Proof of Goldbach's Conjecture, Fermat's Last Theorem

(and other thoughts)

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(I'm working completely alone, so there still may be glitches, but I'd be delighted to discuss these papers (and maybe even find out if the proofs have been published before (in the early 1920's?) or not.) And if not, I want my beer and pizza… ☺ There is much to discuss, and I'll keep adding and correcting as time goes on, until I run out of fuel.

The analysis is based on the concept of "reification" – the consequences of replacing a variable (x) with a real number (e.g. $(n)=3$).

(note: (n) n is not necessarily an integer; e.g. $(n)=\pi$).

Analysis (Proof) of Goldbach's conjecture

Short Proof of Goldbach's conjecture

Update to Proof of Goldbach's conjecture

The Relativistic Unit Circle (and proof of Fermat's Last Theorem)

The Big Bang (10/18)

Entropy (10/19)

"Every even number is the sum of two primes" – Goldbach's Conjecture

Synopsis

(My?) proof of the Goldbach conjecture rests on the affine (non-interacting) definition of prime numbers as the countability of sets defined by prime numbers where the two sets are characterized by the conditions:

1. Existence without interaction (two prime numbers related by addition, but not multiplication.
2. Prime number Interaction (two prime numbers related by multiplication, but not addition.

Addition without multiplication is indicated by the color red, and Multiplication by the color blue.

Goldbach's conjecture is proved by the relation $L = 2N$ where L and N are are the sum and product of two prime numbers, respectively, but the prime numbers included in the sets $\{L\}$ and $\{N\}$ are different under the unique operations of addition and multiplication.

Note that neither $L = M$ or $N = \frac{L}{2}$ is a prime number. but both are expressible as a unique product of prime numbers by the Fundamental Theorem of Arithmetic.

Note also that $\log_{\left(\frac{L}{N}\right)}\left(\frac{L}{N}\right)^2 = 2 = \frac{L}{N} = \log_1(1)^2$ which is equivalent to the expression $2(1)^2 = \frac{\left(1^2 + 1^2\right)}{1^2}$ where 1 and 1 are both prime numbers under the unique operations of addition and multiplication, for the common set $\left\{1^2\right\} = \left\{\left(\frac{x}{x}\right)^2\right\}$ $\forall x$ respectively). This means that Goldbach's conjecture is true for all complete sets $\{x\} \ni \Re$ where x "covers" $\Re$

In the case of entropy, for $\Omega = \left(\frac{L}{N}\right)$, $S \triangleq k_B \log_\Omega(\Omega)^2 = k_B(2) = k_B\left(\sqrt{2}\right)^2 = k_B A,\ A = \left(\sqrt{2}\right)^2$ so the entropy S is proportional to the area $A = |2|$ via Boltzmann's constant k_B. as suggested by Beckenstein/Hawking (see link to Entropy at the beginning of this article).

Extension to Fermat's Last Theorem

This is extended to the proof of Fermat's Last Theorem by noting that for $c = L = p_1 + \mathrm{p}_2$,

$c^2 = p_1{}^2 + p_2{}^2 + 2p_1p_2$

$c^n = p_1{}^n + p_2{}^n + Rem(p_1, p_2, p_1, p_2, n)$ (setting c = Binomial Expansion of p_1 and p_1 in addition and multiplication)

and noting that $c^n = a^n + b^n \Leftrightarrow Rem(p_1, p_2, p_1, p_2, n) = 0$, which cannot be true if $\{p_1, p_2, p_1, p_2, n\} > 0$ Q.E.D.

Proof

Prime Numbers are defined for the two systems by considering the equations:

$(c\tau') = (c\tau) + (v\tau')$ and its self-interaction $(c\tau')^2 = \left[(c\tau) - (v\tau')\right]^2 = (c\tau)^2 + (v\tau')^2 - 2(c\tau)(v\tau')$,

and eliminating the interaction between $(c\tau)^2$ and $(v\tau')$ by removing the multiplicative and distribution laws in their expressions by setting $(c\tau')^2 = \{0^2\}$ for $\{c > 0, \tau > 0, v > 0, \tau' > 0\}$ and defining prime numbers by $p = \left(\sqrt{p}\right)^2$

This results in the expression:

$(c\tau)^2 + (v\tau')^2 = 2(c\tau)(v\tau')$ or $(p_1) + (p_2) = 2(p_1)(p_2)$

Note that if $p_1 = p_2$ then $\left(\sqrt{p}\right)^2 + \left(\sqrt{p}\right)^2 = 2p = 2\left(\sqrt{p}\right)\left(\sqrt{p}\right) = 2\left(\sqrt{p}\right)^2 = 2p$)

