*0.2)e^0.2)))

Input interpretation:

$$\frac{-3.314\times 10^{20}\left(1-0.25-4.264\times 10^{30}\right)}{1-2\times 1.6-(1-2\times 1.6+2\times 0.2)\,e^{0.2}}$$

Result:

$-9.58004... \times 10^{53}$

$-9.58004…*10^{53}$

We have that, dividing the two results, we obtain:

(((-3.314×10^20 *(1-0.25-4.264e+30))) / (((1-2*1.6-(1-2*1.6+2*0.2)e^0.2))) * 1 / (((-3.314×10^20 *(1-0.25-4.264e+30))) / (((2 sech^2(1)+(1-2*1.6) tanh(1))))

Input interpretation:

$$\frac{-3.314\times 10^{20}\left(1-0.25-4.264\times 10^{30}\right)}{1-2\times 1.6-(1-2\times 1.6+2\times 0.2)\,e^{0.2}}\times\frac{1}{\frac{-3.314\times 10^{20}\left(1-0.25-4.264\times 10^{30}\right)}{2\,\mathrm{sech}^2(1)+(1-2\times 1.6)\tanh(1)}}$$

$\mathrm{sech}(x)$ is the hyperbolic secant function

$\tanh(x)$ is the hyperbolic tangent function

Result:

566.467...

566.467…

From the following formula of the coefficients of the “5th order” mock theta function psi(q)

a(n) ~ sqrt(phi) * exp(Pi*sqrt(n/15)) / (2*5^(1/4)*sqrt(n))

(OEIS – sequence A053261)

we obtain, for n = 142:

sqrt(golden ratio) * exp(Pi*sqrt(142/15)) / (2*5^(1/4)*sqrt(142))

Input:

$$\sqrt{\phi} \times \frac{\exp\left(\pi \sqrt{\frac{142}{15}}\right)}{2 \sqrt[4]{5} \sqrt{142}}$$

ϕ is the golden ratio

Exact result:

$$\frac{e^{\sqrt{142/15}\,\pi} \sqrt{\frac{\phi}{142}}}{2 \sqrt[4]{5}}$$

Decimal approximation:

562.9674901451270624093141698696704992272545861579538471347...

562.96749…

Property:

$$\frac{e^{\sqrt{142/15}\,\pi} \sqrt{\frac{\phi}{142}}}{2 \sqrt[4]{5}}$$ is a transcendental number

Alternate forms:

$$\frac{1}{4} \sqrt{\frac{1}{355} \left(5 + \sqrt{5}\right)}\, e^{\sqrt{142/15}\,\pi}$$

$$\frac{\sqrt{\frac{1}{71} \left(1 + \sqrt{5}\right)}\, e^{\sqrt{142/15}\,\pi}}{4 \sqrt[4]{5}}$$

Series representations:

$$\frac{\sqrt{\phi}\, \exp\left(\pi \sqrt{\frac{142}{15}}\right)}{2 \sqrt[4]{5} \sqrt{142}} = \frac{\exp\left(\pi \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k \left(\frac{142}{15} - z_0\right)^k z_0^{-k}}{k!}\right) \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (\phi - z_0)^k z_0^{-k}}{k!}}{2 \sqrt[4]{5} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (142 - z_0)^k z_0^{-k}}{k!}}$$

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

$$\frac{\sqrt{\phi}\,\exp\left(\pi\sqrt{\frac{142}{15}}\right)}{2\sqrt[4]{5}\,\sqrt{142}} = \left(\exp\left(i\pi\left\lfloor\frac{\arg(\phi-x)}{2\pi}\right\rfloor\right)\right.$$
$$\exp\left(\pi\exp\left(i\pi\left\lfloor\frac{\arg\left(\frac{142}{15}-x\right)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k\left(\frac{142}{15}-x\right)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)$$
$$\left.\sum_{k=0}^{\infty}\frac{(-1)^k(\phi-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)\Big/$$
$$\left(2\sqrt[4]{5}\,\exp\left(i\pi\left\lfloor\frac{\arg(142-x)}{2\pi}\right\rfloor\right)\sum_{k=0}^{\infty}\frac{(-1)^k(142-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)$$
for ($x \in \mathbb{R}$ and $x < 0$)

$$\frac{\sqrt{\phi}\,\exp\left(\pi\sqrt{\frac{142}{15}}\right)}{2\sqrt[4]{5}\,\sqrt{142}} =$$
$$\left(\exp\left(\pi\left(\frac{1}{z_0}\right)^{1/2\left\lfloor\arg\left(\frac{142}{15}-z_0\right)/(2\pi)\right\rfloor} z_0^{1/2\left(1+\left\lfloor\arg\left(\frac{142}{15}-z_0\right)/(2\pi)\right\rfloor\right)}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(\frac{142}{15}-z_0\right)^k z_0^{-k}}{k!}\right)\right.$$
$$\left(\frac{1}{z_0}\right)^{-1/2\lfloor\arg(142-z_0)/(2\pi)\rfloor+1/2\lfloor\arg(\phi-z_0)/(2\pi)\rfloor} z_0^{-1/2\lfloor\arg(142-z_0)/(2\pi)\rfloor+1/2\lfloor\arg(\phi-z_0)/(2\pi)\rfloor}$$
$$\left.\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(\phi-z_0)^k z_0^{-k}}{k!}\right)\Big/\left(2\sqrt[4]{5}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(142-z_0)^k z_0^{-k}}{k!}\right)$$

Or, for n = 142.2

sqrt(golden ratio) * exp(Pi*sqrt(142.2/15)) / (2*5^(1/4)*sqrt(142.2))

Input:

$$\sqrt{\phi}\times\frac{\exp\left(\pi\sqrt{\frac{142.2}{15}}\right)}{2\sqrt[4]{5}\,\sqrt{142.2}}$$

ϕ is the golden ratio

Result:

566.413...

566.413…

Series representations:

$$\frac{\sqrt{\phi}\,\exp\left(\pi\sqrt{\frac{142.2}{15}}\right)}{2\sqrt[4]{5}\,\sqrt{142.2}} = \frac{\exp\left(\pi\sqrt{z_0}\,\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k (9.48-z_0)^k z_0^{-k}}{k!}\right)\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k (\phi-z_0)^k z_0^{-k}}{k!}}{2\sqrt[4]{5}\,\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k (142.2-z_0)^k z_0^{-k}}{k!}}$$

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

$$\frac{\sqrt{\phi}\,\exp\left(\pi\sqrt{\frac{142.2}{15}}\right)}{2\sqrt[4]{5}\,\sqrt{142.2}} = \left(\exp\left(i\pi\left\lfloor\frac{\arg(\phi-x)}{2\pi}\right\rfloor\right)\right.$$
$$\exp\left(\pi\exp\left(i\pi\left\lfloor\frac{\arg(9.48-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k (9.48-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)$$
$$\left.\sum_{k=0}^{\infty}\frac{(-1)^k (\phi-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)\Bigg/$$
$$\left(2\sqrt[4]{5}\,\exp\left(i\pi\left\lfloor\frac{\arg(142.2-x)}{2\pi}\right\rfloor\right)\sum_{k=0}^{\infty}\frac{(-1)^k (142.2-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)$$

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

$$\frac{\sqrt{\phi}\,\exp\left(\pi\sqrt{\frac{142.2}{15}}\right)}{2\sqrt[4]{5}\,\sqrt{142.2}} =$$
$$\left(\exp\left(\pi\left(\frac{1}{z_0}\right)^{1/2\lfloor\arg(9.48-z_0)/(2\pi)\rfloor} z_0^{1/2(1+\lfloor\arg(9.48-z_0)/(2\pi)\rfloor)}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k (9.48-z_0)^k z_0^{-k}}{k!}\right)\right.$$
$$\left(\frac{1}{z_0}\right)^{-1/2\lfloor\arg(142.2-z_0)/(2\pi)\rfloor+1/2\lfloor\arg(\phi-z_0)/(2\pi)\rfloor}$$
$$\left.z_0^{-1/2\lfloor\arg(142.2-z_0)/(2\pi)\rfloor+1/2\lfloor\arg(\phi-z_0)/(2\pi)\rfloor}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k (\phi-z_0)^k z_0^{-k}}{k!}\right)\Bigg/$$
$$\left(2\sqrt[4]{5}\,\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k (142.2-z_0)^k z_0^{-k}}{k!}\right)$$

Thence, we obtain the following mathematical connection:

$$\left(\frac{-3.314\times 10^{20}\,(1-0.25-4.264\times 10^{30})}{1-2\times 1.6-(1-2\times 1.6+2\times 0.2)\,e^{0.2}} \times \frac{1}{\frac{-3.314\times 10^{20}\,(1-0.25-4.264\times 10^{30})}{2\,\text{sech}^2(1)+(1-2\times 1.6)\tanh(1)}} \right) = 566.467 \cong$$

$$\cong \left(\sqrt{\phi} \times \frac{\exp\left(\pi\sqrt{\frac{142.2}{15}}\right)}{2\sqrt[4]{5}\,\sqrt{142.2}} \right) = 566.413 \ldots$$

$\Lambda = 1 \quad \alpha = 2 \quad r = 8$

$Q = 0.12660698; \; D > 3; \; D = 4$

Now, we have that:

$$G(r)^2 = \frac{1}{\left(\frac{2}{3} \pm \frac{1}{3}\sqrt{1-24\alpha\Lambda-6\alpha Q^2 r^{4-2D}}\right)^2 r^{D-3}} \left\{ \frac{1}{(D-2)} \right.$$
$$\left\{ \frac{1}{54\alpha} \left[\quad \frac{18\alpha Q^2 r^{3-D}}{3-D} \quad \frac{(1+72\alpha\Lambda)\,r^{D-1}}{D-1} \right] \right.$$
$$\pm \frac{\sqrt{r^{4D}\,(1-24\alpha\Lambda-6\alpha Q^2 r^{4-2D})}}{54\alpha} \left[\frac{6\alpha Q^2 r^{3-3D}}{2D-5} - \frac{(-1+24\alpha\Lambda)\,r^{-1-D}}{D-1} \right]$$
$$\left. \mp \frac{(D-2)^2\,(-1+24\alpha\Lambda)\,Q^2 r^{3+D}\sqrt{1+\frac{6\alpha Q^2 r^{4-2D}}{-1+24\alpha\Lambda}}\;{}_2F_1\left(\frac{D-3}{2(D-2)}, \frac{1}{2}, \frac{3D-7}{2(D-2)}; \frac{6\alpha Q^2 r^{4-2D}}{1-24\alpha\Lambda}\right)}{3\,(D-3)\,(2D-5)\,(D-1)\,\sqrt{r^{4D}\,(1-24\alpha\Lambda-6\alpha Q^2 r^{4-2D})}} \right\}$$
$$\left. + Const \right\}$$

From:

$$G(r)^2 = \frac{1}{\left(\frac{2}{3} \pm \frac{1}{3}\sqrt{1-24\alpha\Lambda-6\alpha Q^2 r^{4-2D}}\right)^2 r^{D-3}} \left\{ \frac{1}{(D-2)} \right.$$
$$\left\{ \frac{1}{54\alpha} \left[-\frac{18\alpha Q^2 r^{3-D}}{3-D} - \frac{(1+72\alpha\Lambda)\,r^{D-1}}{D-1} \right] \right.$$

1/((8*(1/3*sqrt(1-48-6*2*0.12660698^2*8^-4))^2))*(1/2(1/108(-(18*2*0.12660698^2*8^-1)/(3-4)-((1+72*2)*8^3)/3)))

Input interpretation:

$$\frac{1}{8\left(\frac{1}{3}\sqrt{1-48-\frac{6\times2\times0.12660698^2}{8^4}}\right)^2}\left(\frac{1}{2}\left(\frac{1}{108}\left(-\frac{\frac{18\times2\times0.12660698^2}{8}}{3-4}-\frac{1}{3}\left((1+72\times2)\times8^3\right)\right)\right)\right)$$

Result:

2.742306051496021512293779121046409082923438383139335965175...

2.74230605...

$$\pm\frac{\sqrt{r^{4D}\left(1-24\alpha\Lambda-6\alpha Q^2r^{4-2D}\right)}}{54\alpha}\left[\frac{6\alpha Q^2r^{3-3D}}{2D-5}-\frac{(-1+24\alpha\Lambda)\,r^{-1-D}}{D-1}\right]$$

sqrt(8^16(1-24*2-6*2*0.12660698^2*8^-4))/108*(((6*2*0.12660698^2*8^-9)/3-(-(1+24*2)*8^-5)/3))

Input interpretation:

$$\left(\frac{1}{108}\sqrt{8^{16}\left(1-24\times2-\frac{6\times2\times0.12660698^2}{8^4}\right)}\right)\left(\frac{1}{3}\times\frac{6\times2\times0.12660698^2}{8^9}--\frac{1+24\times2}{8^5\times3}\right)$$

Result:

530.84849808039... i

Polar coordinates:

$r = 530.848$ (radius), $\theta = 90°$ (angle)

530.848

$$\mp\frac{(D-2)^2\,(-1+24\alpha\Lambda)\,Q^2r^{3+D}\sqrt{1+\frac{6\alpha Q^2r^{4-2D}}{-1+24\alpha\Lambda}}\;{}_2F_1\left(\frac{D-3}{2(D-2)},\frac{1}{2},\frac{3D-7}{2(D-2)};\frac{6\alpha Q^2r^{4-2D}}{1-24\alpha\Lambda}\right)}{3\,(D-3)\,(2D-5)\,(D-1)\sqrt{r^{4D}\left(1-24\alpha\Lambda-6\alpha Q^2r^{4-2D}\right)}}\Bigg\}$$

where ${}_2F_1(\ldots.) = 1/4$

((((4(-1+48)*0.12660698^2*8^7*sqrt(1+(6*2*0.12660698^2*8^-4) / (-1+48))*1/4)))) / (((3*3*3*sqrt(8^16*(1-48-6*2*0.12660698^2*8^-4)))))

Input interpretation:

$$\frac{4(-1+48)\times 0.12660698^2\times 8^7\sqrt{1+\frac{\frac{6\times 2\times 0.12660698^2}{8^4}}{-1+48}\times\frac{1}{4}}}{3\times 3\times 3\sqrt{8^{16}\left(1-48-\frac{6\times 2\times 0.12660698^2}{8^4}\right)}}$$

Result:

$-0.00050875709\ldots i$

Polar coordinates:

$r = 0.000508757$ (radius), $\theta = -90°$ (angle)

0.000508757

From the sum of the above results, we obtain:

(2.742306051496021512293779121046409082923438383139335965175 + 530.848 + 0.000508757)

Result:

533.590814808496021512293779121046409082923438383139335965 1...

533.5908148…

From the following formula of the coefficients of the "5th order" mock theta function psi(q)

a(n) ~ sqrt(phi) * exp(Pi*sqrt(n/15)) / (2*5^(1/4)*sqrt(n))

(OEIS – sequence A053261)

we obtain, for n = 140.25:

sqrt(golden ratio) * exp(Pi*sqrt(140.25/15)) / (2*5^(1/4)*sqrt(140.25))

Input interpretation:

$$\sqrt{\phi}\times\frac{\exp\left(\pi\sqrt{\frac{140.25}{15}}\right)}{2\sqrt[4]{5}\sqrt{140.25}}$$

ϕ is the golden ratio

Result:

533.615556384521384838451455521824030729819244298061151019...

