137 (2.4.7)

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“There is a most profound and beautiful question associated with the observed coupling constant, e – the amplitude for a real electron to emit or absorb a real photon. It is a simple number that has been experimentally determined to be close to 0.08542455. (My physicist friends won’t recognize this number, because they like to remember it as the inverse of its square: about 137.03597 with about an uncertainty of about 2 in the last decimal place. It has been a mystery ever since it was discovered more than fifty years ago, and all good theoretical physicists put this number up on their wall and worry about it.) Immediately you would like to know where this number for a coupling comes from: is it related to pi or perhaps to the base of natural logarithms? Nobody knows. It’s one of the greatest damn mysteries of physics: a magic number that comes to us with no understanding by man. You might say the “hand of G-d” wrote that number, and “we don’t know how He pushed his pencil.” We know what kind of a dance to do experimentally to measure this number very accurately, but we don’t know what kind of dance to do on the computer to make this number come out, without putting it in secretly!” Not to be put too fine a point on it, I know *exactly* what kind of dance to do on the computer to makes this number come out, without putting it in secretly...

part i: the fine structure constant

Let

$$\hbar = \text{the reduced Planck constant} = 6.66134 \times 10^{-16}$$
$$G = \text{the Gibbs constant} = \int_0^{\pi} \frac{\sin(x)}{x}\, dx$$

and let

$$R_\infty = \text{the Rydberg constant}$$
$$e = \text{the elementary charge}$$
$$c = \text{the speed of light in a vacuum}$$
$$\epsilon_0 = \text{the electric constant}$$
$$\mu_0 = \text{the magnetic constant}$$
$$R_K = \text{the von Klitzing constant}$$
$$Z_0 = \text{vacuum impedance}$$

α is derived from the measurement of the ratio $\frac{\hbar}{m\,R_b}$ between the Planck constant and the mass of the R_b atom because

$$\alpha^2 = \frac{2\,R_\infty}{c}\,\frac{m\,R_b}{m_e}\,\frac{\hbar}{m\,R_b}$$

where m_e is the electron mass.

$$\alpha = \frac{1}{137.036} = \left(e^{2\gamma}\left(e^{-\left(\zeta(12)-\frac{1}{12-1}\right)}\right)^2 - e^{2\gamma}\left(e^{-\left(\sum_{n=1}^{1}\frac{1.00009}{1^{12}}-\int_1^1\frac{1.00009}{1^{12}}\,dn\right)}\right)^2\right)^2$$

And so

$$\left(e^{2\gamma}\left(e^{-\left(\zeta(12)-\frac{1}{12-1}\right)}\right)^2 - e^{2\gamma}\left(e^{-\left(\sum_{n=1}^{1}\frac{1.00009}{1^{12}}-\int_1^1\frac{1.00009}{1^{12}}\,dn\right)}\right)^2\right)^2 =$$

$$\frac{1}{\frac{\left(\frac{3\pi}{2}\right)^3 G}{\sqrt{2}}} = \sqrt{\frac{2\,R_\infty}{c}\,\frac{m\,R_b}{m_e}\,\frac{\hbar}{m\,R_b}} = \frac{e^2}{4\,\pi\,\epsilon_0\,\hbar\,c} = \frac{1}{4\,\pi\,\epsilon_0} = \frac{e^2}{\hbar\,c} = \frac{\pi\,\mu_0}{4}\,\frac{e^2\,c}{\hbar} = \frac{k_e\,e^2}{\hbar\,c} = \frac{c\,\mu_0}{2\,R_K} = \frac{e^2}{4\,\pi}\,\frac{Z_0}{\hbar}$$