Note that prime numbers are only defined for $\left(\sqrt{p}\right)^2 = |p|$ (second order self-interaction ("energy"), but not for $\sqrt{p}$ ("momentum")

The equality is an expression of the result that count of individual elements is preserved under both addition (existence) and multiplication (interaction) for prime numbers, where

$$c = \sqrt{p_1},\ \tau = \sqrt{p_1} \Rightarrow (c\tau) = \left(\sqrt{p_1}\right)^2 = p_1$$

$$v = \sqrt{p_2},\ \tau' = \sqrt{p_2} \Rightarrow (v\tau') = \left(\sqrt{p_2}\right)^2 = p_2$$

$$c = \sqrt{p_1},\ \tau = \sqrt{p_1} \Rightarrow (c\tau) = \left(\sqrt{p_1}\right)^2 = p_1$$

$$v = \sqrt{p_2},\ \tau' = \sqrt{p_2} \Rightarrow (v\tau') = \left(\sqrt{p_2}\right)^2 = p_2$$

$$2=\log_{\sqrt{p_1}}\left(\sqrt{p_1}\right)^2=\log_{\sqrt{p_1}}\left(p_1\right)=\log_{\sqrt{p_2}}\left(\sqrt{p_2}\right)^2=\log_{\sqrt{p_2}}\left(p_2\right)$$

$$2=\log_{\sqrt{p_1}\sqrt{p_2}}\left(\sqrt{p_1}\sqrt{p_2}\right)^2=\log_{\sqrt{p_1p_2}}\left(\sqrt{p_1p_2}\right)^2=\log_{\sqrt{p_1p_2}}\left(p_1p_2\right)$$

$$2=2$$

$$2+2=\log_{\sqrt{p_1}}\left(p_1\right)+\log_{\sqrt{p_2}}\left(p_2\right)=\log_{\sqrt{p_1p_2}}\left(p_1p_2\right)$$

$$\log_{\sqrt{p_1}}\left(p_1\right)+\log_{\sqrt{p_2}}\left(p_2\right)=\log_{\sqrt{p_1p_2}}\left(p_1p_2\right)$$

$$\exp\left[\log_{\sqrt{p_1}}\left(p_1\right)+\log_{\sqrt{p_2}}\left(p_2\right)\right]=\exp\left[\log_{\sqrt{p_1}}\left(p_1\right)\right]\exp\left[\log_{\sqrt{p_2}}\left(p_2\right)\right]=\exp\left[\log_{\sqrt{p_1p_2}}\left(p_1p_2\right)\right]$$

Outline of analysis:

1. Define prime numbers as a subset of the positive real numbers (positive unique sets of integers as a ring without division), and thus "countable" with a 1-1 correspondence with the positive integers where $p=p1_1=p\log_1(1)$
2. Show that Goldbach's Conjecture corresponds to the sum of two primes equal to twice the product of two primes in the general case, so that the count under addition is equal to the count under multiplication for the case of n=2 (from the Binomial Expansion, equated to a single valued function – (see proof of Fermat's Theorem) where interaction is eliminated (and thus the resultant $\{c\tau'\}=\{0\}\Leftrightarrow\left\{(c\tau')^2\right\}=\left\{0^2\right\}$ characterizes a ring without division (prime numbers)
3. Show how the analysis is related to "Spin" (and thus non-linearity – e.g., gravity, Planck's "constant" h)
4. Show that a different formal definition of the derivative is required which includes "Spin", but which is irrelevant for $v=0$ in the interaction case, because the conventional expression and the "relativistic" definition are "equal in the limit(s)"
5. The results can then be extended for relative primes (if necessary) by the Fundamental Theorem of Arithmetic.

This analysis has profound consequences for the concepts of coordinate systems (and thus Special and General Relativity), Quantum Field Theory (normalization, Green's functions, Feynman propagators, etc), and many other disciplines (e.g. Gödel's Theorem), since it addresses the very foundations of mathematics as applied to physics and philosophy, on which I will pontificate even if I have to buy the beer and pizza.

An element (number) m_0 exists if and only if it is positive definite:

$$\exists x\Leftrightarrow x=\sqrt{\left(x^2\right)}=\sqrt{(-x)^2}\triangleq|x|$$

For physics, $x_0 = c_0\tau_0 = m_0$ is the "zero point" mass; c_0 represents the mass creation rate and τ_0 the mass creation "time" for a single mass (See the RUC document). In the context of geometric "coordinates", c_0 represents the ruler creation rate and is the ruler creation time for a singe ruler, where the subscript 0 represents "reified" actual numeric values, so the elements are not variables for that specific instant.

If m_0 can only interact (multiply/divide) with itself, it must be a prime number, and $(m_0)^n$ is also a prime number.