533.61555638…

Series representations:

$$\frac{\sqrt{\phi}\exp\left(\pi\sqrt{\frac{140.25}{15}}\right)}{2\sqrt[4]{5}\sqrt{140.25}} = \frac{\exp\left(\pi\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(9.35-z_0)^k z_0^{-k}}{k!}\right)\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(\phi-z_0)^k z_0^{-k}}{k!}}{2\sqrt[4]{5}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(140.25-z_0)^k z_0^{-k}}{k!}}$$

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

$$\frac{\sqrt{\phi}\exp\left(\pi\sqrt{\frac{140.25}{15}}\right)}{2\sqrt[4]{5}\sqrt{140.25}} = \left(\exp\left(i\pi\left\lfloor\frac{\arg(\phi-x)}{2\pi}\right\rfloor\right)\exp\left(\pi\exp\left(i\pi\left\lfloor\frac{\arg(9.35-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(9.35-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)\sum_{k=0}^{\infty}\frac{(-1)^k(\phi-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right) \Big/ \left(2\sqrt[4]{5}\exp\left(i\pi\left\lfloor\frac{\arg(140.25-x)}{2\pi}\right\rfloor\right)\sum_{k=0}^{\infty}\frac{(-1)^k(140.25-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)$$

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

$$\frac{\sqrt{\phi}\exp\left(\pi\sqrt{\frac{140.25}{15}}\right)}{2\sqrt[4]{5}\sqrt{140.25}} = \left(\exp\left(\pi\left(\frac{1}{z_0}\right)^{1/2\lfloor\arg(9.35-z_0)/(2\pi)\rfloor} z_0^{1/2(1+\lfloor\arg(9.35-z_0)/(2\pi)\rfloor)}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(9.35-z_0)^k z_0^{-k}}{k!}\right)\left(\frac{1}{z_0}\right)^{-1/2\lfloor\arg(140.25-z_0)/(2\pi)\rfloor+1/2\lfloor\arg(\phi-z_0)/(2\pi)\rfloor} z_0^{-1/2\lfloor\arg(140.25-z_0)/(2\pi)\rfloor+1/2\lfloor\arg(\phi-z_0)/(2\pi)\rfloor}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(\phi-z_0)^k z_0^{-k}}{k!}\right) \Big/ \left(2\sqrt[4]{5}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(140.25-z_0)^k z_0^{-k}}{k!}\right)$$

Thence, we obtain the following mathematical connection:

$$\left(\begin{array}{l} G(r)^2 = \dfrac{1}{\left(\frac{2}{3} \pm \frac{1}{3}\sqrt{1-24\alpha\Lambda-6\alpha Q^2 r^{4-2D}}\right)^2 r^{D-3}} \left\{ \dfrac{1}{(D-2)} \right. \\ \left\{ \dfrac{1}{54\alpha} \left[-\dfrac{18\alpha Q^2 r^{3-D}}{3-D} - \dfrac{(1+72\alpha\Lambda)\, r^{D-1}}{D-1} \right] \right. \\ \pm \dfrac{\sqrt{r^{4D}\left(1-24\alpha\Lambda-6\alpha Q^2 r^{4-2D}\right)}}{54\alpha} \left[\dfrac{6\alpha Q^2 r^{3-3D}}{2D-5} - \dfrac{(-1+24\alpha\Lambda)\, r^{-1-D}}{D-1} \right] \\ \left. \mp \dfrac{(D-2)^2 (-1+24\alpha\Lambda)\, Q^2 r^{3+D} \sqrt{1+\frac{6\alpha Q^2 r^{4-2D}}{-1+24\alpha\Lambda}}\ {}_2F_1\left(\frac{D-3}{2(D-2)}, \frac{1}{2}, \frac{3D-7}{2(D-2)}; \frac{6\alpha Q^2 r^{4-2D}}{1-24\alpha\Lambda}\right)}{3(D-3)(2D-5)(D-1)\sqrt{r^{4D}\left(1-24\alpha\Lambda-6\alpha Q^2 r^{4-2D}\right)}} \right\} \\ \left. +Const \right\} \end{array} \right) =$$

$$= 533.5908148\ldots \approx \left(\sqrt{\phi} \times \frac{\exp\left(\pi \sqrt{\frac{140.25}{15}}\right)}{2\sqrt[4]{5}\ \sqrt{140.25}} \right) = 533.61555638\ldots$$

Furthermore, we also obtain:

-26-2048+1/4*(533.5908148*566.46675049)

Where 1/4 is the following term of above analyzed equation:

$${}_2F_1\left(\frac{D-3}{2(D-2)}, \frac{1}{2}, \frac{3D-7}{2(D-2)}; \frac{6\alpha Q^2 r^{4-2D}}{1-24\alpha\Lambda}\right)$$

Input interpretation:

$$-26 - 2048 + \frac{1}{4}(533.5908148 \times 566.46675049)$$

Result:

73491.363737766849813

73491.3637377…

$$\left[-26-2048+\frac{1}{4}(533.5908148\times 566.46675049)\right] = 73491.3637377\ldots \Rightarrow$$

$$\Rightarrow -3927+2\left(\sqrt[13]{N\exp\left[\int d\hat{\sigma}\left(-\frac{1}{4u^2}\mathbf{P}_i D\mathbf{P}_i\right)\right]|Bp\rangle_{\mathrm{NS}} + \int[d\mathbf{X}^\mu]\exp\left\{\int d\hat{\sigma}\left(-\frac{1}{4v^2}D\mathbf{X}^\mu D^2\mathbf{X}^\mu\right)\right\}|\mathbf{X}^\mu,\mathbf{X}^i=0\rangle_{\mathrm{NS}}}\right) =$$

$$-3927+2\sqrt[13]{2.2983717437\times 10^{59}+2.0823329825883\times 10^{59}}$$

$= 73490.8437525.... \Rightarrow$

(the boundary state corresponding to the NSNS-sector of N Dp-branes in the limit of u → ∞)

$$\Rightarrow\left(A(r)\times\frac{1}{B(r)}\left(-\frac{1}{\phi(r)}\right)\times\frac{1}{e^{\Lambda(r)}}\right)\Rightarrow$$

$$\Rightarrow\left(-0.000029211892\times\frac{1}{0.0003644621}\left(-\frac{1}{0.0005946833}\right)\times\frac{1}{0.00183393}\right)=$$

$= 73491.788325481187105491595720422205480251957265634133987 00...$

$= 73491.7883254... \Rightarrow$

(the ratio concerning the general asymptotically flat solution of the equations of motion of the p-brane)

$$\left(\begin{array}{c} I_{21} \ll \int_{-\infty}^{+\infty} \exp\left(-\left(\frac{t}{H}\right)^2\right) \left| \sum_{\lambda \leq P^{1-\varepsilon_2}} \frac{a(\lambda)}{\sqrt{\lambda}} B(\lambda) \lambda^{-i(T+t)} \right|^2 dt \ll \\ \ll H\left\{\left(\frac{4}{\varepsilon_2 \log T}\right)^{2r} (\log T)(\log X)^{-2\beta} + (\varepsilon_2^{-2r} (\log T)^{-2r} + \varepsilon_2^{-r} h_1^r (\log T)^{-r}) T^{-\varepsilon_1}\right\} \end{array}\right)/$$

$$/(26 \times 4)^2 - 24 = \left(\frac{7.9313976505275 \times 10^8}{(26 \times 4)^2 - 24}\right) = 73493.30662\ldots$$

(the Karatsuba's equation concerning the zeros of a special type of function connected with Dirichlet series)

Now, we have also that:

(533.5908148*566.46675049)/1.53537+18

Where 1.53537 is the reciprocal even Fibonacci constant and 18 is a Lucas number

Input interpretation:

$$\frac{533.5908148 \times 566.46675049}{1.53537} + 18$$

Result:

196883.547034960562764675615649647967590873861023727179767...

196883.54703496**...** results very near to the term 196884 that is in the Fourier expansion of the normalized J-invariant.

Now, we have that:

$$F(r)^2 = \frac{1}{r^{D-3}}\left\{\frac{1}{(D-2)}\right.$$
$$\left\{\frac{1}{54\alpha}\left[-\frac{18\alpha Q^2 r^{3-D}}{3-D} - \frac{(1+72\alpha\Lambda) r^{D-1}}{D-1}\right]\right.$$
$$\pm \frac{\sqrt{r^{4D}(1-24\alpha\Lambda-6\alpha Q^2 r^{4-2D})}}{54\alpha}\left[\frac{6\alpha Q^2 r^{3-3D}}{2D-5} - \frac{(-1+24\alpha\Lambda) r^{-1-D}}{D-1}\right]$$
$$\left.\mp \frac{(D-2)^2(-1+24\alpha\Lambda) Q^2 r^{3+D}\sqrt{1+\frac{6\alpha Q^2 r^{4-2D}}{-1+24\alpha\Lambda}}\ {}_2F_1\left(\frac{D-3}{2(D-2)}, \frac{1}{2}, \frac{3D-7}{2(D-2)}; \frac{6\alpha Q^2 r^{4-2D}}{1-24\alpha\Lambda}\right)}{3(D-3)(2D-5)(D-1)\sqrt{r^{4D}(1-24\alpha\Lambda-6\alpha Q^2 r^{4-2D})}}\right\}$$
$$\left.+Const\right\},$$

$$F(r)^2 = \frac{1}{r^{D-3}}\left\{\frac{1}{(D-2)}\right.$$
$$\left\{\frac{1}{54\alpha}\left[-\frac{18\alpha Q^2 r^{3-D}}{3-D} - \frac{(1+72\alpha\Lambda)\, r^{D-1}}{D-1}\right]\right.$$

1/8*1/2*(1/108(-(18*2*0.12660698^2*8^-1)/(3-4)-((1+72*2)*8^3)/3)))

Input interpretation:

$$\frac{1}{8}\times\frac{1}{2}\left(\frac{1}{108}\left(-\frac{\frac{18\times2\times0.12660698^2}{8}}{3-4}-\frac{1}{3}\left((1+72\times2)\times8^3\right)\right)\right)$$

Result:

−14.320945911280923278279320987654320987654320987654320987 6...

-14.320945911...

For the other parts, we have the same results as above. Thence, we obtain.

(-14.320945911280923278279320987654+ 530.848 + 0.000508757)

Input interpretation:

−14.320945911280923278279320987654 + 530.848 + 0.000508757

Result:

516.527562845719076721720679012346

516.5275628...

From the following formula of the coefficients of the “5th order” mock theta function psi(q)

a(n) ~ sqrt(phi) * exp(Pi*sqrt(n/15)) / (2*5^(1/4)*sqrt(n))

(OEIS – sequence A053261)

we obtain, for n = 139.19:

sqrt(golden ratio) * exp(Pi*sqrt(139.19/15)) / (2*5^(1/4)*sqrt(139.19))

Input interpretation:

$$\sqrt{\phi} \times \frac{\exp\left(\pi \sqrt{\frac{139.19}{15}}\right)}{2 \sqrt[4]{5} \sqrt{139.19}}$$

ϕ is the golden ratio

Result:

516.5118707970643232676493971592274798548954906174671275829...

516.51187…

Series representations:

$$\frac{\sqrt{\phi} \exp\left(\pi \sqrt{\frac{139.19}{15}}\right)}{2 \sqrt[4]{5} \sqrt{139.19}} = \frac{\exp\left(\pi \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (9.27933 - z_0)^k z_0^{-k}}{k!}\right) \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (\phi - z_0)^k z_0^{-k}}{k!}}{2 \sqrt[4]{5} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (139.19 - z_0)^k z_0^{-k}}{k!}}$$

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

$$\frac{\sqrt{\phi} \exp\left(\pi \sqrt{\frac{139.19}{15}}\right)}{2 \sqrt[4]{5} \sqrt{139.19}} = \left(\exp\left(i \pi \left\lfloor \frac{\arg(\phi - x)}{2 \pi} \right\rfloor\right) \exp\left(\pi \exp\left(i \pi \left\lfloor \frac{\arg(9.27933 - x)}{2 \pi} \right\rfloor\right) \sqrt{x} \sum_{k=0}^{\infty} \frac{(-1)^k (9.27933 - x)^k x^{-k} \left(-\frac{1}{2}\right)_k}{k!}\right) \sum_{k=0}^{\infty} \frac{(-1)^k (\phi - x)^k x^{-k} \left(-\frac{1}{2}\right)_k}{k!}\right) \Bigg/ \left(2 \sqrt[4]{5} \exp\left(i \pi \left\lfloor \frac{\arg(139.19 - x)}{2 \pi} \right\rfloor\right) \sum_{k=0}^{\infty} \frac{(-1)^k (139.19 - x)^k x^{-k} \left(-\frac{1}{2}\right)_k}{k!}\right)$$

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

$$\frac{\sqrt{\phi}\,\exp\left(\pi\sqrt{\frac{139.19}{15}}\right)}{2\sqrt[4]{5}\,\sqrt{139.19}} = \left(\exp\left(\pi\left(\frac{1}{z_0}\right)^{1/2\lfloor\arg(9.27933-z_0)/(2\pi)\rfloor} z_0^{1/2(1+\lfloor\arg(9.27933-z_0)/(2\pi)\rfloor)}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(9.27933-z_0)^k z_0^{-k}}{k!}\right)\left(\frac{1}{z_0}\right)^{-1/2\lfloor\arg(139.19-z_0)/(2\pi)\rfloor+1/2\lfloor\arg(\phi-z_0)/(2\pi)\rfloor} z_0^{-1/2\lfloor\arg(139.19-z_0)/(2\pi)\rfloor+1/2\lfloor\arg(\phi-z_0)/(2\pi)\rfloor}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(\phi-z_0)^k z_0^{-k}}{k!}\right)\Bigg/\left(2\sqrt[4]{5}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(139.19-z_0)^k z_0^{-k}}{k!}\right)$$

(233+89+21)+1/4*(516.5275628*566.46675049)

Where 233, 89 and 21 are Fibonacci numbers

Input interpretation:

$$(233+89+21)+\frac{1}{4}(516.5275628\times 566.46675049)$$

Result:

73491.922509458851443

73491.922509...