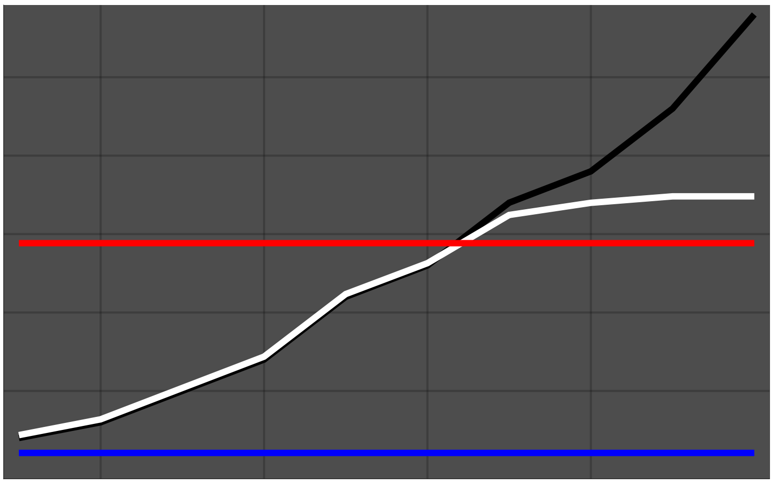
Let

$$\alpha_G = \text{the gravitational coupling constant}$$

and in natural units

$$\left(e^{2\gamma}\left(e^{-\left(\zeta(12)-\frac{1}{12-1}\right)}\right)^2 - e^{2\gamma}\left(e^{-\left(\sum_{n=1}^{1}\frac{1.00009}{1^{12}}-\int_1^1\frac{1.00009}{1^{12}}\,dn\right)}\right)^2\right)^2 = \alpha_G\left(\left(\frac{e}{m_e}\right)^2\right)$$

Thus we have a non-arbitrary, non-subjective, time-line, whose units are associated to the fundamental physical constants as we know them, and have a certain minimum and maximum size with an uncertainty constrained by the Gibbs constant:



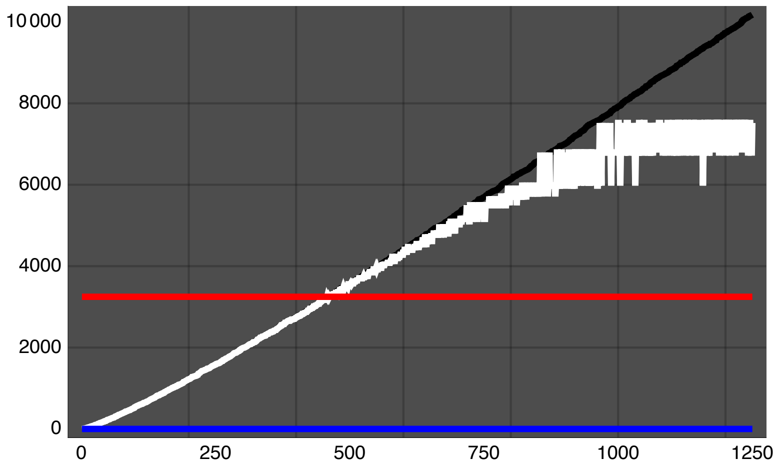
$$e^{2\gamma}\sqrt{\frac{p_x}{e^{2\gamma}}}^{\,2}$$

$$\sqrt[12]{\frac{e^{2\gamma}\left(e^{-\left(\zeta(12)-\frac{1}{12-1}\right)}\right)^2}{e^{2\gamma}\left(e^{-\left(\zeta(12)-\frac{1}{12-1}\right)}\right)^2-e^{2\gamma}\left(\exp\left(-\left(\sum_{n=1}^{p_x}\frac{1}{n^{12}}-\int_1^{p_x}\frac{1}{n^{12}}\,dn\right)\right)\right)^2}} \qquad \sqrt[12]{\frac{e^{2\gamma}\left(e^{-\left(\zeta(12)-\frac{1}{12-1}\right)}\right)^2}{\hbar}} \qquad \sqrt[12]{\frac{e^{2\gamma}\left(e^{-\left(\zeta(12)-\frac{1}{12-1}\right)}\right)^2}{\sqrt{\alpha}}}$$

This is a discontinuous -a *local*- time-line, particular to one location on the global time-line. There are a potentially infinite number of these local time-lines, each associated to a different (positive) real value of s and to a different set of constant. Refining α as