$1_1 = \log_1(1)$ (Unit element)

$$1_{10} = \log_{10}(10)$$

$$1_x = \log_x(x)$$

$$1_{m_0} \triangleq \log_{m_0}(m_0)^{1_{m0}}$$

$$p(1_p) = p\log_p(p) = p^{(1_p)} = p$$

Consider the following expressions, where $\left\{\left(\sqrt{c}\right)^2, \left(\sqrt{v}\right)^2, \left(\sqrt{\tau}\right)^2, \left(\sqrt{\tau'}\right)^2\right\} = \{|c|, |v|, |\tau|, |\tau'|\}$ are independent variables over the positive square roots of real numbers. Assume all values are positive definite in what follows.

$$(c\tau) - (v\tau') = \{0\}$$
$$N = (c\tau) = (v\tau')$$

For integers, note that the single valued number N can be represented in a number of different multiplicative configurations:

$$12 = (3*4) = (4*3) = (2*6) = (1*12)$$

Note that $c\tau_c = c*1_c = 1_{c^c} = c\log_c(c) = \log_c(c)^c$ for $\tau_c = 1_c$ and $c = \{c\} = c*1_1$

For c and v positive numbers, $c\tau_c$ cannot be divided by a similar number $v(\tau_v')$ since negative exponents are not allowed, and thus $(c\tau_c)$ and $[v(\tau_v')]$ are relatively prime; $\frac{[v(\tau_v')]}{(c\tau_c)} = \{0\}$ and

$$\left(\frac{[v(\tau_v')]}{(c\tau_c)}\right)^2 = \{0^2\} = \left(\frac{p_2}{p_1}\right)^2, \text{ and } \left(\frac{p_2}{p_1}\right)^n = \{0^n\}$$

Proof of Goldbach's conjecture

$$A - B \geq 0 \Leftrightarrow A \geq B$$

$$[A-B]^2 = [A^2 + B^2 - 2AB] \geq 0 \Leftrightarrow [A^2 + B^2] \geq 2AB$$

A and B can be parameterized so that:

$A = (c\tau)$, $B = (v\tau')$, and

$$[(c\tau)-(v\tau')]^2 = (c\tau)^2 + (v\tau')^2 - 2(c\tau)(v\tau')$$

In order to establish an interaction between the parameterized numbers $(c\tau)$ and $(v\tau')$ the identification

$(c\tau') = (c\tau) - (v\tau')$ is established, so that:

$(c\tau')^2 = (c\tau)^2 + (v\tau')^2 - 2(c\tau)(v\tau')$ where $(c\tau')$ is the interaction (multiplication) between the two internal parameters c and τ' of the components $(c\tau')$ and $(v\tau')$

Setting $(c\tau')^2 \triangleq \{0^2\} = \left(\sqrt{p_1}\right)^2\left(\sqrt{p_2}\right)^2 = p_1 p_2$ under addition where $c > 0$ and $\tau' > 0$ eliminates any internal interaction between $(c\tau)^2$ and $(v\tau')^2$, and thus $(c\tau)$ and $(v\tau')$ so that the cartesian spaces of non-interacting elements $[(ct),(v\tau')]$ and $[(ct)^2,(v\tau')^2]$ are established, which are identified with prime numbers:

$[(ct),(v\tau')] \equiv [p_1, p_2]$ and $[(ct)^2,(v\tau')^2] \equiv [(p_1)^2,(p_2)^2]$

So that

$(c\tau)^2 + (v\tau')^2 = 2(c\tau)(v\tau') \Leftrightarrow p_1 + p_2 = 2p_1 p_2$, where the color red indicates the relation between $(c\tau)^2$ and $(v\tau')^2$ under addition (existence) and the color blue indicates the relation between $(c\tau)$ and $(v\tau')$ under multiplication. Note that the elements on both sides of the equality are independent, since there is no relation between τ and v (τ and v), so that the "metrics" $d = v\tau$, $d = v\tau$ are not defined, and similarly for $d^2 = (v\tau)^2$, $d^2 = (v\tau)^2$ and since A and B are now prime numbers, division across the equality is not allowed, and so the expressions $d = v\tau$, $d = v\tau$ (etc.) are not allowed either.

Note that $(v\tau)$ and $(v\tau)^2$ do not appear in the equation(s), so that $x = v\tau$ coordinate distance is irrelevant.