Thence, we have also here the following mathematical connection:

$$\left[(233+89+21)+\frac{1}{4}(516.5275628\times 566.46675049)\right] = 73491.9225\ldots \Rightarrow$$

$$\Rightarrow -3927 + 2\left(\sqrt[13]{\frac{N \exp\left[\int d\hat{\sigma}\left(-\frac{1}{4u^2}\mathbf{P}_i D\mathbf{P}_i\right)\right] | Bp\rangle_{\rm NS}}{\int [d\mathrm{X}^\mu] \exp\left\{\int d\hat{\sigma}\left(-\frac{1}{4v^2} D\mathrm{X}^\mu D^2 \mathrm{X}^\mu\right)\right\} | \mathrm{X}^\mu, \mathrm{X}^i = 0\rangle_{\rm NS}} +}\right) =$$

$$-3927 + 2\sqrt[13]{2.2983717437 \times 10^{59} + 2.0823329825883 \times 10^{59}}$$

$= 73490.8437525.... \Rightarrow$

(the boundary state corresponding to the NSNS-sector of N Dp-branes in the limit of $u \to \infty$)

$$\Rightarrow \left(A(r) \times \frac{1}{B(r)}\left(-\frac{1}{\phi(r)}\right) \times \frac{1}{e^{\Lambda(r)}}\right) \Rightarrow$$

$$\Rightarrow \left(-0.000029211892 \times \frac{1}{0.0003644621}\left(-\frac{1}{0.0005946833}\right) \times \frac{1}{0.00183393}\right) =$$

$= 73491.788325481187105491595720422205480251957265634133987 00...$

$= 73491.7883254... \Rightarrow$

(the ratio concerning the general asymptotically flat solution of the equations of motion of the p-brane)

$$\left(\begin{array}{c} I_{21} \leqslant \int_{-\infty}^{+\infty} \exp\left(-\left(\frac{t}{H}\right)^2\right) \left| \sum_{\lambda \leqslant P^{1-\varepsilon_2}} \frac{a(\lambda)}{\sqrt{\lambda}} B(\lambda) \lambda^{-i(T+t)} \right|^2 dt \leqslant \\ \leqslant H\left\{\left(\frac{4}{\varepsilon_2 \log T}\right)^{2r} (\log T)(\log X)^{-2\beta} + (\varepsilon_2^{-2r} (\log T)^{-2r} + \varepsilon_2^{-r} h_1^r (\log T)^{-r}) T^{-\varepsilon_1}\right\} \end{array}\right) /$$

$$/(26 \times 4)^2 - 24 = \left(\frac{7.9313976505275 \times 10^8}{(26 \times 4)^2 - 24}\right) = 73493.30662\ldots$$

(the Karatsuba's equation concerning the zeros of a special type of function connected with Dirichlet series)

From the result of:

$$G(r)^2 = \frac{1}{\left(\frac{2}{3} \pm \frac{1}{3}\sqrt{1-24\alpha\Lambda-6\alpha Q^2 r^{4-2D}}\right)^2 r^{D-3}} \left\{ \frac{1}{(D-2)} \right.$$

$$\left\{ \frac{1}{54\alpha}\left[-\frac{18\alpha Q^2 r^{3-D}}{3-D} - \frac{(1+72\alpha\Lambda)\, r^{D-1}}{D-1}\right] \right.$$

$$\pm \frac{\sqrt{r^{4D}\left(1-24\alpha\Lambda-6\alpha Q^2 r^{4-2D}\right)}}{54\alpha}\left[\frac{6\alpha Q^2 r^{3-3D}}{2D-5} - \frac{(-1+24\alpha\Lambda)\, r^{-1-D}}{D-1}\right]$$

$$\left.\mp \frac{(D-2)^2(-1+24\alpha\Lambda)\, Q^2 r^{3+D}\sqrt{1+\frac{6\alpha Q^2 r^{4-2D}}{-1+24\alpha\Lambda}}\; {}_2F_1\left(\frac{D-3}{2(D-2)}, \frac{1}{2}; \frac{3D-7}{2(D-2)}; \frac{6\alpha Q^2 r^{4-2D}}{1-24\alpha\Lambda}\right)}{3(D-3)(2D-5)(D-1)\sqrt{r^{4D}\left(1-24\alpha\Lambda-6\alpha Q^2 r^{4-2D}\right)}} \right\}$$

$$\left. + Const \right\}$$

that is equal to 533.590814808496 we obtain:

(((1/(2.742306051496 + 530.848 + 0.000508757)))^1/512

Input interpretation:

$$\sqrt[512]{\frac{1}{2.742306051496 + 530.848 + 0.000508757}}$$

Result:

0.987810006...

0.987810006...

result very near to the dilaton value **0.989117352243 = ϕ**

And:

1/8(((log base 0.987810006 (((1/(2.742306051496 + 530.848 + 0.000508757))))))

Input interpretation:

$$\frac{1}{8}\log_{0.987810006}\left(\frac{1}{2.742306051496 + 530.848 + 0.000508757}\right)$$

$\log_b(x)$ is the base- b logarithm

Result:

64.00000...

64

Alternative representation:

$$\frac{1}{8}\log_{0.98781}\left(\frac{1}{2.7423060514960000+530.848+0.000508757}\right)=\frac{\log\left(\frac{1}{533.591}\right)}{8\log(0.98781)}$$

$\log(x)$ is the natural logarithm

Series representations:

$$\frac{1}{8}\log_{0.98781}\left(\frac{1}{2.7423060514960000+530.848+0.000508757}\right)=-\frac{\sum_{k=1}^{\infty}\frac{(-1)^k(-0.998126)^k}{k}}{8\log(0.98781)}$$

$$\frac{1}{8}\log_{0.98781}\left(\frac{1}{2.7423060514960000+530.848+0.000508757}\right)=-10.1918\log(0.0018741)-0.125\log(0.0018741)\sum_{k=0}^{\infty}(-0.01219)^k\,G(k)$$

$$\text{for }\left(G(0)=0\text{ and }G(k)=\frac{(-1)^{1+k}\,k}{2(1+k)(2+k)}+\sum_{j=1}^{k}\frac{(-1)^{1+j}\,G(-j+k)}{1+j}\right)$$

From the result of:

$$F(r)^2=\frac{1}{r^{D-3}}\left\{\frac{1}{(D-2)}\left\{\frac{1}{54\alpha}\left[-\frac{18\alpha Q^2r^{3-D}}{3-D}-\frac{(1+72\alpha\Lambda)\,r^{D-1}}{D-1}\right]\pm\frac{\sqrt{r^{4D}\left(1-24\alpha\Lambda-6\alpha Q^2r^{4-2D}\right)}}{54\alpha}\left[\frac{6\alpha Q^2r^{3-3D}}{2D-5}-\frac{(-1+24\alpha\Lambda)\,r^{-1-D}}{D-1}\right]\mp\frac{(D-2)^2(-1+24\alpha\Lambda)\,Q^2r^{3+D}\sqrt{1+\frac{6\alpha Q^2r^{4-2D}}{-1+24\alpha\Lambda}}\;{}_2F_1\left(\frac{D-3}{2(D-2)},\frac{1}{2},\frac{3D-7}{2(D-2)};\frac{6\alpha Q^2r^{4-2D}}{1-24\alpha\Lambda}\right)}{3(D-3)(2D-5)(D-1)\sqrt{r^{4D}\left(1-24\alpha\Lambda-6\alpha Q^2r^{4-2D}\right)}}\right\}+Const\right\},$$

That is equal to 516.5275628, we obtain:

1/(-14.32094591128+ 530.848 + 0.000508757)^1/512

Input interpretation:

$$\frac{1}{\sqrt[512]{-14.32094591128+530.848+0.000508757}}$$

Result:

0.987872712...

0.987872712....

result very near to the dilaton value $\mathbf{0.989117352243 = \phi}$

And:

1/(-14.32094591128+ 530.848 + 0.000508757)^(1/(4096*2))

Input interpretation:

$$\frac{1}{\sqrt[4096\times 2]{-14.32094591128 + 530.848 + 0.000508757}}$$

Result:

0.9992377018...

0.9992377018..... result very near to the following Rogers-Ramanujan continued fraction:

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

Further, we also obtain:

1/128 log base 0.9992377018 ((((1/(-14.32094591128+ 530.848 + 0.000508757))))

Input interpretation:

$$\frac{1}{128}\log_{0.9992377018}\left(\frac{1}{-14.32094591128 + 530.848 + 0.000508757}\right)$$

$\log_b(x)$ is the base$-b$ logarithm

Result:

64.00000...

64

Alternative representation:

$$\frac{1}{128}\log_{0.999238}\left(\frac{1}{-14.320945911280000+530.848+0.000508757}\right)=\frac{\log\left(\frac{1}{516.528}\right)}{128\log(0.999238)}$$

log(x) is the natural logarithm

Series representations:

$$\frac{1}{128}\log_{0.999238}\left(\frac{1}{-14.320945911280000+530.848+0.000508757}\right)=-\frac{\sum_{k=1}^{\infty}\frac{(-1)^k(-0.998064)^k}{k}}{128\log(0.999238)}$$

$$\frac{1}{128}\log_{0.999238}\left(\frac{1}{-14.320945911280000+530.848+0.000508757}\right)=-10.2447\log(0.00193601)-0.0078125\log(0.00193601)\sum_{k=0}^{\infty}(-0.000762298)^k G(k)$$

$$\text{for}\left(G(0)=0\text{ and }G(k)=\frac{(-1)^{1+k}k}{2(1+k)(2+k)}+\sum_{j=1}^{k}\frac{(-1)^{1+j}G(-j+k)}{1+j}\right)$$

From the result of:

$$G(r)^2 = \frac{1}{\left(\frac{2}{3} \pm \frac{1}{3}\sqrt{1 - 24\alpha\Lambda - 6\alpha Q^2 r^{4-2D}}\right)^2 r^{D-3}} \left\{ \frac{1}{(D-2)} \right.$$

$$\left\{ \frac{1}{54\alpha} \left[-\frac{18\alpha Q^2 r^{3-D}}{3-D} - \frac{(1+72\alpha\Lambda)\, r^{D-1}}{D-1} \right] \right.$$

$$\pm \frac{\sqrt{r^{4D}\left(1 - 24\alpha\Lambda - 6\alpha Q^2 r^{4-2D}\right)}}{54\alpha} \left[\frac{6\alpha Q^2 r^{3-3D}}{2D-5} - \frac{(-1+24\alpha\Lambda)\, r^{-1-D}}{D-1} \right]$$

$$\left. \mp \frac{(D-2)^2 (-1+24\alpha\Lambda)\, Q^2 r^{3+D} \sqrt{1 + \frac{6\alpha Q^2 r^{4-2D}}{-1+24\alpha\Lambda}}\; {}_2F_1\left(\frac{D-3}{2(D-2)}, \frac{1}{2}; \frac{3D-7}{2(D-2)}; \frac{6\alpha Q^2 r^{4-2D}}{1-24\alpha\Lambda}\right)}{3(D-3)(2D-5)(D-1)\sqrt{r^{4D}\left(1 - 24\alpha\Lambda - 6\alpha Q^2 r^{4-2D}\right)}} \right\}$$

$$\left. + Const \right\}$$

that is equal to 533.590814808496 we obtain:

(1.82366811451+1.0864055-1)*(((2.742306051496 + 530.848 + 0.000508757)))

Where 1.82366811451 and 1.0864055 are the values of two Ramanujan mock theta functions

Input interpretation:

(1.82366811451 + 1.0864055 − 1) (2.742306051496 + 530.848 + 0.000508757)

Result:

1019.19773631059998817687696

1019.19773... result very near to the rest mass of Phi meson 1019.445

And:

(1.333425959 + 1.897512108)(((2.742306051496 + 530.848 + 0.000508757)))

Where 1.333425959 and 1.897512108 are the values of two Ramanujan mock theta functions

Input interpretation:

(1.333425959 + 1.897512108) (2.742306051496 + 530.848 + 0.000508757)

Result:

1723.998875766317041417232

1723.9988757.... result in the range of the mass of candidate "glueball" $f_0(1710)$ ("glueball" =1760 ± 15 MeV).

Further, we also obtain:

5+(1.333425959 + 1.897512108)(((2.742306051496 + 530.848 + 0.000508757)))

Input interpretation:

$5 + (1.333425959 + 1.897512108)(2.742306051496 + 530.848 + 0.000508757)$

Result:

1728.998875766317041417232

1728.9988757... ≈ 1729

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

From which:

(((5+(1.333425959 + 1.897512108)(((2.742306051496 + 530.848 + 0.000508757))))))^1/15

Input interpretation:

$\sqrt[15]{5 + (1.333425959 + 1.897512108)(2.742306051496 + 530.848 + 0.000508757)}$

Result:

1.643815...

1.643815.... ≈ $\zeta(2) = \frac{\pi^2}{6} = 1.644934 \ldots$

In conclusion, we obtain:

1/10^27* ((((29/10^3+(((5+(1.333425959 + 1.897512108)(((2.742306051496 + 530.848 + 0.000508757))))))^1/15))))

Input interpretation:

$$\frac{1}{10^{27}}\left(\frac{29}{10^3} + (5 + (1.333425959 + 1.897512108)(2.742306051496 + 530.848 + 0.000508757)) \wedge (1/15)\right)$$

Result:

$1.672815... \times 10^{-27}$

1.672815... * 10^{-27} result very closed to the proton mass

We have also:

golden ratio + 1/4(((2.742306051496 + 530.848 + 0.000508757)))

Input interpretation:

$$\phi + \frac{1}{4}(2.742306051496 + 530.848 + 0.000508757)$$

ϕ is the golden ratio

Result:

135.0157376908738948482045868343656381177203091798057628621...

135.0157376…. result very near to the rest mass of Pion meson 134.976

Alternative representations:

$$\phi + \frac{1}{4}(2.7423060514960000 + 530.848 + 0.000508757) = \frac{533.591}{4} + 2\sin(54°)$$

$$\phi + \frac{1}{4}(2.7423060514960000 + 530.848 + 0.000508757) = -2\cos(216°) + \frac{533.591}{4}$$

$$\phi + \frac{1}{4}(2.7423060514960000 + 530.848 + 0.000508757) = \frac{533.591}{4} - 2\sin(666°)$$

From which:

1/((((golden ratio + 1/4(((2.742306051496 + 530.848 + 0.000508757)))))))^(1/(64*7))

Input interpretation:

$$\frac{1}{\sqrt[64\times7]{\phi + \frac{1}{4}(2.742306051496 + 530.848 + 0.000508757)}}$$

ϕ is the golden ratio

Result:

0.989110194...

0.989110194….

result practically equal to the dilaton value $\mathbf{0.989117352243} = \boldsymbol{\phi}$

Alternative representations:

$$\frac{1}{64 \times \sqrt[7]{\phi + \frac{1}{4}(2.7423060514960000 + 530.848 + 0.000508757)}} = \frac{1}{\sqrt[448]{\frac{533.591}{4} + 2\sin(54°)}}$$

$$\frac{1}{64 \times \sqrt[7]{\phi + \frac{1}{4}(2.7423060514960000 + 530.848 + 0.000508757)}} = \frac{1}{\sqrt[448]{-2\cos(216°) + \frac{533.591}{4}}}$$

$$\frac{1}{64 \times \sqrt[7]{\phi + \frac{1}{4}(2.7423060514960000 + 530.848 + 0.000508757)}} = \frac{1}{\sqrt[448]{\frac{533.591}{4} - 2\sin(666°)}}$$

1/7 log base 0.989110194 ((((1/((((golden ratio + 1/4(((2.742306051496 + 530.848 + 0.000508757))))))))))

Input interpretation:

$$\frac{1}{7}\log_{0.989110194}\left(\frac{1}{\phi + \frac{1}{4}(2.742306051496 + 530.848 + 0.000508757)}\right)$$

$\log_b(x)$ is the base- b logarithm

ϕ is the golden ratio

Result:

64.00000...