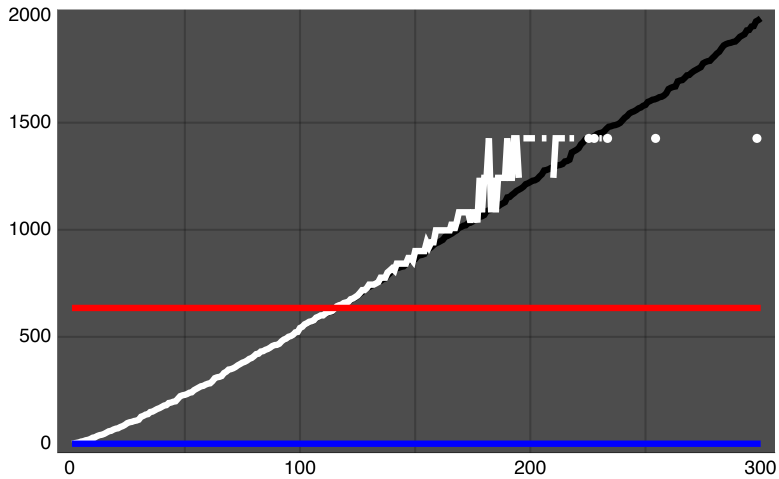
$$\alpha = \left(e^{2\gamma}\left(e^{-\left(\zeta(s)-\frac{1}{s-1}\right)}\right)^2 - e^{2\gamma}\left(e^{-\left(\sum_{n=1}^{1}\frac{1}{1^s}-\int_1^1\frac{1}{1^s}\,dn\right)}\right)^2\right)^2$$

where s is a positive integer:



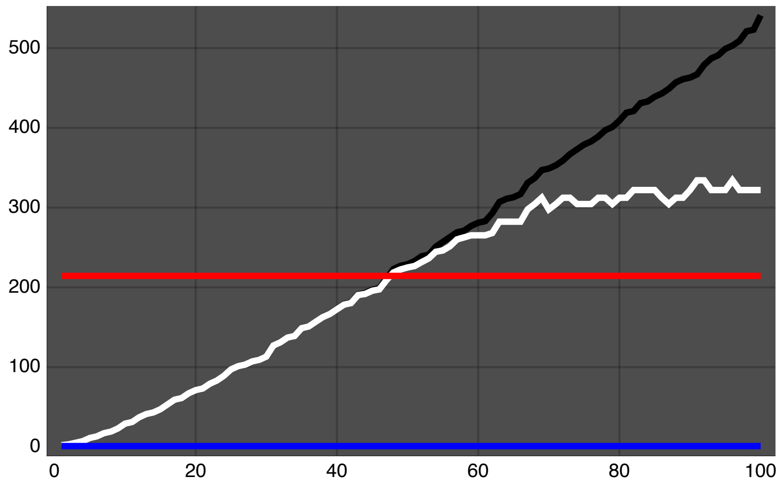
$$e^{2\gamma}\sqrt{\frac{p_x}{e^{2\gamma}}}^{\,2}$$

$$\sqrt[4]{\frac{e^{2\gamma}\left(e^{-\left(\zeta(4)-\frac{1}{4-1}\right)}\right)^2}{e^{2\gamma}\left(e^{-\left(\zeta(4)-\frac{1}{4-1}\right)}\right)^2-e^{2\gamma}\left(\exp\left(-\left(\sum_{n=1}^{p_x}\frac{1}{n^{4}}-\int_1^{p_x}\frac{1}{n^{4}}\,dn\right)\right)\right)^2}} \qquad \sqrt[4]{\frac{e^{2\gamma}\left(e^{-\left(\zeta(4)-\frac{1}{4-1}\right)}\right)^2}{\hbar}} \qquad \sqrt[4]{\frac{e^{2\gamma}\left(e^{-\left(\zeta(4)-\frac{1}{4-1}\right)}\right)^2}{\sqrt{\alpha}}}$$