Note that $p_1 = p_2 \Leftrightarrow p_1 = p_2$, so that $p_1^2 + p_1^2 = 2p_1^2$ so that $p_1 = p_2$

For $p_1 \neq p_2 \Leftrightarrow p_1 \neq p_2$

$p_i = p_i(1_1) = p_i(\tau_i)$, $\tau_i = 1_1$ where $\{c, v, c, v\} \triangleq \{c\} \times \{v\} \times \{c\} \times \{v\}$ is complete over the sets where each of the

The set $\{(c\tau)^2, (v\tau')^2, (c\tau)^2, (v\tau')^2\} = \{P\}$ is thus a complete subset of prime numbers from the positive integers) (A ring without division), where

$$(c\tau)^2 = (p_1) = \left[\sqrt{p_1}\right]^2, \; c = \sqrt{p_1}, \; \tau_1 = \sqrt{p_1}$$
$$(v\tau')^2 = (p_2) = \left[\sqrt{p_2}\right]^2, \; v = \sqrt{p_2}, \; \tau_1' = \sqrt{p_2}$$
$$(c\tau)^2 = (p_1) = \left[\sqrt{p_1}\right]^2, \; c = \sqrt{p_1}, \; \tau_1 = \sqrt{p_1}$$
$$(v\tau')^2 = (p_2) = \left[\sqrt{p_2}\right]^2, \; v = \sqrt{p_2}, \; \tau_1' = \sqrt{p_2}$$

Then there must be a value $L = L$ for which

$L = L = (c\tau)^2 + (v\tau')^2 = M = 2(c\tau)(v\tau') = 2N$, where $M = p_1 + p_2 = 2N = 2(p_1 p_2)$

(Since the l.h.s. cannot be divided by the r.hs., this is an example of a wff that is true but unprovable (ref. Gödel), since the syntax of the r.h.s. is not expressible as a product of primes).

Goldbach's conjecture is proved by the relation $L = 2N$ where L and N are are the sum and product of two prime numbers, respectively, but the prime numbers included in the sets $\{L\}$ and $\{N\}$ are different under the unique operations of addition and multiplication.

Note that neither $L = M$ or $N = \frac{L}{2}$ is a prime number. but both are expressible as a unique product of prime numbers by the Fundamental Theorem of Arithmetic.

Note also that $\log_{\left(\frac{L}{N}\right)}\left(\sqrt{\frac{L}{N}}\right)^2 = \log_{\left(\frac{L}{N}\right)}\left(\frac{L}{N}\right)^2 = 2 = \log_1(1)^2$ which is equivalent to the expression $2(1)^2 = \frac{\left(1^2+1^2\right)}{1^2}$ where 1 and 1 are both prime numbers under the unique operations of addition and multiplication, for the common set $\{1^2\} = \left\{\left(\frac{x}{x}\right)^2\right\}$ $\forall x$ respectively). This means that Goldbach's conjecture is true for all complete sets $\{x\} \ni \Re$ where x "covers" $\Re$

Note also that $p_2 = \frac{L}{2p_1}$, so that if L and p_1 (or p_2) are known, the other can be found. Similarly, if L and p_1 (or p_2) are known, the other can be found. However, the search for these solutions in addition or multiplication are independent of each other.

Counting and Spin

$$L = p_1 + p_2 = (c\tau)^2 + (v\tau')^2 = 2(c\tau)(v\tau') = 2p_1p_2 = L$$

$$c_1 = \sqrt{p_1}, \tau_1 = \sqrt{p_1}$$
$$c_2 = \sqrt{p_2}, \tau_2 = \sqrt{p_2}$$

$$c_1\tau_1 = \left(\sqrt{p_1}\right)^2 = p_1$$
$$c_2\tau_2 = \left(\sqrt{p_2}\right)^2 = p_2$$

Then setting $L = L = h^2 = 2S^2$ where $S = p_1p_2$ the result is

$S \triangleq \frac{h}{\sqrt{2}}$ which shows that count is preserved for "Spin" in the case the elements are (non-interacting) prime numbers.

Logarithms, Counting, and Physics

An element in a set is a collection of unique (reified, indivisible) elements, which can then be defined in turn as sets of elements.

The base of a logarithm is the **count** χ of unique (single valued) elements $\sum_n 1_{x_i}$ in the set to which it refers.