64

Alternative representation:

$$\frac{1}{7}\log_{0.98911}\left(\frac{1}{\phi+\frac{1}{4}(2.7423060514960000+530.848+0.000508757)}\right)=\frac{\log\left(\frac{1}{\phi+\frac{533.591}{4}}\right)}{7\log(0.98911)}$$

log(x) is the natural logarithm

Series representations:

$$\frac{1}{7}\log_{0.98911}\left(\frac{1}{\phi+\frac{1}{4}(2.7423060514960000+530.848+0.000508757)}\right)=-\frac{\sum_{k=1}^{\infty}\frac{(-1)^k\left(-1+\frac{1}{133.398+\phi}\right)^k}{k}}{7\log(0.98911)}$$

$$\frac{1}{7}\log_{0.98911}\left(\frac{1}{\phi+\frac{1}{4}(2.7423060514960000+530.848+0.000508757)}\right)=$$
$$-13.047\log\left(\frac{1}{133.398+\phi}\right)-0.142857\log\left(\frac{1}{133.398+\phi}\right)\sum_{k=0}^{\infty}(-0.0108898)^k\,G(k)$$
$$\text{for }\left(G(0)=0\text{ and }G(k)=\frac{(-1)^{1+k}\,k}{2(1+k)(2+k)}+\sum_{j=1}^{k}\frac{(-1)^{1+j}\,G(-j+k)}{1+j}\right)$$

From:

http://mathworld.wolfram.com/MadelungConstants.html

$$-\sum_{i,j,k=-\infty}^{\infty}{}'\,\frac{(-1)^{i+j+k+1}}{\sqrt{i^2+j^2+k^2}}$$

$$-12\pi \sum_{m,n=1,3,\ldots}^{\infty} \text{sech}^2\left(\frac{1}{2}\pi\sqrt{m^2+n^2}\right)$$

$-1.74756\ldots$

-1.747564 = Madelung constant

From the result of:

$$F(r)^2 = \frac{1}{r^{D-3}}\left\{\frac{1}{(D-2)}\right.$$
$$\left\{\frac{1}{54\alpha}\left[-\frac{18\alpha Q^2 r^{3-D}}{3-D} - \frac{(1+72\alpha\Lambda)\,r^{D-1}}{D-1}\right]\right.$$
$$\pm\frac{\sqrt{r^{4D}\left(1-24\alpha\Lambda-6\alpha Q^2 r^{4-2D}\right)}}{54\alpha}\left[\frac{6\alpha Q^2 r^{3-3D}}{2D-5} - \frac{(-1+24\alpha\Lambda)\,r^{-1-D}}{D-1}\right]$$
$$\left.\mp\frac{(D-2)^2(-1+24\alpha\Lambda)\,Q^2 r^{3+D}\sqrt{1+\frac{6\alpha Q^2 r^{4-2D}}{-1+24\alpha\Lambda}}\;{}_2F_1\left(\frac{D-3}{2(D-2)},\frac{1}{2},\frac{3D-7}{2(D-2)};\frac{6\alpha Q^2 r^{4-2D}}{1-24\alpha\Lambda}\right)}{3(D-3)(2D-5)(D-1)\sqrt{r^{4D}\left(1-24\alpha\Lambda-6\alpha Q^2 r^{4-2D}\right)}}\right\}$$
$$\left.+Const\right\},$$

That is equal to 516.5275628, we obtain:

516.5275628 + 1.747564 = 518.2751268

Inserting this value in the following mock theta function formula, we obtain:

sqrt(golden ratio) * exp(Pi*sqrt(518.2751268/15)) / (2*5^(1/4)*sqrt(518.2751268))

Input interpretation:

$$\sqrt{\phi}\times\frac{\exp\left(\pi\sqrt{\frac{518.2751268}{15}}\right)}{2\sqrt[4]{5}\sqrt{518.2751268}}$$

ϕ is the golden ratio

Result:

$1.95585729\ldots\times 10^6$

1955857.29…

Series representations:

$$\frac{\sqrt{\phi}\,\exp\left(\pi\sqrt{\frac{518.275}{15}}\right)}{2\sqrt[4]{5}\,\sqrt{518.275}} = \frac{\exp\left(\pi\sqrt{z_0}\,\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(34.5517-z_0)^k z_0^{-k}}{k!}\right)\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(\phi-z_0)^k z_0^{-k}}{k!}}{2\sqrt[4]{5}\,\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(518.275-z_0)^k z_0^{-k}}{k!}}$$

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

$$\frac{\sqrt{\phi}\,\exp\left(\pi\sqrt{\frac{518.275}{15}}\right)}{2\sqrt[4]{5}\,\sqrt{518.275}} = \left(\exp\left(i\pi\left\lfloor\frac{\arg(\phi-x)}{2\pi}\right\rfloor\right)\exp\left(\pi\exp\left(i\pi\left\lfloor\frac{\arg(34.5517-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(34.5517-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)\sum_{k=0}^{\infty}\frac{(-1)^k(\phi-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right) \Big/ \left(2\sqrt[4]{5}\,\exp\left(i\pi\left\lfloor\frac{\arg(518.275-x)}{2\pi}\right\rfloor\right)\sum_{k=0}^{\infty}\frac{(-1)^k(518.275-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)$$

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

$$\frac{\sqrt{\phi}\,\exp\left(\pi\sqrt{\frac{518.275}{15}}\right)}{2\sqrt[4]{5}\,\sqrt{518.275}} = \left(\exp\left(\pi\left(\frac{1}{z_0}\right)^{1/2\lfloor\arg(34.5517-z_0)/(2\pi)\rfloor} z_0^{1/2(1+\lfloor\arg(34.5517-z_0)/(2\pi)\rfloor)}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(34.5517-z_0)^k z_0^{-k}}{k!}\right)\left(\frac{1}{z_0}\right)^{-1/2\lfloor\arg(518.275-z_0)/(2\pi)\rfloor+1/2\lfloor\arg(\phi-z_0)/(2\pi)\rfloor} z_0^{-1/2\lfloor\arg(518.275-z_0)/(2\pi)\rfloor+1/2\lfloor\arg(\phi-z_0)/(2\pi)\rfloor}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(\phi-z_0)^k z_0^{-k}}{k!}\right) \Big/ \left(2\sqrt[4]{5}\,\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(518.275-z_0)^k z_0^{-k}}{k!}\right)$$

1.95585729 × 10^6 / 9.934057617

Where 9.9340... is a value of a black hole entropy

Input interpretation:

$$\frac{1.95585729 \times 10^6}{9.934057617}$$

Result:

196884.0292060488458912468576635596938475054950952173443589...

196884.029206...

Or:

1/9.9340*sqrt(golden ratio) * exp(Pi*sqrt(518.2744828/15)) / (2*5^(1/4)*sqrt(518.2744828))

Input interpretation:

$$\frac{1}{9.9340} \sqrt{\phi} \times \frac{\exp\left(\pi \sqrt{\frac{518.2744828}{15}}\right)}{2 \sqrt[4]{5} \sqrt{518.2744828}}$$

ϕ is the golden ratio

Result:

196883.0346030501807414151666943204508842544063764947841232...

196883.0346….

Series representations:

$$\frac{\sqrt{\phi} \exp\left(\pi \sqrt{\frac{518.274}{15}}\right)}{\left(2 \sqrt[4]{5} \sqrt{518.274}\right) 9.934} = \frac{0.0336592 \exp\left(\pi \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (34.5516 - z_0)^k z_0^{-k}}{k!}\right) \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (\phi - z_0)^k z_0^{-k}}{k!}}{\sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (518.274 - z_0)^k z_0^{-k}}{k!}}$$

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

$$\frac{\sqrt{\phi}\exp\left(\pi\sqrt{\frac{518.274}{15}}\right)}{\left(2\sqrt[4]{5}\sqrt{518.274}\right)9.934} =$$

$$\left(0.0336592\exp\left(i\pi\left\lfloor\frac{\arg(\phi-x)}{2\pi}\right\rfloor\right)\exp\left(\pi\exp\left(i\pi\left\lfloor\frac{\arg(34.5516-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(34.5516-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)\sum_{k=0}^{\infty}\frac{(-1)^k(\phi-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right) / \left(\exp\left(i\pi\left\lfloor\frac{\arg(518.274-x)}{2\pi}\right\rfloor\right)\sum_{k=0}^{\infty}\frac{(-1)^k(518.274-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)$$

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

$$\frac{\sqrt{\phi}\exp\left(\pi\sqrt{\frac{518.274}{15}}\right)}{\left(2\sqrt[4]{5}\sqrt{518.274}\right)9.934} =$$

$$\left(0.0336592\exp\left(\pi\left(\frac{1}{z_0}\right)^{1/2\lfloor\arg(34.5516-z_0)/(2\pi)\rfloor} z_0^{1/2(1+\lfloor\arg(34.5516-z_0)/(2\pi)\rfloor)}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(34.5516-z_0)^k z_0^{-k}}{k!}\right)\left(\frac{1}{z_0}\right)^{-1/2\lfloor\arg(518.274-z_0)/(2\pi)\rfloor+1/2\lfloor\arg(\phi-z_0)/(2\pi)\rfloor} z_0^{-1/2\lfloor\arg(518.274-z_0)/(2\pi)\rfloor+1/2\lfloor\arg(\phi-z_0)/(2\pi)\rfloor}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(\phi-z_0)^k z_0^{-k}}{k!}\right) / \left(\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(518.274-z_0)^k z_0^{-k}}{k!}\right)$$

A similar result can be obtained also by the Ramanujan mock theta functions. Indeed, we have the difference between the two following values of Ramanujan mock theta functions:

2.6709253774829 - 0.9243408674589 = 1.746584510024

Adding this result 1.746584510024 to the above solution 516.5275628, we obtain 518.274147. Then, inserting it in the previous mock formula, we obtain:

1/9.9340*sqrt(golden ratio) * exp(Pi*sqrt(518.27414731/15)) / (2*5^(1/4)*sqrt(518.27414731))

Input interpretation:

$$\frac{1}{9.9340}\sqrt{\phi}\times\frac{\exp\left(\pi\sqrt{\frac{518.27414731}{15}}\right)}{2\sqrt[4]{5}\sqrt{518.27414731}}$$

ϕ is the golden ratio

Result:

196881.9215847116965728872215010107282627274477546136840595...

196881.92158….

196881.92158, 196884.029206... and 196883.0346….

results very near to the term 196884 that is in the Fourier expansion of the normalized J-invariant.

Furthermore, from:

Three-dimensional AdS gravity and extremal CFTs at c = 8m
Spyros D. Avramis,ab Alex Kehagias b and Constantina Mattheopoulou
https://iopscience.iop.org/article/10.1088/1126-6708/2007/11/022/pdf

we have that:

For $c = 24$ and $c = 48$, the (holomorphic) partition functions read

$$Z_{24}(\tau) = j(\tau) - 744$$
$$= q^{-1} + 196884\, q + 21493760\, q^2 + 864299970\, q^3 + 20245856256\, q^4 + \ldots$$

and

$$Z_{48}(\tau) = j^2(\tau) - 1488\, j(\tau) + 159769$$
$$= q^{-2} + 1 + 42987520\, q + 40491909396\, q^2 + 8504046600192\, q^3 + \ldots, \quad (1.6)$$

where $j(\tau)$ is the modular j-function and $q = e^{2\pi i\tau}$. The partition function in (1.5) defines a very special theory among the 71 holomorphic CFTs believed to exist at $c = 24$ [14]. It was first constructed by Frenkel, Lepowsky and Meurman [15] (see also [16]) by considering 24 chiral bosons on the Leech lattice and using a $\mathbb{Z}_2$ orbifold to project out the 24 dimension-1 primaries. The 196884 dimension-2 operators correspond to one Virasoro descendant plus 196883 primaries whose number is the dimension of the lowest non-trivial representation of the largest sporadic group, the monster group. In fact, each coefficient in (1.5) equals the number of descendants at this level plus the dimension of an irreducible representation of the monster; this observation forms part of monstrous moonshine, an unexpected connection between modular functions and finite simple groups. For the partition function (1.6) and, in general, all $Z_{24k}(\tau)$ with $k \geqslant 2$, the corresponding CFTs have not been identified, but the number of available lattices in these dimensions makes their existence plausible.

Series representations:

$$\frac{\sqrt{\phi}\, \exp\left(\pi \sqrt{\frac{518.274147310000}{15}}\right)}{\left(2 \sqrt[4]{5}\, \sqrt{518.274147310000}\right) 9.934} =$$

$$\left(0.0336592 \exp\left(\pi \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (34.5516098206667 - z_0)^k z_0^{-k}}{k!}\right) \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (\phi - z_0)^k z_0^{-k}}{k!}\right) \Bigg/ \left(\sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (518.274147310000 - z_0)^k z_0^{-k}}{k!}\right)$$

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

$$\frac{\sqrt{\phi}\,\exp\left(\pi\sqrt{\frac{518.274147310000}{15}}\right)}{\left(2\sqrt[4]{5}\,\sqrt{518.274147310000}\right)9.934} = \left(0.0336592\,\exp\left(i\pi\left\lfloor\frac{\arg(\phi-x)}{2\pi}\right\rfloor\right)\exp\left(\pi\exp\left(i\pi\left\lfloor\frac{\arg(34.5516098206667-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(34.5516098206667-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)\sum_{k=0}^{\infty}\frac{(-1)^k(\phi-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right) \Big/ \left(\exp\left(i\pi\left\lfloor\frac{\arg(518.274147310000-x)}{2\pi}\right\rfloor\right)\sum_{k=0}^{\infty}\frac{(-1)^k(518.274147310000-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right) \text{ for } (x\in\mathbb{R} \text{ and } x<0)$$

$$\frac{\sqrt{\phi}\,\exp\left(\pi\sqrt{\frac{518.274147310000}{15}}\right)}{\left(2\sqrt[4]{5}\,\sqrt{518.274147310000}\right)9.934} = \left(0.0336592\,\exp\left(\pi\left(\frac{1}{z_0}\right)^{1/2\lfloor\arg(34.5516098206667-z_0)/(2\pi)\rfloor} z_0^{1/2(1+\lfloor\arg(34.5516098206667-z_0)/(2\pi)\rfloor)}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(34.5516098206667-z_0)^k z_0^{-k}}{k!}\right)\left(\frac{1}{z_0}\right)^{-1/2\lfloor\arg(518.274147310000-z_0)/(2\pi)\rfloor+1/2\lfloor\arg(\phi-z_0)/(2\pi)\rfloor} z_0^{-1/2\lfloor\arg(518.274147310000-z_0)/(2\pi)\rfloor+1/2\lfloor\arg(\phi-z_0)/(2\pi)\rfloor}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(\phi-z_0)^k z_0^{-k}}{k!}\right) \Big/ \left(\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(518.274147310000-z_0)^k z_0^{-k}}{k!}\right)$$

Now, we have that:

$$e^{b/2} - 1 \neq 0$$

count $f_T(0) < 0$ leads the form function to obey $\beta_0' < 0$. Furthermore, one can extract more constraints evaluating (727) at the throat, namely

$$4\pi\left(\rho_m + p_{mt}\right)|_{r_0} = \frac{1}{2r_0^2} f_T(0) - \frac{(1-\beta_0')}{4r_0^2}\left(1 - \frac{r_0 a_0'}{2}\right) f_T(0)\,, \quad (730)$$

and thus for a zero redshift function at the throat, namely $a_0' = 0$, and considering $4\pi\left(\rho_m + p_{mt}\right)|_{r_0} \geq 0$, we acquire the constraint $\beta_0' \leq -1$. For the general case $a_0' \neq 0$, we obtain the restriction $r_0 a_0' \leq [1 - 2/(1-\beta_0')]$.