$e^{2\gamma}\sqrt{\frac{p_x}{e^{2\gamma}}}^{2}$

$\sqrt[5]{\frac{e^{2\gamma}\left(e^{-\left(\zeta(5)-\frac{1}{5-1}\right)}\right)^2}{e^{2\gamma}\left(e^{-\left(\zeta(5)-\frac{1}{5-1}\right)}\right)^2-e^{2\gamma}\left(\exp\left(-\left(\sum_{n=1}^{p_x}\frac{1}{n^5}-\int_1^{p_x}\frac{1}{n^5}\,dn\right)\right)\right)^2}}$ $\sqrt[5]{\frac{e^{2\gamma}\left(e^{-\left(\zeta(5)-\frac{1}{5-1}\right)}\right)^2}{\hbar}}$ $\sqrt[5]{\frac{e^{2\gamma}\left(e^{-\left(\zeta(5)-\frac{1}{5-1}\right)}\right)^2}{\sqrt{\alpha}}}$



$e^{2\gamma}\sqrt{\frac{p_x}{e^{2\gamma}}}^{2}$

$\sqrt[6]{\frac{e^{2\gamma}\left(e^{-\left(\zeta(6)-\frac{1}{6-1}\right)}\right)^2}{e^{2\gamma}\left(e^{-\left(\zeta(6)-\frac{1}{6-1}\right)}\right)^2-e^{2\gamma}\left(\exp\left(-\left(\sum_{n=1}^{p_x}\frac{1}{n^6}-\int_1^{p_x}\frac{1}{n^6}\,dn\right)\right)\right)^2}}$ $\sqrt[6]{\frac{e^{2\gamma}\left(e^{-\left(\zeta(6)-\frac{1}{6-1}\right)}\right)^2}{\hbar}}$ $\sqrt[6]{\frac{e^{2\gamma}\left(e^{-\left(\zeta(6)-\frac{1}{6-1}\right)}\right)^2}{\sqrt{\alpha}}}$

part ii: quantum gravity

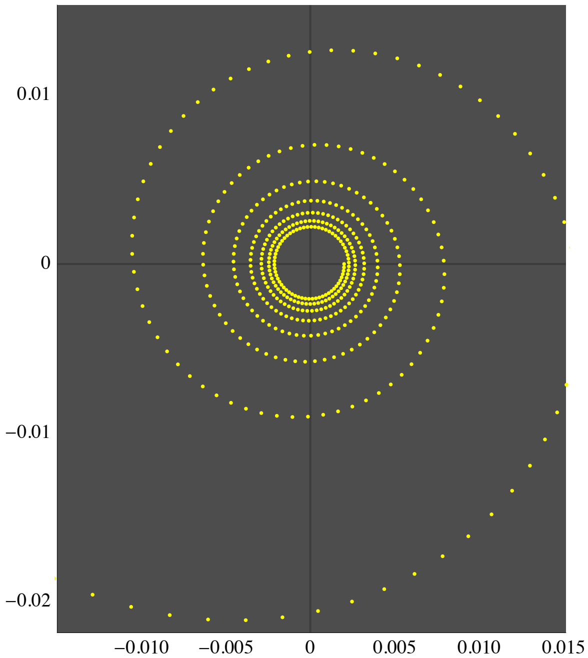
The *General Theory Relativity* in its present form says that space-time is curved by mass. It follows that, in the beginning, all the mass of that universe was concentrated into a zero-dimensional point. That the idea is *a half-truth* is shown by the implication of multiple singularities (at the centers of black holes), the lack of a coherent framework for both large scale and small scale objects, and by the flat rotation curves of distant galaxies. A similar idea that doesn't carry any absurd consequences is the idea of the infinite compression of energy (light), and the elimination of mass. Now curvature is to be attributed, not to mass - which is a combination of light and space- but to *imbalances* of light and space. Mathematically, we capture what it is to be balanced, and what it is to depart from balance thereby producing curvature, by re-expressing the tradition equation for a circle of area 1 ($\pi \sqrt{\frac{1}{\pi}}^{2} = 1$) as

$$\lim_{x\to\infty} e^{2\gamma}\left(\sqrt{\frac{1}{e^{2\left(\sum_{n=1}^{x}\frac{1}{n}-\int_1^x \frac{1}{n}\,dn\right)}}}\right)^2 = 1$$