For example, a set might consist of elements

$$\left\{\Omega_{x_i}\right\} = \left\{x_1 = c^n, x_2 = f(x), x_3 = f^n\left(x\right), x_4 = g(f(x)\right\} = \left\{x_1, x_2, x_3, x_4\right\}$$

$$\chi(\Omega) = \chi\left\{c^n, f(x), f^n\left(x\right), g(f(x)\right\} = \left\{1_{c^n} + 1_{f(x)} + 1_{f^n(x)} + 1_{g(f(x))}\right\} = 4,$$

so that $1_4 = \log_4(4) = log_{\chi(\Omega)}\left(\chi(\Omega)\right)^1$

$$\begin{aligned} &1_4 = \log_4(4) \\ &4 = \chi\left\{c^n, f(x), f^n\left(x\right), g(f(x)\right\} = \chi\left\{c^n, f(x), f^n\left(x\right), g(f(x)\right\} \\ &\chi\left\{c^n, f(x), f^n\left(x\right), g(f(x)\right\} \triangleq \left\{1_{c^n} + 1_{f(x)} + 1_{f^n(x)} + 1_{g(f(x))}\right\} \end{aligned}$$

The set of integers $\{Z\}$ then express the counts of the sets to which they refer. In the case the elements of the set are integers, e.g. $\Omega = \left\{4, 678, (78)^5, 1\right\}$, $\chi = 1_4 + 1_{678} + 1_{(78)^5} + 1_1 = 4$ is also an integer, and by the Fundamental Theorem of Arithmetic, can be expressed as a product of primes. In this case, each element of the set can be expressed as a sum of unit integers $1_1 = \log_1(1)^1$

For a set of elements consisting of a rational fraction, we have

$1_{\frac{1}{n}} = 1_{n^{-1}} = \log_{n^{-1}}(1)^{n^{-1}}$ so that $1_{n\left\{\frac{1}{n}\right\}} = 1_{\sum_n\left\{\frac{1}{n}\right\}} = 1_1 = \log_1(1)^1$

For an element equal to $\sqrt{2}$,

$1_{\sqrt{2}} = \log_{\sqrt{2}}(1)^{\sqrt{2}}$ so that for $\varphi = \sqrt{1+1}$

$$\varphi^2 = \left(\sqrt{1+1}\right)^2 = \left(\sqrt{2}\right)^2 = 2$$
$$1_{\left(\sqrt{2}\right)^2} = 1_2 = \log_2(\varphi)^2 = \log_2(\sqrt{1+1})^2 = 2$$

So that $\chi(\varphi^2) = 2$

Note that for $\varphi = 1+1$,

$\varphi^2 = (1+1)^2 = 1^2 + 1^2 + 2(1)^2 = 4(1)^2$ so that $\chi\left(\varphi^2\right) = 4$

If p is a prime number, then

$$\varphi = \sqrt{p_1 + p_2}$$
$$\varphi^2 = p_1 + p_2 = L$$
$$\chi(\varphi^2) = 2$$
$$\varphi = \sqrt{2p_1p_2}$$
$$\varphi^2 = 2p_1p_2 = 2N = N + N$$
$$\chi(\varphi^2) = 2$$
$$p_1 + p_2 = 2N$$
$$\chi(\varphi^2) = \chi(\varphi^2) = 2$$

Goldbach's conjecture is proved. For physics, the count of bosons is represented by non-interacting prime numbers as sets with counts of unit elements. The square root of a prime number is analogous to then Newtonian (and relativistic) momentum of a set of non-interacting elements (particles) that do not interact with anything and so do not contribute to an equal and opposite Newtonian force. The actual prime number characterizes this force (and thus its existence at a field point in a "coordinate system"), and thus Einstein's definition of "simultaneity" for photons which do not interaction.

For a given value of v, the analysis represents the "area" of the quadrants of the RUC for $\frac{\tau'}{\tau} > 1$ where "imagining" $\gamma = \{0\}$ and examining the difference allows the interpretation of this "area" as the product of two boson sets, which are countable (and therefore unobservable), which corresponds to the physical concept of "entropy" as the values of the prime numbers increase. This is why entropy is proportional to “area” as suggested by Hawking and Beckenstein (that said, I believe their analysis would have to involve degeneracy if it is to use the Gravitational constant).

$$\varphi = \sqrt{\text{Me}} \triangleq \sqrt{\text{thought}}$$
$$\varphi^2 = \left(\sqrt{\text{Me}}\right)^2 \triangleq \left|\text{thought}\right|$$

(Descartes = “I think, therefore I am”)

There is only Thee and Me, but I’m not altogether sure about Thee” …..

(Einstein’s Relativity was a desperate attempt to avoid solipsism…)

In particular, for a and b integers (and prime numbes), $1_a + 1_b = 1_{(a+b)}$.

Note that the square root of a prime number is not an integer, but $p = \sqrt{p^2}$. This has important consequences for the definition of a “coordinate” system in physics (e.g. Einstein’s definition of “simultaneity” and Newton’s third law of motion.)

Note that $N = \{p_1 p_2\}$ is a unique product of primes, as per the Fundamental Theorem of Arithmetic.