For

$$r_0 a_0' \leq [1 - 2/(1-\beta_0')].$$

We obtain:

(1-(2/(1-(-2))); (1-(2/(1+2)))

Input:

$$1 - \frac{2}{1+2}$$

Exact result:

$$\frac{1}{3}$$

Decimal approximation:

0.3333333333333333333333333333333333333333333333333333333333333...

0.333333333333.....

For $\alpha_0' = 3$; $r_0 = 1/9$

$F_T(0) < 0$; $F_T(0) = -0.8$; $\beta_0' = -2$

$$4\pi\left(\rho_m + p_{mt}\right)|_{r_0} = \frac{1}{2r_0^2} f_T(0) - \frac{(1-\beta_0')}{4r_0^2}\left(1 - \frac{r_0 a_0'}{2}\right) f_T(0)$$

-0.8/(2*(1/9)^2) – (1+2)/(4*(1/9)^2) * (1-(1/3*1/2))*(-0.8)

Input:

$$-\frac{0.8}{2\left(\frac{1}{9}\right)^2}-\frac{1+2}{4\left(\frac{1}{9}\right)^2}\left(1-\frac{1}{3}\times\frac{1}{2}\right)\times(-0.8)$$

Result:

8.1

8.1

$$\left[4\pi\left(\rho_m+p_{mt}\right)|_{r_0}\right]=8.1$$

α_2 = 1.12420238394

From:

Stable spiral for $\alpha_2 < 3$ and

$$-32\sqrt{3}\sqrt{\frac{(3-\alpha_2)^3}{\left(71\alpha_2^2-336\alpha_2+288\right)^2}} < \alpha_1 < 0 \text{ or}$$

$\alpha_1 < 0, \alpha_2 \leq \frac{1}{71}\left(168-36\sqrt{6}\right) \approx 1.124.$

Saddle otherwise (hyperbolic cases).

-32*sqrt(3)*sqrt((((((((3-1.12420238394)^3)))/(((71*1.12420238394^2-366*1.12420238394+288)^2)))))

Input interpretation:

$$-32\sqrt{3}\sqrt{\frac{(3-1.12420238394)^3}{(71\times 1.12420238394^2+366\times(-1.12420238394)+288)^2}}$$

Result:

-4.2220543383...

-4.2220543383...

1/10^35*(((-(-32*sqrt(3)*sqrt((((((((3-1.12420238394)^3)))/(((71*1.12420238394^2-366*1.12420238394+288)^2)))))))))^1/3

Input interpretation:

$$\frac{1}{10^{35}} \sqrt[3]{-\left(-32\sqrt{3}\sqrt{\frac{(3-1.12420238394)^3}{(71\times 1.12420238394^2+366\times(-1.12420238394)+288)^2}}\right)}$$

Result:

$1.6162477730... \times 10^{-35}$

$1.616247773... * 10^{-35}$ result practically equal to the Planck length

Now, we have that:

curve), and $\Lambda = 0.05$, $\alpha = 0.40$, $\beta = 0.55$, and $\lambda = 1.8$ (long dashed curve), respectively. The initial value for H used to numerically integrate Eq. (814) is $H(0) = 0.1$. From [607].

is we take $p_m = 0$. In this case the gravitational field equations (809) and (810) become

$$\rho_m(t) = \frac{3\alpha H^4 - 6H^2 + \Lambda}{6\beta\lambda H^4 - 2}, \qquad (813)$$

and

$$\dot{H}(t) = \frac{\left(3\alpha H^4 - 6H^2 + \Lambda\right)\left(3\beta\lambda H^4 - 1\right)}{4H^2\left(\alpha + \beta\lambda\Lambda - 3\beta\lambda H^2\right) - 4}, \qquad (814)$$

respectively.

From:

$$\rho_m(t) = \frac{3\alpha H^4 - 6H^2 + \Lambda}{6\beta\lambda H^4 - 2},$$

((((3*0.40*0.1^4)-6(0.1)^2+0.05))) / ((((6*0.55*1.8*0.1^4)-2)))

Input:

$$\frac{3\times 0.4\times 0.1^4 - 6\times 0.1^2 + 0.05}{6\times 0.55\times 1.8\times 0.1^4 - 2}$$

Result:

0.004941467615881916929328010419094471057904197546671361394...

Repeating decimal:

0.004941467615881916929328010419094471057904197546671361394...

(period 9870)

0.00494146761588191….

From the following formula of the coefficients of the "5th order" mock theta function psi(q)

a(n) ~ sqrt(phi) * exp(Pi*sqrt(n/15)) / (2*5^(1/4)*sqrt(n))

(OEIS – sequence A053261)

we obtain, for n = 127.956:

sqrt(golden ratio) * exp(Pi*sqrt(127.956/15)) / (2*5^(1/4)*sqrt(127.956))

Input interpretation:

$$\sqrt{\phi} \times \frac{\exp\left(\pi \sqrt{\frac{127.956}{15}}\right)}{2 \sqrt[4]{5} \sqrt{127.956}}$$

ϕ is the golden ratio

Result:

363.1652985107259188463830215530212541336208337729651752004...

363.1652985….

Series representations:

$$\frac{\sqrt{\phi} \exp\left(\pi \sqrt{\frac{127.956}{15}}\right)}{2 \sqrt[4]{5} \sqrt{127.956}} = \frac{\exp\left(\pi \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (8.5304-z_0)^k z_0^{-k}}{k!}\right) \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (\phi-z_0)^k z_0^{-k}}{k!}}{2 \sqrt[4]{5} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (127.956-z_0)^k z_0^{-k}}{k!}}$$

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

$$\frac{\sqrt{\phi}\exp\left(\pi\sqrt{\frac{127.956}{15}}\right)}{2\sqrt[4]{5}\sqrt{127.956}} = \left(\exp\left(i\pi\left\lfloor\frac{\arg(\phi-x)}{2\pi}\right\rfloor\right)\exp\left(\pi\exp\left(i\pi\left\lfloor\frac{\arg(8.5304-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(8.5304-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)\sum_{k=0}^{\infty}\frac{(-1)^k(\phi-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right) / \left(2\sqrt[4]{5}\exp\left(i\pi\left\lfloor\frac{\arg(127.956-x)}{2\pi}\right\rfloor\right)\sum_{k=0}^{\infty}\frac{(-1)^k(127.956-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)$$

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

$$\frac{\sqrt{\phi}\exp\left(\pi\sqrt{\frac{127.956}{15}}\right)}{2\sqrt[4]{5}\sqrt{127.956}} = \left(\exp\left(\pi\left(\frac{1}{z_0}\right)^{1/2\lfloor\arg(8.5304-z_0)/(2\pi)\rfloor} z_0^{1/2(1+\lfloor\arg(8.5304-z_0)/(2\pi)\rfloor)}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(8.5304-z_0)^k z_0^{-k}}{k!}\right)\left(\frac{1}{z_0}\right)^{-1/2\lfloor\arg(127.956-z_0)/(2\pi)\rfloor+1/2\lfloor\arg(\phi-z_0)/(2\pi)\rfloor} z_0^{-1/2\lfloor\arg(127.956-z_0)/(2\pi)\rfloor+1/2\lfloor\arg(\phi-z_0)/(2\pi)\rfloor}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(\phi-z_0)^k z_0^{-k}}{k!}\right) / \left(2\sqrt[4]{5}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(127.956-z_0)^k z_0^{-k}}{k!}\right)$$

Inserting this value in the previous expression, we obtain:

363.165*1/((((((((3*0.40*0.1^4)-6(0.1)^2+0.05)))*1 / ((((6*0.55*1.8*0.1^4)-2)))))))

Input interpretation:

$$363.165\times\frac{1}{(3\times 0.4\times 0.1^4-6\times 0.1^2+0.05)\times\frac{1}{6\times 0.55\times 1.8\times 0.1^4-2}}$$

Result:

73493.348177125506072874493927125506072874493927125506072 87...

$73493.348177\overline{125506072874493927}$ (period 18)

73493.3481771255....

We have the following mathematical connection:

$$\left(363.165 \times \frac{1}{(3 \times 0.4 \times 0.1^4 - 6 \times 0.1^2 + 0.05) \times \frac{1}{6 \times 0.55 \times 1.8 \times 0.1^4 - 2}}\right) = 73493.34817 \Rightarrow$$

$$\Rightarrow -3927 + 2\left(\sqrt[13]{\frac{N \exp\left[\int d\hat{\sigma}\left(-\frac{1}{4u^2}\mathbf{P}_i D\mathbf{P}_i\right)\right] |Bp\rangle_{\mathrm{NS}}}{\int [d\mathbf{X}^\mu] \exp\left\{\int d\hat{\sigma}\left(-\frac{1}{4v^2} D\mathbf{X}^\mu D^2 \mathbf{X}^\mu\right)\right\} |\mathbf{X}^\mu, \mathbf{X}^i = 0\rangle_{\mathrm{NS}}} +}\right) =$$

$$-3927 + 2\sqrt[13]{2.2983717437 \times 10^{59} + 2.0823329825883 \times 10^{59}}$$

$$= 73490.8437525.... \Rightarrow$$

(the boundary state corresponding to the NSNS-sector of N Dp-branes in the limit of u → ∞)

$$\Rightarrow \left(A(r) \times \frac{1}{B(r)}\left(-\frac{1}{\phi(r)}\right) \times \frac{1}{e^{\Lambda(r)}}\right) \Rightarrow$$

$$\Rightarrow \left(-0.000029211892 \times \frac{1}{0.0003644621}\left(-\frac{1}{0.0005946833}\right) \times \frac{1}{0.00183393}\right) =$$

$$= 73491.788325481187105491595720422205480251957265634133987\,00...$$

$$= 73491.7883254... \Rightarrow$$

(the ratio concerning the general asymptotically flat solution of the equations of motion of the p-brane)

$$\left(\begin{array}{c} J_{21} \ll \int_{-\infty}^{+\infty} \exp\left(-\left(\frac{t}{H}\right)^2\right) \left| \sum_{\lambda \leq P^{1-\varepsilon_2}} \frac{a(\lambda)}{\sqrt{\lambda}} B(\lambda) \lambda^{-i(T+t)} \right|^2 dt \ll \\ \ll H\left\{\left(\frac{4}{\varepsilon_2 \log T}\right)^{2r} (\log T)(\log X)^{-2\beta} + (\varepsilon_2^{-2r} (\log T)^{-2r} + \varepsilon_2^{-r} h_1^r (\log T)^{-r}) T^{-\varepsilon_1}\right\} \end{array}\right) /$$

$$/(26 \times 4)^2 - 24 = \left(\frac{7.9313976505275 \times 10^8}{(26 \times 4)^2 - 24}\right) = 73493.30662\ldots$$

(the Karatsuba's equation concerning the zeros of a special type of function connected with Dirichlet series)

From:

$$\dot{H}(t) = \frac{(3\alpha H^4 - 6H^2 + \Lambda)(3\beta\lambda H^4 - 1)}{4H^2(\alpha + \beta\lambda\Lambda - 3\beta\lambda H^2) - 4},$$

We obtain:

((((3*0.40*0.1^4 – 6*0.1^2 + 0.05)*(3*0.55*1.8*0.1^4-1)))) / ((((4*0.1^2(0.40+0.55*1.8*0.05-3*0.55*1.8*0.1^2)-4))))

Input:

$$\frac{(3\times 0.4\times 0.1^4 - 6\times 0.1^2 + 0.05)(3\times 0.55\times 1.8\times 0.1^4 - 1)}{4\times 0.1^2 (0.4 + 0.55\times 1.8\times 0.05 - 3\times 0.55\times 1.8\times 0.1^2) - 4}$$

Result:

−0.00247967609022677198880902026708120690659388111291200459...

-0.002479676.....

From the following formula of the coefficients of the "5th order" mock theta function psi(q)

a(n) ~ sqrt(phi) * exp(Pi*sqrt(n/15)) / (2*5^(1/4)*sqrt(n))

(OEIS – sequence A053261)

we obtain, for n = 107.17

sqrt(golden ratio) * exp(Pi*sqrt(107.17/15)) / (2*5^(1/4)*sqrt(107.17))

Input interpretation:

$$\sqrt{\phi}\times\frac{\exp\left(\pi\sqrt{\frac{107.17}{15}}\right)}{2\sqrt[4]{5}\ \sqrt{107.17}}$$

ϕ is the golden ratio

Result:

- More digits

182.220...

Series representations:

$$\frac{\sqrt{\phi}\exp\left(\pi\sqrt{\frac{107.17}{15}}\right)}{2\sqrt[4]{5}\sqrt{107.17}} = \frac{\exp\left(\pi\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(7.14467-z_0)^k z_0^{-k}}{k!}\right)\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(\phi-z_0)^k z_0^{-k}}{k!}}{2\sqrt[4]{5}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(107.17-z_0)^k z_0^{-k}}{k!}}$$

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

$$\frac{\sqrt{\phi}\exp\left(\pi\sqrt{\frac{107.17}{15}}\right)}{2\sqrt[4]{5}\sqrt{107.17}} = \left(\exp\left(i\pi\left\lfloor\frac{\arg(\phi-x)}{2\pi}\right\rfloor\right)\exp\left(\pi\exp\left(i\pi\left\lfloor\frac{\arg(7.14467-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(7.14467-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)\sum_{k=0}^{\infty}\frac{(-1)^k(\phi-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right) \Big/ \left(2\sqrt[4]{5}\exp\left(i\pi\left\lfloor\frac{\arg(107.17-x)}{2\pi}\right\rfloor\right)\sum_{k=0}^{\infty}\frac{(-1)^k(107.17-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)$$

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

$$\frac{\sqrt{\phi}\exp\left(\pi\sqrt{\frac{107.17}{15}}\right)}{2\sqrt[4]{5}\sqrt{107.17}} = \left(\exp\left(\pi\left(\frac{1}{z_0}\right)^{1/2\lfloor\arg(7.14467-z_0)/(2\pi)\rfloor} z_0^{1/2(1+\lfloor\arg(7.14467-z_0)/(2\pi)\rfloor)}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(7.14467-z_0)^k z_0^{-k}}{k!}\right)\left(\frac{1}{z_0}\right)^{-1/2\lfloor\arg(107.17-z_0)/(2\pi)\rfloor+1/2\lfloor\arg(\phi-z_0)/(2\pi)\rfloor} z_0^{-1/2\lfloor\arg(107.17-z_0)/(2\pi)\rfloor+1/2\lfloor\arg(\phi-z_0)/(2\pi)\rfloor}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(\phi-z_0)^k z_0^{-k}}{k!}\right) \Big/ \left(2\sqrt[4]{5}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(107.17-z_0)^k z_0^{-k}}{k!}\right)$$

Inserting this value in the previous expression, we obtain:

182.22/-(((((((((3*0.40*0.1^4 – 6*0.1^2 + 0.05)*(3*0.55*1.8*0.1^4-1))))*1 / ((((4*0.1^2(0.40+0.55*1.8*0.05-3*0.55*1.8*0.1^2)-4))))))))

Input interpretation:

$$-\left(182.22 \Big/ \left(\left((3\times 0.4\times 0.1^4 - 6\times 0.1^2 + 0.05)(3\times 0.55\times 1.8\times 0.1^4 - 1)\right)\times \frac{1}{4\times 0.1^2 (0.4 + 0.55\times 1.8\times 0.05 - 3\times 0.55\times 1.8\times 0.1^2) - 4}\right)\right)$$

Result:

73485.40429058037524594197189115774672527133271132133531108...