Where the traditional equation fails by implying that an energy source located at the center of this area unit-circle is undiminished from center to circumference (it has either a zero or an infinite radius), the second provides us with a potentially infinite number of energy levels. Given that γ is a spacial case of $\zeta(s) - \frac{1}{s-1}$, we can go from $\lim_{x\to\infty} e^{2\gamma} \sqrt{\frac{1}{e^{2\left(\sum_{n=1}^{x}\frac{1}{n}-\int_1^x \frac{1}{n}\,dn\right)}}}^{2} = 1$ to the more general:

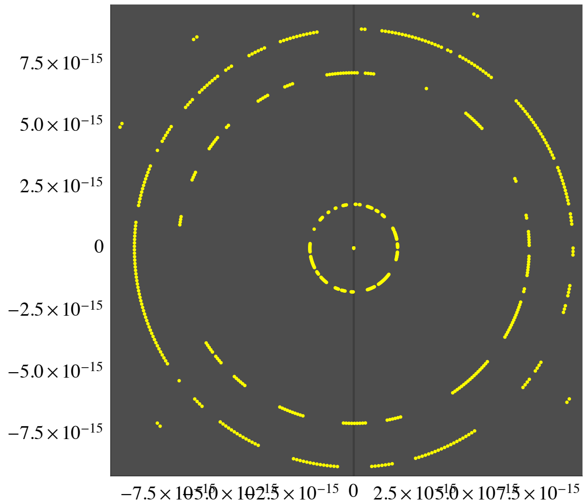
$$\lim_{x\to\infty} e^{(s+1)\left(\zeta(s)-\frac{1}{s-1}\right)}\left(\left(\frac{1}{\exp\left((s+1)\left(\sum_{n=1}^{x}\frac{1}{n^s}-\int_1^x \frac{1}{n^s}\,dn\right)\right)}\right)^{\frac{1}{s+1}}\right)^{s+1} = 1$$

Although the limit is 1, regardless of the values of x or s, we get an inter-relationship between the partial sum/integral and the limit that is non-repeating if and only $s = 1$. These dynamics are associated with spirals that unfold forever:



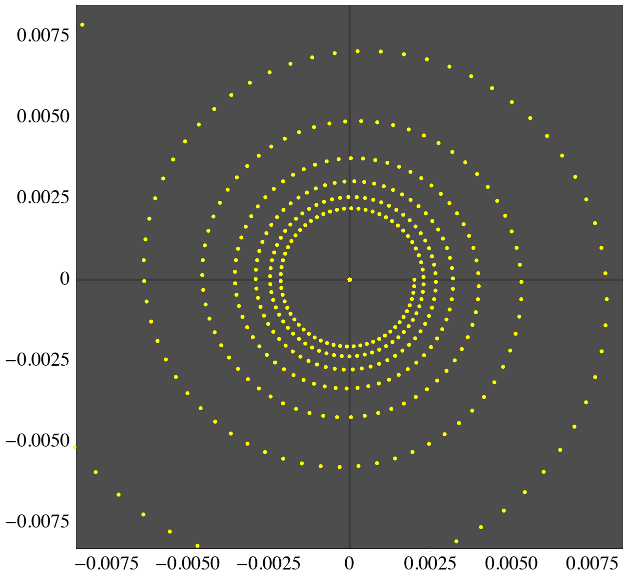
$$1 - e^{2\gamma}\sqrt{\frac{1}{e^{2\left(\sum_{n=1}^{x}\frac{1}{n}-\int_1^x \frac{1}{n}\,dn\right)}}}^{2}$$