That is, the count of elements in $\text{Count}\{L\} = \text{Count}\{L\}$

In particular, for

$$p_1 = \sqrt{2} = p_2 = p_1 = p_2$$
$$p_i = \left(\sqrt{p_i}\right)^2 = p_i = \left(\sqrt{p_i}\right)^2$$

$$\left(\sqrt{2}\right)^2 + \left(\sqrt{2}\right)^2 = 2\left(\sqrt{2}\right)\left(\sqrt{2}\right)$$
$$2 + 2 = 4$$

Examples:

$$12 = 5 + 7 = 2[(3)(2)] = 2(6) = 12$$
$$12 = 11 + 1 = 2[(3)(2)] = 2(6) = 12$$
$$12 = (2)(5) + 2 = 2[(3)(2)] = 2(6) = 12$$
$$12 = 9 + 3 = (3)^2 + (3)^1 = 2[(3)(2)] = 2(6) = 12$$
$$12 = 8 + 4 = (2)^3 + (2)^2 = 2[(3)(2)] = 2(6) = 12$$
$$12 = 6 + 6 = (2)(3) + (2)(3) = 2[(3)(2)] = 2(6) = 12$$

$$30 = 23 + 7 = 2[(3)(5)] = 2(15) = 30$$
$$30 = 29 + 1 = 2[(3)(5)] = 2(15) = 30$$

Note that the above examples have been reified to the base 10. The sum can be subdivided many ways, but it can always be divided into two separate sums which are unique in terms of prime factorization, and therefore serve as p_1 and p_2 However, this subdivision must be done by observation, since there is no resultant $(c\tau')^2 = \{0^2\}$ and therefore $(c\tau') = \{0\}$ in the expression that defines prime numbers.

By Goldbach, the sum can be parsed any number of ways under addition when considering different bases

$$\left(\sqrt{30}\right)^2 = \left(\sqrt{29}\right)^2 + \left(\sqrt{1}\right)^2 = 2\left(\sqrt{3}\right)^2\left(\sqrt{5}\right)^2$$

e.g. $= \left(\sqrt{6}\right)^2 + \left(\sqrt{24}\right)^2 = \left(\sqrt{2}\right)^2 + \left(\sqrt{2}\right)^2 + \left(\sqrt{2}\right)^2 + \left(\sqrt{12}\right)^2 + \left(\sqrt{12}\right)^2$,

$$= \sum_{i=1}^{30} \left(\sqrt{1}\right)_i^2$$

and in general, $L = \left(\sqrt{L}\right)^2 = L\left(\sqrt{1}\right)^2 = \sum_{i=1}^{L} L_i,\ L_i = \left(\sqrt{1}\right)^2$

, where $L = 2N$ has a unique representation by the Fundamental Theorem of arithmetic, but can be partitioned in different ways as long as the sum is consistent in terms of the unit base.

Note that the definition of "prime number" is independent of a specific numerical value (e.g., 10) base; it applies to all bases for the logarithm to apply to all sets (bases).

The full expression is complete by the Fundamental Theorem of Arithmetic applied to N .

Thus "Every even number is the sum of two primes", since powers of prime numbers are also prime, and the count of prime sets is preserved under the operations of addition and multiplication. QED (Goldbach's Conjecture)

Proof of Fermat's Last Theorem

A "nomial" is equivalent to a prime number (the invariant count of a set of single elements, expressed by their "base count p " of the unit element $1_p = \log_p(p) = \log p(\chi\{1*p\})$, so the Binomial expansion for the case $n = 2$ applies, and thus Fermat's expression $c^n = a^n + b^n$ is false for $\{a,b,c,n\}$ positive integers, $\{a,b\}$ prime numbers, since for $(c = a+b) \equiv (L = p_1 + p_2)$,

$c^n = (a+b)^n = a^n + b^n + \operatorname{Re} m(a,b,n)$ where the Binomial Expansion has been set equal to c^n. (Note that $c \equiv L$ is not a prime number).

Since $c^n = (a+b)^n \Leftrightarrow \operatorname{Re} m(a,b,n) = 0$, Fermat's Theorem $c^n \neq (a+b)^n$ for all $\{a,b,c,n\}$, QED.

This can then be generalized to higher powers of n inductively via the expression

$$(c\tau)^n = (c\tau')^2 (c\tau')^{n-2} = ((c\tau)+(v\tau'))^2 \left[((c\tau)+(v\tau'))^{n-2}\right] = (c\tau)^n + (v\tau')^n + \operatorname{Re} m((c\tau),(v\tau'),n)$$

where $(c\tau)$ characterizes the initial state, $(v\tau')$ is a change to the initial state, and $(c\tau')$ the final state, and $(c\tau')^2 = ((c\tau)+(v\tau'))^2 = (c\tau)^2 + (v\tau')^2 + 2(c\tau)(v\tau')$ characterizes radiation and absorption to the Relativistic Unit Circle (RUC) in the document referred to above.