73485.40429...

We have the following mathematical connections:

$$\left(-\left(182.22 \Big/ \left(\left((3\times 0.4\times 0.1^4 - 6\times 0.1^2 + 0.05)(3\times 0.55\times 1.8\times 0.1^4 - 1)\right)\times \frac{1}{4\times 0.1^2 (0.4 + 0.55\times 1.8\times 0.05 - 3\times 0.55\times 1.8\times 0.1^2) - 4}\right)\right)\right) = 73485.40429 \Rightarrow$$

$$\Rightarrow -3927 + 2\left(\sqrt[13]{\begin{array}{c} N \exp\left[\int d\hat{\sigma}\left(-\frac{1}{4u^2}\mathbf{P}_i D\mathbf{P}_i\right)\right] |Bp\rangle_{\rm NS} + \\ \int [d\mathbf{X}^\mu] \exp\left\{\int d\hat{\sigma}\left(-\frac{1}{4v^2} D\mathbf{X}^\mu D^2 \mathbf{X}^\mu\right)\right\} |\mathbf{X}^\mu, \mathbf{X}^i = 0\rangle_{\rm NS}\end{array}}\right) =$$

$$-3927 + 2\sqrt[13]{2.2983717437\times 10^{59} + 2.0823329825883\times 10^{59}}$$

$$= 73490.8437525.... \Rightarrow$$

(the boundary state corresponding to the NSNS-sector of N Dp-branes in the limit of u → ∞)

$$\Rightarrow \left(A(r) \times \frac{1}{B(r)}\left(-\frac{1}{\phi(r)}\right) \times \frac{1}{e^{\Lambda(r)}}\right) \Rightarrow$$

$$\Rightarrow \left(-0.000029211892 \times \frac{1}{0.0003644621}\left(-\frac{1}{0.0005946833}\right) \times \frac{1}{0.00183393}\right) =$$

$= 73491.788325481187105491595720422205480251957265634133987\ldots$

$= 73491.7883254\ldots \Rightarrow$

(the ratio concerning the general asymptotically flat solution of the equations of motion of the p-brane)

$$\left(\begin{array}{c} I_{21} \ll \int_{-\infty}^{+\infty} \exp\left(-\left(\frac{t}{H}\right)^2\right) \left| \sum_{\lambda \leq P^{1-\varepsilon_2}} \frac{a(\lambda)}{\sqrt{\lambda}} B(\lambda) \lambda^{-i(T+t)} \right|^2 dt \ll \\ \ll H\left\{ \left(\frac{4}{\varepsilon_2 \log T}\right)^{2r} (\log T)(\log X)^{-2\beta} + (\varepsilon_2^{-2r} (\log T)^{-2r} + \varepsilon_2^{-r} h_1^r (\log T)^{-r}) T^{-\varepsilon_1} \right\} \end{array} \right) /$$

$$/(26 \times 4)^2 - 24 = \left(\frac{7.9313976505275 \times 10^8}{(26 \times 4)^2 - 24}\right) = 73493.30662\ldots$$

(the Karatsuba's equation concerning the zeros of a special type of function connected with Dirichlet series)

From:

THE WORK OF GEORGE ANDREWS: A MADISON PERSPECTIVE
By Richard Askey

$$\phi_0(-q) = \prod_{n=0}^{\infty} \frac{(1-q^{5n+5})(1+q^{5n+2})(1+q^{5n+3})}{(1-q^{10n+2})(1-q^{10n+8})}$$

$$+1-\prod_{n=0}^{\infty}(1-q^{5n+5})^{-1}\left\{\frac{1}{1-q}+(1-q^{-1})\sum_{n=1}^{\infty}\frac{(-1)^n q^{n(15n+5)/2}(1+q^{5n})}{(1-q^{5n+1})(1-q^{5n-1})}\right\}.$$

when $q = e^{-t}$ and $t \to 0$

This and similar identities for the other fifth order mock theta functions were central to their study as George noted [22].

t = 0.5

For $q = e^{-0.5}$, we obtain:

product ((((1-(exp(-0.5))^(5n+5))) ((1+(exp(-0.5))^(5n+2))) ((1+(exp(-0.5))^(5n+3))))) / ((((1-(exp(-0.5))^(10n+2))) ((1-(exp(-0.5))^(10n+8))))), n=0 to infinity

Input interpretation:

$$\prod_{n=0}^{\infty} \frac{(1 - \exp^{5n+5}(-0.5))(1 + \exp^{5n+2}(-0.5))(1 + \exp^{5n+3}(-0.5))}{(1 - \exp^{10n+2}(-0.5))(1 - \exp^{10n+8}(-0.5))}$$

Approximated product:

$$\prod_{n=0}^{\infty} \frac{(1 + 0.606531^{2+5n})(1 + 0.606531^{3+5n})(1 - 0.606531^{5+5n})}{(1 - 0.606531^{2+10n})(1 - 0.606531^{8+10n})} \approx 2.59524$$

2.59524

product ((((1-(exp(-0.5))^(5n+5))^-1))), n=0 to infinity

Input interpretation:

$$\prod_{n=0}^{\infty} \frac{1}{1 - \exp^{5n+5}(-0.5)}$$

Infinite product:

$$\prod_{n=0}^{\infty} \frac{1}{1 - 0.606531^{5n+5}} = 1.097477024605212$$

1.097477024605212

(((1/(1-exp(-0.5)))+(1-((exp(-0.5)^(-1)))))) sum (((-1)^n*exp(-0.5)^(n(15n+5)/2)*(1+exp(-0.5)^(5n)))) / ((((1-(exp(-0.5))^(5n+1)) ((1-(exp(-0.5))^(5n-1)))))), n=1..5778

Where 5778 is a Lucas number

Input interpretation:

$$\left(\frac{1}{1-\exp(-0.5)}+\left(1-\frac{1}{\exp(-0.5)}\right)\right)\sum_{n=1}^{5778}\frac{(-1)^n \exp^{n\left(\frac{1}{2}(15n+5)\right)}(-0.5)\left(1+\exp^{5n}(-0.5)\right)}{\left(1-\exp^{5n+1}(-0.5)\right)\left(1-\exp^{5n-1}(-0.5)\right)}$$

Result:

−0.0167965

-0.0167965

Thence:

2.59524+1-1.097477024605212*(-0.0167965)

Input interpretation:

$2.59524 + 1 - 0.0167965 \times (-1.097477024605212)$

Result:

3.6136737728437814433358

Repeating decimal:

3.6136737728437814433358

3.6136737728...

We perform the 128th root of the result and obtain:

(((1/((2.59524+1-1.097477024605212*(-0.0167965))))))^1/128

Input interpretation:

$$\sqrt[128]{\frac{1}{2.59524 + 1 - 0.0167965 \times (-1.097477024605212)}}$$

Result:

0.99001329...

0.99001329.... result very near to the dilaton value $\mathbf{0.989117352243} = \boldsymbol{\phi}$

Now we have:

a) If we execute the 1444th root of the inverse of the result of above mock theta function, we obtain the following result:

((((((1/((2.59524+1-1.097477024605212*(-0.0167965))))))))^1/1444

Input interpretation:

$$\sqrt[1444]{\frac{1}{2.59524+1-0.0167965\times(-1.097477024605212)}}$$

Result:

0.999110697...

0.999110697... result practically equal to the value of the following Rogers-Ramanujan continued fraction:

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

Performing the following calculation, we obtain:

sqrt((((log base 0.999110697 ((((((1/((2.59524+1-1.097477024605212*(-0.0167965)))))))))))))

Input interpretation:

$$\sqrt{\log_{0.999110697}\left(\frac{1}{2.59524+1-0.0167965\times(-1.097477024605212)}\right)}$$

$\log_b(x)$ is the base- b logarithm

Result:

38.0000...

38

All 2nd roots of 1444.:

$38.\,e^0\approx 38.000$ (real, principal root)

$38. e^{i\pi} \approx -38.000$ (real root)

Alternative representation:

$$\sqrt{\log_{0.999111}\left(\frac{1}{2.59524+1-1.0974770246052120000(-1)\,0.0167965}\right)} = \sqrt{\frac{\log\left(\frac{1}{3.61367}\right)}{\log(0.999111)}}$$

$\log(x)$ is the natural logarithm

Series representations:

$$\sqrt{\log_{0.999111}\left(\frac{1}{2.59524+1-1.0974770246052120000(-1)\,0.0167965}\right)} = \sqrt{-\frac{\sum_{k=1}^{\infty}\frac{(-1)^k(-0.723273)^k}{k}}{\log(0.999111)}}$$

$$\sqrt{\log_{0.999111}\left(\frac{1}{2.59524+1-1.0974770246052120000(-1)\,0.0167965}\right)} = \sqrt{-1+\log_{0.999111}(0.276727)}\sum_{k=0}^{\infty}\binom{\frac{1}{2}}{k}(-1+\log_{0.999111}(0.276727))^{-k}$$

$$\sqrt{\log_{0.999111}\left(\frac{1}{2.59524+1-1.0974770246052120000(-1)\,0.0167965}\right)} = \sqrt{-1+\log_{0.999111}(0.276727)}\sum_{k=0}^{\infty}\frac{(-1)^k(-1+\log_{0.999111}(0.276727))^{-k}\left(-\frac{1}{2}\right)_k}{k!}$$

b) Instead, if we execute the 4096th root of the inverse of the result of above mock theta function, we obtain the following result:

(((1/((2.59524+1-1.097477024605212*(-0.0167965))))))^1/4096

Input interpretation:

$$\sqrt[4096]{\frac{1}{2.59524 + 1 - 0.0167965 \times (-1.097477024605212)}}$$

Result:

0.9996863956...

0.9996863956... result very near to the value of the following Rogers-Ramanujan continued fraction:

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

Then:

sqrt((((log base 0.9996863956 (((1/((2.59524+1-1.097477024605212*(-0.0167965)))))))))

Input interpretation:

$$\sqrt{\log_{0.9996863956}\left(\frac{1}{2.59524 + 1 - 0.0167965 \times (-1.097477024605212)}\right)}$$

$\log_b(x)$ is the base- b logarithm

Result:

64.0000...

64

All 2nd roots of 4096.:

$64.\ e^0 \approx 64.000$ (real, principal root)

$64.\ e^{i\pi} \approx -64.000$ (real root)

Alternative representation:

$$\sqrt{\log_{0.999686}\left(\frac{1}{2.59524 + 1 - 1.0974770246052120000\,(-1)\,0.0167965}\right)} = \sqrt{\frac{\log\left(\frac{1}{3.61367}\right)}{\log(0.999686)}}$$

log(x) is the natural logarithm

Series representations:

$$\sqrt{\log_{0.999686}\left(\frac{1}{2.59524+1-1.0974770246052120000(-1)\,0.0167965}\right)} = \sqrt{-\frac{\sum_{k=1}^{\infty}\frac{(-1)^k(-0.723273)^k}{k}}{\log(0.999686)}}$$

$$\sqrt{\log_{0.999686}\left(\frac{1}{2.59524+1-1.0974770246052120000(-1)\,0.0167965}\right)} = \sqrt{-1+\log_{0.999686}(0.276727)}\sum_{k=0}^{\infty}\binom{\frac{1}{2}}{k}(-1+\log_{0.999686}(0.276727))^{-k}$$

$$\sqrt{\log_{0.999686}\left(\frac{1}{2.59524+1-1.0974770246052120000(-1)\,0.0167965}\right)} = \sqrt{-1+\log_{0.999686}(0.276727)}\sum_{k=0}^{\infty}\frac{(-1)^k(-1+\log_{0.999686}(0.276727))^{-k}\left(-\frac{1}{2}\right)_k}{k!}$$

sqrt((((log base 0.9996863956 (((1/((2.59524+1-1.097477024605212*(-0.0167965))))))))))-((((sqrt((((log base 0.999110697 ((((((1/((2.59524+1-1.097477024605212*(-0.0167965))))))))))))))))

Input interpretation:

$$\sqrt{\log_{0.9996863956}\left(\frac{1}{2.59524+1-0.0167965\times(-1.097477024605212)}\right)} - \sqrt{\log_{0.999110697}\left(\frac{1}{2.59524+1-0.0167965\times(-1.097477024605212)}\right)}$$

$\log_b(x)$ is the base- b logarithm

Result:

26.0000...

26

Alternative representation:

$$\sqrt{\log_{0.999686}\left(\frac{1}{2.59524+1-1.09747702460521200000\,(-1)\,0.0167965}\right)} - \sqrt{\log_{0.999111}\left(\frac{1}{2.59524+1-1.09747702460521200000\,(-1)\,0.0167965}\right)} = -\sqrt{\frac{\log\left(\frac{1}{3.61367}\right)}{\log(0.999111)}} + \sqrt{\frac{\log\left(\frac{1}{3.61367}\right)}{\log(0.999686)}}$$

log(x) is the natural logarithm

Series representations:

$$\sqrt{\log_{0.999686}\left(\frac{1}{2.59524+1-1.09747702460521200000\,(-1)\,0.0167965}\right)} - \sqrt{\log_{0.999111}\left(\frac{1}{2.59524+1-1.09747702460521200000\,(-1)\,0.0167965}\right)} = \sum_{k=0}^{\infty}\binom{\frac{1}{2}}{k}\left(-(-1+\log_{0.999111}(0.276727))^{-k}\sqrt{-1+\log_{0.999111}(0.276727)} + (-1+\log_{0.999686}(0.276727))^{-k}\sqrt{-1+\log_{0.999686}(0.276727)}\right)$$

$$\sqrt{\log_{0.999686}\left(\frac{1}{2.59524+1-1.09747702460521200000\,(-1)\,0.0167965}\right)} - \sqrt{\log_{0.999111}\left(\frac{1}{2.59524+1-1.09747702460521200000\,(-1)\,0.0167965}\right)} = -\sqrt{-\frac{\sum_{k=1}^{\infty}\frac{(-1)^k(-0.723273)^k}{k}}{\log(0.999111)}} + \sqrt{-\frac{\sum_{k=1}^{\infty}\frac{(-1)^k(-0.723273)^k}{k}}{\log(0.999686)}}$$

$$\sqrt{\log_{0.999686}\left(\frac{1}{2.59524+1-1.09747702460521200000\,(-1)\,0.0167965}\right)} - \sqrt{\log_{0.999111}\left(\frac{1}{2.59524+1-1.09747702460521200000\,(-1)\,0.0167965}\right)} = \sum_{k=0}^{\infty}\frac{1}{k!}(-1)^k\left(-\frac{1}{2}\right)_k\left(-(-1+\log_{0.999111}(0.276727))^{-k}\sqrt{-1+\log_{0.999111}(0.276727)} + (-1+\log_{0.999686}(0.276727))^{-k}\sqrt{-1+\log_{0.999686}(0.276727)}\right)$$

We note that the results of two expressions within the square roots are respectively 38 and 64. What do the two equations have in common? 64 is a fundamental number that appears in Ramanujan's paper "Modular equations and approximation to pi". Regarding the number 38, first of all, we note that, subtracted from 64, it provides 26

c) Instead, if we execute the 1369th root of the inverse of the result of above mock theta function, we obtain the following result:

((((((1/((2.59524+1-1.097477024605212*(-0.0167965))))))))^1/1369

Input interpretation:

$$\sqrt[1369]{\frac{1}{2.59524 + 1 - 0.0167965 \times (-1.097477024605212)}}$$

Result:

0.99906199978808082958327531152412383458292050763086761 8013...