But if s takes on a (positive) real value other than 1 -when the spiral eventually takes on a maximum/minimum size- we get an inter-relationship that *is* repetitive and a spiral whose expansion is strictly finite:



$$1 - e^{(11+1)\left(\zeta(11)-\frac{1}{11-1}\right)}\left(\left(\frac{1}{e^{(11+1)\left(\sum_{n=1}^{x}\frac{1}{n^{11}}-\int_1^x\left(\frac{1}{n^{11}}\right)dn\right)}}\right)^{\frac{1}{11+1}}\right)^{11+1}$$

$$1 - e^{(12+1)\left(\zeta(12)-\frac{1}{12-1}\right)}\left(\left(\frac{1}{e^{(12+1)\left(\sum_{n=1}^{x}\frac{1}{n^{12}}-\int_1^x\left(\frac{1}{n^{12}}\right)dn\right)}}\right)^{\frac{1}{12+1}}\right)^{12+1}$$

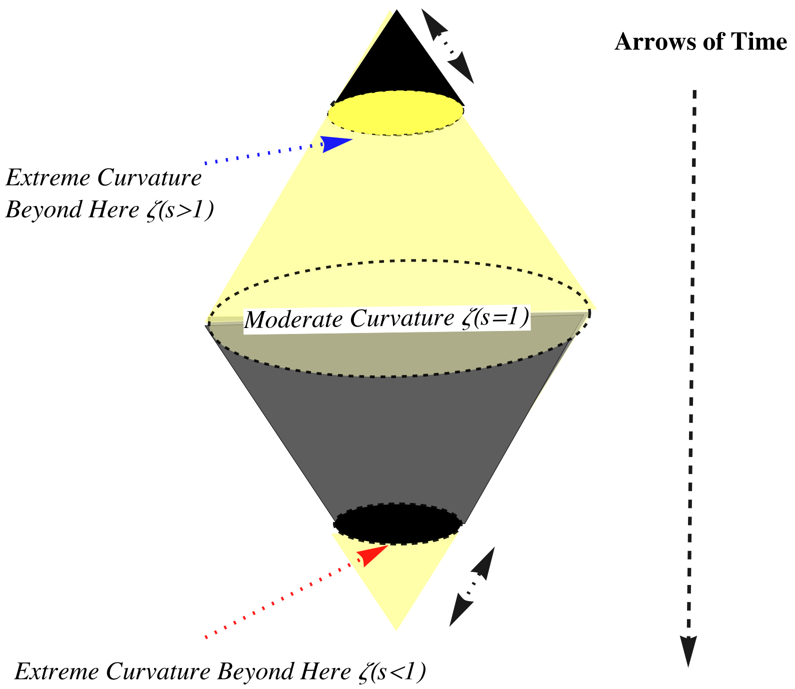


$$1 - e^{2\gamma}\sqrt{\frac{1}{e^{2\left(\sum_{n=1}^{x}\frac{1}{n}-\int_1^x\frac{1}{n}\,dn\right)}}}^{\,2}$$

$$1 - e^{(12+1)\left(\zeta(12)-\frac{1}{12-1}\right)}\left(\left(\frac{1}{e^{(12+1)\left(\sum_{n=1}^{x}\frac{1}{n^{12}}-\int_1^x\left(\frac{1}{n^{12}}\right)dn\right)}}\right)^{\frac{1}{12+1}}\right)^{12+1}$$

Take the 1/r^2 formula, and consider a circle of area 1. There is in the limit a perfect balance of light and space ($E = 1$ and $A = 1$). If however if we write π as the partial sum/integral $e^{2\left(\sum_{n=1}^{x}\frac{1}{n}-\int_1^x\frac{1}{n}dn\right)}$ and/or s is a real number other than 1, then we have an imbalance. We can say the following: if $s = 1$, then there is an approximately symmetrical relationship between light and space, and the new formula will yield predictions which are similar to those yielded by 1/r^2. If however $s \neq 1$, the balance is strongly tipped toward light (extreme example the singularity of concentrated light at the root of the universe), or conversely toward space (extreme example the interior of black holes), and the new formula makes *entirely* different predictions than 1/r^2. When $s \neq 1$, the region of space described by the new law curves back on itself. In these light or space dense environments, curvature -as a function of density- is far greater.