The result can then be extended to the interactions of more than two primes (invariant particle sets) via the multinomial theorem.

Example

For $3,4,5$ right triangle,

$$\psi\psi^* = 25 = (a+bi)(a-bi) = (b+ai)(b-ai)$$
$$(4+3i)(4-3i) = (3+4i)(3-4i) \quad ?????$$

But $\varphi^2 = c^2 = a^2 + b^2 + 2ab = 49 = 25 + 24 = \left(\sqrt{25}\right)^2 + \left(\sqrt{24}\right)^2 = \left(\sqrt{49}\right)^2 = \left(\left(\sqrt{7}\right)^2\left(\sqrt{7}\right)^2\right)^2 = 49$

Vectors and Areas

(Physically, energy is characterized by areas which only exist for $A = \left(\sqrt{A}\right)^2$)

(In vector language, $\left\{(c\tau)^2\right\}$ and $\left\{(v\tau')^2\right\}$ are "affine" (in two dimensions, "parallel"), so there is no origin (or "connection"). If they are not parallel, then h^2 characterizes the connection (origen).

Note that for rectangles and circles:

Squares (Cartesian coordinates)

$$\varphi(s_1, s_2) = s_1 + s_2 \quad (= 2s \text{ only as a sum only if } s = s_1 = s_2)$$
$$\varphi^2 = (s_1 + s_2)^2 = s_1{}^2 + s_2{}^2 + 2(s_1)(s_2)$$

(see the "Relativistic Unit Circle, where the interaction point is the "center" of the interaction "origin" is at the center of the RUC)

Squares (Radial coordinates)

$$\varphi(r_1, r_2) = r_1 + r_2 \quad (= 2r \text{ only as a sum only if } r = r_1 = r_2)$$
$$\varphi^2 = (r_1 + r_2)^2 = r_1{}^2 + r_2{}^2 + 2(r_1)(r_2) \quad ,$$
$$\pi\varphi^2 = \pi(r_1 + r_2)^2 = \pi\left[r_1{}^2 + r_2{}^2 + 2(r_1)(r_2)\right] = \pi r_1{}^2 + \pi r_2{}^2 + \left(2\pi r_1\right)r_2 = \pi r_1{}^2 + \pi r_2{}^2 + C_1 r_2$$

where the term $C_1 r_2$ indicates the interaction between the circumference C_1 of circle 1 $C_1 = 2\pi r_1$ and the radius r_2 of circle 2. The point of interaction then lies at the juncture of the circumference and radius of circle 1 and circle 2, respectively, so is characterized as "Spin" interaction at a points on either side of the $\frac{1}{\gamma}$ or γ axis at the circumference of the RUC in radial coordinates at the final state where $\left(v\tau'\right) = 0, \frac{\tau'}{\tau'} = 1_{\tau'} = \log_{\tau'}\left(\tau'\right)$ where $\tau' = \tau' exp(\tau' - \tau') = \tau' exp(\{0\})$.

If there is interaction, one circle is inside the other ($r_1 \neq r_2$), and the spin S characterizes the interaction of the two circles as a rotations at the point of interaction; if they are "rotating" in the same direction, then at the interaction point they are rotating in the opposite direction (absorption, increase in rest mass, "attraction") and if counter "rotating" at the interaction point they are rotating in the same direction (radiation, decrease in rest mass, "repulsion". The distinction is termed the "chirality" of the system.

In one “dimension” from the RUC for two elements that are interacting:

(If not interacting, $\varphi^2 = \cos^2(0) = 1,\ \theta = 0,\ (v\tau')^2 = 0 = \{0^2\}$)

“Cartesian coordinates” (interaction at the field point at the center of the RUC:

Radiation:

$$\left(1^2\right)\vec{i} = \left[(\frac{1}{\gamma})^2 + \left(\beta\right)^2 + 2\frac{\beta}{\gamma}\right]\vec{i}$$

Absorption

$$\left(\gamma^2\right)\vec{i} = \left[(1)^2 + \left(\gamma\beta\right)^2 + 2\beta\gamma\right]\vec{i}$$

“Radial coordinates” (interaction at the field point at the junction of the radius and circumference):

Radiation:

$$\pi\left(1^2\right)\vec{i} = \pi\left[(\frac{1}{\gamma})^2 + \left(\beta\right)^2 + 2\frac{\beta}{\gamma}\right]\vec{i} = \left[\pi(\frac{1}{\gamma})^2 + \pi\left(\beta\right)^2 + \left(2\pi\beta\right)\frac{1}{\gamma}\right]\vec{i}$$