0.9990619.... result also very near to the previous Rogers-Ramanujan continued fraction.

Executing the following calculation, we obtain:

(((log base 0.999061999788 ((((((1/((2.59524+1-1.097477024605212*(-0.0167965)))))))))))^1/2

Input interpretation:

$$\sqrt{\log_{0.999061999788}\left(\frac{1}{2.59524 + 1 - 0.0167965 \times (-1.097477024605212)}\right)}$$

$\log_b(x)$ is the base- b logarithm

Result:

37.00000...

37

Now, the results of the two roots are respectively 64 and 37. We note that:

sqrt((((log base 0.9996863956 (((1/((2.59524+1-1.097477024605212*(-0.0167965)))))))))-sqrt(((log base 0.999061999788 ((((((1/((2.59524+1-1.097477024605212*(-0.0167965)))))))))))

Input interpretation:

$$\sqrt{\log_{0.9996863956}\left(\frac{1}{2.59524+1-0.0167965\times(-1.097477024605212)}\right)} - \sqrt{\log_{0.999061999788}\left(\frac{1}{2.59524+1-0.0167965\times(-1.097477024605212)}\right)}$$

$\log_b(x)$ is the base- b logarithm

Result:

27.0000...

27

Alternative representation:

$$\sqrt{\log_{0.999686}\left(\frac{1}{2.59524+1-1.09747702460521200000(-1)\,0.0167965}\right)} - \sqrt{\log_{0.99906199978800000}\left(\frac{1}{2.59524+1-1.09747702460521200000(-1)\,0.0167965}\right)} = -\sqrt{\frac{\log\left(\frac{1}{3.61367}\right)}{\log(0.99906199978800000)}} + \sqrt{\frac{\log\left(\frac{1}{3.61367}\right)}{\log(0.999686)}}$$

$\log(x)$ is the natural logarithm

Series representations:

$$\sqrt{\log_{0.999686}\left(\frac{1}{2.59524+1-1.09747702460521200000(-1)\,0.0167965}\right)} - \sqrt{\log_{0.99906199978800000}\left(\frac{1}{2.59524+1-1.09747702460521200000(-1)\,0.0167965}\right)} = \sum_{k=0}^{\infty} \binom{\frac{1}{2}}{k} \left(-(-1+\log_{0.99906199978800000}(0.276727))^{-k} \sqrt{-1+\log_{0.99906199978800000}(0.276727)} + (-1+\log_{0.999686}(0.276727))^{-k} \sqrt{-1+\log_{0.999686}(0.276727)}\right)$$

$$\sqrt{\log_{0.999686}\left(\frac{1}{2.59524+1-1.0974770246052120000\,(-1)\,0.0167965}\right)} - \sqrt{\log_{0.9990619997880000}\left(\frac{1}{2.59524+1-1.0974770246052120000\,(-1)\,0.0167965}\right)}$$
$$= -\sqrt{-\frac{\sum_{k=1}^{\infty}\frac{(-1)^k(-0.723273)^k}{k}}{\log(0.9990619997880000)}} + \sqrt{-\frac{\sum_{k=1}^{\infty}\frac{(-1)^k(-0.723273)^k}{k}}{\log(0.999686)}}$$

$$\sqrt{\log_{0.999686}\left(\frac{1}{2.59524+1-1.0974770246052120000\,(-1)\,0.0167965}\right)} - \sqrt{\log_{0.9990619997880000}\left(\frac{1}{2.59524+1-1.0974770246052120000\,(-1)\,0.0167965}\right)}$$
$$= \sum_{k=0}^{\infty}\frac{1}{k!}(-1)^k\left(-\frac{1}{2}\right)_k\Big(-(-1+\log_{0.9990619997880000}(0.276727))^{-k}\sqrt{-1+\log_{0.9990619997880000}(0.276727)} + (-1+\log_{0.999686}(0.276727))^{-k}\sqrt{-1+\log_{0.999686}(0.276727)}\Big)$$

From this result, performing the square, we obtain:

[sqrt((((log base 0.9996863956 (((1/((2.59524+1-1.097477024605212*(-0.0167965)))))))))-sqrt(((log base 0.999061999788 ((((((1/((2.59524+1-1.097477024605212*(-0.0167965)))))))))))))]^2

Input interpretation:

$$\left(\sqrt{\log_{0.9996863956}\left(\frac{1}{2.59524+1-0.0167965\times(-1.097477024605212)}\right)} - \sqrt{\log_{0.999061999788}\left(\frac{1}{2.59524+1-0.0167965\times(-1.097477024605212)}\right)}\right)^2$$

$\log_b(x)$ is the base- b logarithm

Result:

729.000...

729

We think that this result can contribute to the understanding of the mock theta function analyzed here. In fact, the sum of the two cubes $6^3 + 8^3 = 9^3 - 1$ is equal to 728 and we note that $728 = 9^3 - 1$ from which $9^3 = 728 + 1 = 729$.

Furthermore, $729 = 9^3$ also appears in the following sum of cubes whose result is 1729, the famous Hardy-Ramanujan number :

$$1729 = 1^3 + 12^3 = 9^3 + 10^3 .$$

With regard the previous results: 38 and 26, we have that:

(38^3+26^3)+(1024)+24

Input:

$$(38^3 + 26^3) + 1024 + 24$$

Result:

73496

73496

Thence, we have the following mathematical connections:

$$\left(\sqrt{\log_{0.999110697}\left(\frac{1}{2.59524 + 1 - 0.0167965 \times (-1.097477024605212)}\right)}\right)^3 +$$

$$+\left(\sqrt{\log_{0.9996863956}\left(\frac{1}{2.59524 + 1 - 0.0167965 \times (-1.097477024605212)}\right) - \sqrt{\log_{0.999110697}\left(\frac{1}{2.59524 + 1 - 0.0167965 \times (-1.097477024605212)}\right)}}\right)^3 + 1024 + 24 =$$

$= 73496 \Rightarrow$

$$\Rightarrow -3927+2\left(\sqrt[13]{\frac{N\exp\left[\int d\hat{\sigma}\left(-\frac{1}{4u^2}\mathrm{P}_i D\mathrm{P}_i\right)\right]|Bp\rangle_{\mathrm{NS}}}{\int[d\mathrm{X}^\mu]\exp\left\{\int d\hat{\sigma}\left(-\frac{1}{4v^2}D\mathrm{X}^\mu D^2\mathrm{X}^\mu\right)\right\}|\mathrm{X}^\mu,\mathrm{X}^i=0\rangle_{\mathrm{NS}}}+}\right)=$$

$$-3927+2\sqrt[13]{2.2983717437\times10^{59}+2.0823329825883\times10^{59}}$$

$= 73490.8437525.... \Rightarrow$

$$\Rightarrow\left(A(r)\times\frac{1}{B(r)}\left(-\frac{1}{\phi(r)}\right)\times\frac{1}{e^{\Lambda(r)}}\right)\Rightarrow$$

$$\Rightarrow\left(-0.000029211892\times\frac{1}{0.0003644621}\left(-\frac{1}{0.0005946833}\right)\times\frac{1}{0.00183393}\right)=$$

$= 73491.788325481187105491595720422205480251957265634133987 00...$

$= 73491.7883254... \Rightarrow$

$$\left(\begin{array}{c} I_{21}\ll\int\limits_{-\infty}^{+\infty}\exp\left(-\left(\frac{t}{H}\right)^2\right)\left|\sum_{\lambda\leq P^{1-\varepsilon_2}}\frac{a(\lambda)}{\sqrt{\lambda}}B(\lambda)\lambda^{-i(T+t)}\right|^2dt\ll \\ \ll H\left\{\left(\frac{4}{\varepsilon_2\log T}\right)^{2r}(\log T)(\log X)^{-2\beta}+(\varepsilon_2^{-2r}(\log T)^{-2r}+\varepsilon_2^{-r}h_1^r(\log T)^{-r})T^{-\varepsilon_1}\right\}\end{array}\right)/$$

$$/(26\times4)^2-24=\left(\frac{7.9313976505275\times10^8}{(26\times4)^2-24}\right)=73493.30662\ldots$$

Mathematical connections with the boundary state corresponding to the NSNS-sector of N Dp-branes in the limit of u → ∞, withthe ratio concerning the general asymptotically flat solution of the equations of motion of the p-brane and with the Karatsuba's equation concerning the zeros of a special type of function connected with Dirichlet series.

From the following expression previous analyzed, we obtain also:

(((log base 0.999061999788 ((((((1/((2.59524+1-1.097477024605212*(-0.0167965)))))))))))+18

Where 18 is a Lucas number

Input interpretation:

$$\log_{0.999061999788}\left(\frac{1}{2.59524+1-0.0167965\times(-1.097477024605212)}\right)+18$$

$\log_b(x)$ is the base- b logarithm

Result:

1387.00...

1387 result practically equal to the rest mass of Sigma baryon 1387.2

Alternative representation:

$$\log_{0.9990619997880000}\left(\frac{1}{2.59524+1-1.0974770246052120000\,(-1)\,0.0167965}\right)+18 = 18+\frac{\log\left(\frac{1}{3.61367}\right)}{\log(0.9990619997880000)}$$

$\log(x)$ is the natural logarithm

Series representations:

$$\log_{0.9990619997880000}\left(\frac{1}{2.59524+1-1.0974770246052120000\,(-1)\,0.0167965}\right)+18 = 18-\frac{\sum_{k=1}^{\infty}\frac{(-1)^k\,(-0.723273)^k}{k}}{\log(0.9990619997880000)}$$

$$\log_{0.9990619997880000}\left(\frac{1}{2.59524+1-1.0974770246052120000\,(-1)\,0.0167965}\right)+18 = 18-1065.597840072\log(0.276727)-\log(0.276727)\sum_{k=0}^{\infty}(-0.0009380002120000)^k\,G(k)$$

$$\text{for}\left(G(0)=0\text{ and }G(k)=\frac{(-1)^{1+k}\,k}{2\,(1+k)\,(2+k)}+\sum_{j=1}^{k}\frac{(-1)^{1+j}\,G(-j+k)}{1+j}\right)$$

Now, we have that:

$$(2.6)\quad 1+q\frac{1+q}{1-q^2}+q^4\frac{(1+q)(1+q^3)}{(1-q^2)(1-q^4)}$$
$$+q^9\frac{(1+q)(1+q^3)(1+q^5)}{(1-q^2)(1-q^4)(1-q^6)}+\cdots+q^{n^2}\prod_{k=1}^{n}\frac{1+q^{2k-1}}{1-q^{2k}}+\cdots$$
$$=\prod_{n=0}^{\infty}\frac{1}{(1-q^{8n+1})(1-q^{8n+4})(1-q^{8n+7})};$$

$$\prod_{n=0}^{\infty}\frac{1}{(1-q^{8n+1})(1-q^{8n+4})(1-q^{8n+7})}$$

For q = $e^{-0.5}$, we obtain:

product 1/((((1-(exp(-0.5))^(8n+1)) (1-(exp(-0.5))^(8n+4)) (1-(exp(-0.5))^(8n+7))))), n=0 to infinity

Input interpretation:

$$\prod_{n=0}^{\infty}\frac{1}{(1-\exp^{8n+1}(-0.5))(1-\exp^{8n+4}(-0.5))(1-\exp^{8n+7}(-0.5))}$$

Approximated product:

$$\prod_{n=0}^{\infty}\frac{1}{(1-0.606531^{1+8n})(1-0.606531^{4+8n})(1-0.606531^{7+8n})}\approx 3.07498$$

3.07498

And:

$$(2.7)\quad 1+q^3\frac{1+q}{1-q^2}+q^8\frac{(1+q)(1+q^3)}{(1-q^2)(1-q^4)}$$
$$+q^{15}\frac{(1+q)(1+q^3)(1+q^5)}{(1-q^2)(1-q^4)(1-q^6)}+\cdots+q^{n(n+2)}\prod_{k=1}^{n}\frac{1+q^{2k-1}}{1-q^{2k}}+\cdots$$
$$=\prod_{n=0}^{\infty}\frac{1}{(1-q^{8n+3})(1-q^{8n+4})(1-q^{8n+5})}.$$

$$\prod_{n=0}^{\infty} \frac{1}{(1-q^{8n+3})(1-q^{8n+4})(1-q^{8n+5})}$$

product 1/((((1-(exp(-0.5))^(8n+3)) (1-(exp(-0.5))^(8n+4)) (1-(exp(-0.5))^(8n+5))))), n=0 to infinity

Input interpretation:

$$\prod_{n=0}^{\infty} \frac{1}{(1-\exp^{8n+3}(-0.5))(1-\exp^{8n+4}(-0.5))(1-\exp^{8n+5}(-0.5))}$$

Approximated product:

$$\prod_{n=0}^{\infty} \frac{1}{(1-0.606531^{3+8n})(1-0.606531^{4+8n})(1-0.606531^{5+8n})} \approx 1.63522$$

1.63522

And:

1/(3.07498 - 1.63522)^1/32

Input interpretation:

$$\frac{1}{\sqrt[32]{3.07498-1.63522}}$$

Result:

0.9886747...

0.9886747.... result very near to the dilaton value **0.989117352243** = ϕ

34/10^3+(3.07498 + 1.63522)^(1/Pi)

Input interpretation:

$$\frac{34}{10^3}+\sqrt[\pi]{3.07498+1.63522}$$

Result:

1.6717027500406085195774939365326003204686753384515870359 90...