But all of these degrees of curvature -and everything in this universe- is governed by the same equation:



This mathematics extends the inverse square law, and extends Newton's/Einstein's law of gravity beyond the arithmetically continuous classical regions in which there is a balance of light and space, to *all* regions amenable to mathematical description. For instance, if we take a unit -such as $\sqrt[12]{\frac{e^{2\gamma}\left(e^{-\left(\zeta(12)-\frac{1}{12-1}\right)}\right)^2}{e^{2\gamma}\left(e^{-\left(\zeta(12)-\frac{1}{12-1}\right)}\right)^2-e^{2\gamma}\left(e^{-\left(\sum_{n=1}^{x}\frac{1}{n^{12}}-\int_1^x\frac{1}{n^{12}}dn\right)}\right)^2}}$ - and attach it to the equation $e^{2\gamma}\left(\sqrt{\frac{1}{e^{2\left(\sum_{n=1}^{x}\frac{1}{n}-\int_1^x\frac{1}{n}dn\right)}}}\right)^2$ like this

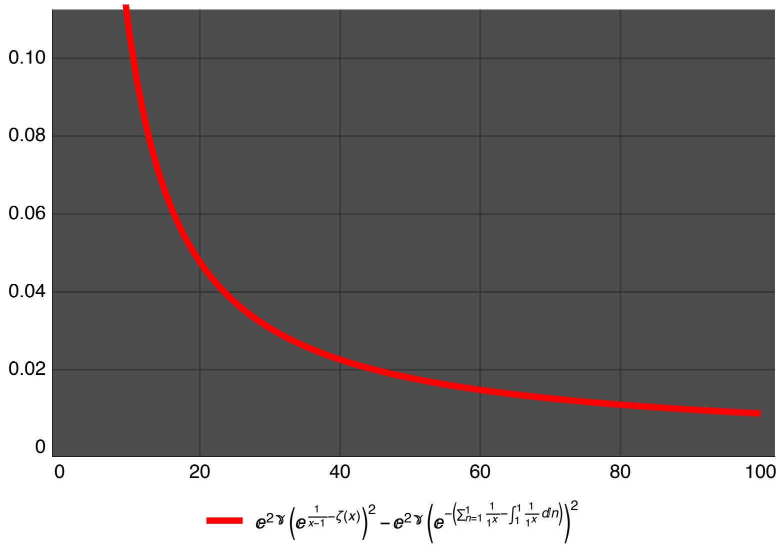
$$e^{2\gamma}\left(\sqrt{\frac{\text{Unit}}{e^{2\left(\sum_{n=1}^{x}\frac{1}{n}-\int_1^x\frac{1}{n}dn\right)}}}\right)^2$$

we see that while the overall time-line is governed by the inverse square law, the units of which this time-line is comprised are not.

part iii: re-timing the universe

An implication of this theory is that speed of light is apparent, i.e. the speed of light is a well-founded illusion derived from the expansion of space (rather than the principle according to which light is propogated at the velocity c regardless of the state of motion of the emitting body we have the principle according to which space expands at the velocity c regardless of the state of motion of a body *in* space).

Amd if we plot the first 100 positive integer values of $e^{2\gamma}\left(e^{\frac{1}{s-1}-\zeta(s)}\right)^2 - e^{2\gamma}\left(e^{-\left(\sum_{n=1}^{1}\frac{1}{1^s}-\int_1^1\frac{1}{1^s}\,dn\right)}\right)^2$, we see this means that -while every time-line is under tight constraint by its place within the global time-line governed by the Riemann Hypothesis- the apparent speed of light is faster in the past meaning that the real expansion of space is slower in the past.



Time is therefore following an asymmetric light-to-dark arrow, and all clocks based on an assumption of symmetry will yield grossly inflated times when extrapolating from the near-present to the distant past.

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