1.67170275….

result practically equal to the value of the formula:

$m_{p'} = 2 \times \frac{\eta}{R} m_P = 1.6714213 \times 10^{-24}$ gm

that is the holographic proton mass (N. Haramein)

Alternative representations:

$$\frac{34}{10^3} + \sqrt[\pi]{3.07498 + 1.63522} = \sqrt[180°]{4.7102} + \frac{34}{10^3}$$

$$\frac{34}{10^3} + \sqrt[\pi]{3.07498 + 1.63522} = 4.7102^{-1/(i \log(-1))} + \frac{34}{10^3}$$

$$\frac{34}{10^3} + \sqrt[\pi]{3.07498 + 1.63522} = \sqrt[\cos^{-1}(-1)]{4.7102} + \frac{34}{10^3}$$

Series representations:

$$\frac{34}{10^3} + \sqrt[\pi]{3.07498 + 1.63522} = \frac{17}{500} + \sqrt[4 \sum_{k=0}^{\infty} \frac{(-1)^k}{1+2k}]{4.7102}$$

$$\frac{34}{10^3} + \sqrt[\pi]{3.07498 + 1.63522} = \frac{17}{500} + \sqrt[-2+2 \sum_{k=1}^{\infty} \frac{2^k}{\binom{2k}{k}}]{4.7102}$$

$$\frac{34}{10^3} + \sqrt[\pi]{3.07498 + 1.63522} = \frac{17}{500} + \sqrt[\sum_{k=0}^{\infty} \frac{2^{-k}(-6+50k)}{\binom{3k}{k}}]{4.7102}$$

$\binom{n}{m}$ is the binomial coefficient

Integral representations:

$$\frac{34}{10^3} + \sqrt[\pi]{3.07498 + 1.63522} = \frac{17}{500} + e^{0.774865 / \left(\int_0^{\infty} \frac{1}{1+t^2} dt\right)}$$

$$\frac{34}{10^3} + \sqrt[\pi]{3.07498 + 1.63522} = \frac{17}{500} + e^{0.387433/\left(\int_0^1 \sqrt{1-t^2}\, dt\right)}$$

$$\frac{34}{10^3} + \sqrt[\pi]{3.07498 + 1.63522} = \frac{17}{500} + e^{0.774865/\left(\int_0^\infty \frac{\sin(t)}{t}\, dt\right)}$$

Now, we have that:

$$(2.8) \quad G(s) = 1 = \sum_{n=1}^{\infty} (-1)^n s^{2n} q^{n(4n-1)} \left(1 - sq^{4n}\right)$$
$$\times \frac{(1+q)(1+q^3)()\cdots(1+q^{2n-1})}{(1+sq)(1+sq^3)\cdots(1+sq^{2n-1})} \cdot \frac{(1-sq^2)(1-sq^4)\cdots(1-sq^{2n-2})}{(1-q^2)(1-q^4)(1-q^6)\cdots(1-q^{2n})}$$
$$= 1 - s^2q^3 \frac{(1-sq^4)(1+x)}{(1+sq)(1-q^2)} + s^4q^{14} \frac{(1-sq^8)(1+q)(1+q^3)((1-sq^2)}{(1+sq)(1+sq^3)(1-q^2)(1-q^4)}$$
$$- s^6q^{33} \frac{(1-sq^{12})(1+q)(1+q^3)(1+q^5)(1-sq^2)(1-sq^4)}{(1+sq)(1+sq^3)(1+sq^5)(1-q^4)(1-q^6)} + \cdots$$

$$1 - s^2q^3 \frac{(1-sq^4)(1+x)}{(1+sq)(1-q^2)} + s^4q^{14} \frac{(1-sq^8)(1+q)(1+q^3)((1-sq^2)}{(1+sq)(1+sq^3)(1-q^2)(1-q^4)}$$
$$- s^6q^{33} \frac{(1-sq^{12})(1+q)(1+q^3)(1+q^5)(1-sq^2)(1-sq^4)}{(1+sq)(1+sq^3)(1+sq^5)(1-q^4)(1-q^6)} + \cdots$$

1-((exp(-0.5))^3)* ((((1-((exp(-0.5))^4))*(1+2)))) / (((1+((exp(-0.5))*(1-((exp(-0.5))^2))))))

Input:

$$1 - \exp^3(-0.5) \times \frac{(1-\exp^4(-0.5))(1+2)}{1+\exp(-0.5)(1-\exp^2(-0.5))}$$

Result:

0.581612...

0.581612...

((exp(-0.5))^14)*((((1-((exp(-0.5))^8))*(((1+((exp(-0.5))* (((1+((exp(-0.5))^3)))* (((1+((exp(-0.5))^2))) / (((((1+((exp(-0.5))*(1+((exp(-0.5))^3)))* (((1+((exp(-0.5))^2)))* (((1+((exp(-0.5))^4)))))

((exp(-0.5))^14)*((((1-((exp(-0.5))^8))*(((1+((exp(-0.5))* (((1+((exp(-0.5))^3)))* (((1+((exp(-0.5))^2))))

Input:

$$\exp^{14}(-0.5)\left(\left(1-\exp^{8}(-0.5)\right)\left(1+\exp(-0.5)\left(\left(1+\exp^{3}(-0.5)\right)\left(1+\exp^{2}(-0.5)\right)\right)\right)\right)$$

Result:

0.00180359...

0.00180359... = numerator

0.00180359/ (((((1+((exp(-0.5))*(1+((exp(-0.5))^3)))* (((1+((exp(-0.5))^2)))* (((1+((exp(-0.5))^4)))))))))

Input interpretation:

$$\frac{0.00180359}{1+\left(\exp(-0.5)\left(1+\exp^{3}(-0.5)\right)\right)\left(\left(1+\exp^{2}(-0.5)\right)\left(1+\exp^{4}(-0.5)\right)\right)}$$

Result:

0.000838053...

0.000838053...

$$-\,s^{6}q^{33}\,\frac{(1-sq^{12})(1+q)(1+q^{3})(1+q^{5})(1-sq^{2})(1-sq^{4})}{(1+sq)(1+sq^{3})(1+sq^{5})(1-q^{4})(1-q^{6})}+\cdots$$

((1-((exp(-0.5))^12)))*(1+((exp(-0.5))*(1+((exp(-0.5))^3)))* (1+((exp(-0.5))^5)))*(1-((exp(-0.5))^2)))*(1-((exp(-0.5))^4)))

Input:

$$\left(1-\exp^{12}(-0.5)\right)\left(1+\left(\exp(-0.5)\left(1+\exp^{3}(-0.5)\right)\right)\left(1+\exp^{5}(-0.5)\right)\right)\left(1-\exp^{2}(-0.5)\right)\left(1-\exp^{4}(-0.5)\right)$$

Result:

0.982897...

0.982897...

-(((exp(-0.5))^33))*0.9828974429

Input interpretation:

$\exp^{33}(-0.5) \times (-0.9828974429)$

Result:

$-6.70887... \times 10^{-8}$

$-6.70887...*10^{-8}$ = numerator

-6.70887 × 10^-8 / (((((1+((exp(-0.5))*(1+((exp(-0.5))^3)))*(1+((exp(-0.5))^5)))*(1-((exp(-0.5))^4))* (1+((exp(-0.5))^6))))))

Input interpretation:

$$-\frac{6.70887 \times 10^{-8}}{(1 + (\exp(-0.5)(1 + \exp^3(-0.5))) (1 + \exp^5(-0.5))) (1 - \exp^4(-0.5)) (1 + \exp^6(-0.5))}$$

Result:

$-4.09979... \times 10^{-8}$

$-4.09979... * 10^{-8}$

We note that from the denominator of above expression, we obtain:

(((((1+((exp(-0.5))*(1+((exp(-0.5))^3)))*(1+((exp(-0.5))^5)))*(1-((exp(-0.5))^4))* (1+((exp(-0.5))^6))))))

Input:

$$(1 + (\exp(-0.5)(1 + \exp^3(-0.5))) (1 + \exp^5(-0.5))) (1 - \exp^4(-0.5)) \left(1 + \exp^6(-0.5)\right)$$

Result:

1.6363920213892314981655348957512188092889803810198506632O2...

1.636392...

The final result of the expression:

$$(2.8)\quad G(s) = 1 = \sum_{n=1}^{\infty} (-1)^n s^{2n} q^{n(4n-1)} \, (1 - sq^{4n})$$

$$\times \frac{(1+q)(1+q^3)()\cdots(1+q^{2n-1})}{(1+sq)(1+sq^3)\cdots(1+sq^{2n-1})} \cdot \frac{(1-sq^2)(1-sq^4)\cdots(1-sq^{2n-2})}{(1-q^2)(1-q^4)(1-q^6)\cdots(1-q^{2n})}$$

$$= 1 - s^2 q^3 \frac{(1-sq^4)(1+x)}{(1+sq)(1-q^2)} + s^4 q^{14} \frac{(1-sq^8)(1+q)(1+q^3)((1-sq^2)}{(1+sq)(1+sq^3)(1-q^2)(1-q^4)}$$

$$- s^6 q^{33} \frac{(1-sq^{12})(1+q)(1+q^3)(1+q^5)(1-sq^2)(1-sq^4)}{(1+sq)(1+sq^3)(1+sq^5)(1-q^4)(1-q^6)} + \cdots$$

Is:

(0.581612 + 0.000838053 - 4.09979e-8)

Input interpretation:

$0.581612 + 0.000838053 - 4.09979 \times 10^{-8}$

Result:

0.5824500120021

0.5824500120021

We note that the reciprocal of this result is:

1/(0.581612 + 0.000838053 - 4.09979e-8)

Input interpretation:

$$\frac{1}{0.581612 + 0.000838053 - 4.09979 \times 10^{-8}}$$

Result:

1.716885534198245566141706396447121056231450546835792586182...

1.716885534... and it is practically equal to the Ramanujan mock theta function $\boldsymbol{\phi(q)}$ **= 1.7168646644...**

We have also that, performing the 64th root of the result, we obtain:

(0.581612 + 0.000838053 - 4.09979e-8)^1/64

Input interpretation:

$$\sqrt[64]{0.581612 + 0.000838053 - 4.09979 \times 10^{-8}}$$

Result:

0.99159006...

0.99159006.... result very near to the dilaton value $\mathbf{0.989117352243} = \boldsymbol{\phi}$

From which:

log base 0.99159006(0.581612 + 0.000838053 - 4.09979e-8)

Input interpretation:

$\log_{0.99159006}(0.581612 + 0.000838053 - 4.09979 \times 10^{-8})$

$\log_b(x)$ is the base- b logarithm

Result:

64.0000...

64

From the following Ramanujan modular equation, we obtain:

$$G_{333} = \frac{1}{2}(6+\sqrt{37})^{\frac{1}{4}}(7\sqrt{3}+2\sqrt{37})^{\frac{1}{6}}\{\sqrt{(7+2\sqrt{3})}+\sqrt{(3+2\sqrt{3})}\}$$

G_{333} = (((0.9322052927154882* 1.701783193524* (3.234826365531+2.542459756837))))

1/(1.701783193524*2) * G_{333}

Input interpretation:

$$\frac{1}{1.701783193524 \times 2} (0.9322052927154882 \times 1.701783193524 (3.234826365531 + 2.542459756837))$$

Result:

2.6928083504015946100170300288

2.692808...

(((log base 0.99159006(0.581612 + 0.000838053 - 4.09979e-8))))^(2.692808)+322+76+29+3

Where 2.692808 is the above result obtained from the G_{333} modular form of Ramanujan

Input interpretation:

$$\log_{0.99159006}^{2.692808}(0.581612 + 0.000838053 - 4.09979 \times 10^{-8}) + 322 + 76 + 29 + 3$$

$\log_b(x)$ is the base- b logarithm

Result:

73492.6...

73492.6

Or, utilizing the following coefficients formula of the 5th order mock theta function:

a(n) ~ sqrt(phi) * exp(Pi*sqrt(n/15)) / (2*5^(1/4)*sqrt(n))

for n = 133.22, we obtain:

((((((log base 0.99159006(0.581612 + 0.000838053 - 4.09979e-8))))^(2.692808)))) + (((sqrt(golden ratio) * exp(Pi*sqrt(133.22/15)) / (2*5^(1/4)*sqrt(133.22)))))

Input interpretation:

$$\log_{0.99159006}^{2.692808}(0.581612 + 0.000838053 - 4.09979 \times 10^{-8}) + \sqrt{\phi} \times \frac{\exp\left(\pi \sqrt{\frac{133.22}{15}}\right)}{2 \sqrt[4]{5} \sqrt{133.22}}$$

$\log_b(x)$ is the base- b logarithm

ϕ is the golden ratio

Result:

73491.7...

73491.7

We obtain the following mathematical connection:

$$\left[\log_{0.99159006}^{2.692808}(0.581612 + 0.000838053 - 4.09979 \times 10^{-8}) + \sqrt{\phi} \times \frac{\exp\left(\pi \sqrt{\frac{133.22}{15}}\right)}{2 \sqrt[4]{5} \sqrt{133.22}}\right] = 73491.7 \Rightarrow$$

$$\Rightarrow -3927 + 2\left(\sqrt[13]{\frac{N \exp\left[\int d\hat{\sigma}\left(-\frac{1}{4u^2}\mathbf{P}_i D\mathbf{P}_i\right)\right] |Bp\rangle_{NS}}{\int [d\mathbf{X}^\mu] \exp\left\{\int d\hat{\sigma}\left(-\frac{1}{4v^2} D\mathbf{X}^\mu D^2 \mathbf{X}^\mu\right)\right\} |\mathbf{X}^\mu, \mathbf{X}^i = 0\rangle_{NS}} + }\right) =$$

$$-3927+2\sqrt[13]{2.2983717437\times10^{59}+2.0823329825883\times10^{59}}$$

$= 73490.8437525.... \Rightarrow$

$$\Rightarrow\left(A(r)\times\frac{1}{B(r)}\left(-\frac{1}{\phi(r)}\right)\times\frac{1}{e^{\Lambda(r)}}\right)\Rightarrow$$

$$\Rightarrow\left(-0.000029211892\times\frac{1}{0.0003644621}\left(-\frac{1}{0.0005946833}\right)\times\frac{1}{0.00183393}\right)=$$

$= 73491.788325481187105491595720422205480251957265634133987 00...$

$= 73491.7883254... \Rightarrow$

$$\left(\begin{array}{c} I_{21}\ll\int_{-\infty}^{+\infty}\exp\left(-\left(\frac{t}{H}\right)^2\right)\left|\sum_{\lambda\leq P^{1-\varepsilon_1}}\frac{a(\lambda)}{\sqrt{\lambda}}B(\lambda)\lambda^{-i(T+t)}\right|^2dt\ll \\ \ll H\left\{\left(\frac{4}{\varepsilon_2\log T}\right)^{2r}(\log T)(\log X)^{-2\beta}+(\varepsilon_2^{-2r}(\log T)^{-2r}+\varepsilon_2^{-r}h_1^r(\log T)^{-r})T^{-\varepsilon_1}\right\}\end{array}\right)/$$

$$/(26\times4)^2-24=\left(\frac{7.9313976505275\times10^8}{(26\times4)^2-24}\right)= 73493.30662\ldots$$

Mathematical connections with the boundary state corresponding to the NSNS-sector of N Dp-branes in the limit of u → ∞, withthe ratio concerning the general asymptotically flat solution of the equations of motion of the p-brane and with the Karatsuba's equation concerning the zeros of a special type of function connected with Dirichlet series.

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