Absorption

$$\pi\left(\gamma^2\right)\vec{i} = \pi\left[(1)^2 + \left(\gamma\beta\right)^2 + 2\beta\gamma\right]\vec{i} = \left[\pi(1)^2 + \pi\left(\gamma\beta\right)^2 + \left(2\pi\beta\right)\gamma\right]\vec{i}$$

(Obviously, there is much more to be said in this context)

The factor of π means one can’t “square the circle” since the interactions will be different by the factor of $|\pi| = \left(\sqrt{\pi}\right)^2$

Matrix representation

In particular, note that

$$Tr\begin{vmatrix} \left(\sqrt{2}\right)^2 & 0 \\ 0 & \left(\sqrt{2}\right)^2 \end{vmatrix} = 2\det\begin{vmatrix} \left(\sqrt{2}\right) & 0 \\ 0 & \sqrt{2} \end{vmatrix}$$

So that

$$Tr\begin{vmatrix} 2 & 0 \\ 0 & 2 \end{vmatrix} = 2\det\begin{vmatrix} \left(\sqrt{2}\right) & 0 \\ 0 & \sqrt{2} \end{vmatrix} \Leftrightarrow 2+2=4=2\left(\sqrt{2}\right)\left(\sqrt{2}\right)$$

$$|M| = \begin{vmatrix} p_1 & 0 \\ 0 & p_2 \end{vmatrix} = \begin{vmatrix} \left(\sqrt{p_1}\right)^2 & 0 \\ 0 & \left(\sqrt{p_2}\right)^2 \end{vmatrix} = \begin{vmatrix} \left(c\tau\right)^2 & 0 \\ 0 & \left(v\tau'\right)^2 \end{vmatrix}$$

$$M = Tr\left(|M|\right) = p_1 + p_2 = p_2 + p_1 = \left(\sqrt{p_1}\right)^2 + \left(\sqrt{p_2}\right)^2 = \left(c\tau\right)^2 + \left(v\tau'\right)^2$$

$$|N| = \begin{vmatrix} p_1 & 0 \\ 0 & p_2 \end{vmatrix} = \begin{vmatrix} \left(\sqrt{p_1}\right)^2 & 0 \\ 0 & \left(\sqrt{p_2}\right)^2 \end{vmatrix} = \begin{vmatrix} \left(c\tau\right) & 0 \\ 0 & \left(v\tau'\right) \end{vmatrix}$$

$$N = Det\left(|N|\right) = \left(c\tau\right)\left(v\tau'\right) = p_1 p_2 = p_2 p_1 = \left(\sqrt{p_1}\right)^2\left(\sqrt{p_2}\right)^2$$

$$M = 2N$$

$$Tr\left(|M|\right) = 2Det|N|$$

Then $h^2 = 2S^2$ where $S^2 = \det|N| = \frac{h^2}{2}$, so that again, $S = \frac{h}{\sqrt{2}}$ and particle count is preserved.

TBD – Analysis of Pauli and Dirac matrices in the light of the above…. (After lunch)

(Hint: both are inconsistent with positive real numbers)

Relativistic definition of the Derivative

The Relativistic Unit Circle

Consider the following expressions

(Orthogonal coordinates)

$$x = ct,\ x' = vt'$$
$$\varphi = ct + vt'$$

The expression $\varphi = c\tau'$ implies an interaction (multiplication) between the two terms $(c\tau)$ and $(v\tau')$. where

$$\varphi_o^{\ 2} = (ct + vt')^2 = (ct)^2 + (vt')^2 + 2(c\tau)(v\tau')$$

(Radial Coordinates)

$$r = ct,\ r' = vt'$$
$$\varphi = r' = ct' = ct + vt' = r + r'$$

Then $r' = ct'$ implies an interaction between r and r', since

$$\varphi^2 = (r + r')^2 = (r)^2 + (r')^2 + 2r(r')$$

(Up to this point, r can be replaced by s (the side of a square))

Inserting π explicitly yields

$$\pi(\varphi^2) = \pi(r + r')^2 = \pi\left[(r)^2 + (r')^2 + 2r(r')\right]$$
$$\pi(\varphi^2) = \pi(r)^2 + \pi(r')^2 + (2\pi r)(r')$$

Note that this equation is only valid for two circle, one with a radius, and the other with a circumference).

This term has a non-interacting (affine, linear) term

$$A^2 = \pi(r)^2 + \pi(r')^2$$

And a non-linear term $S^2 = (2\pi r)(r') = (C_r)r'$ which is an interaction term “affine connection” between the two circles r and r’. For r = r’, we can define a “spin” S where

$r' = r \Leftrightarrow S^2 = 2\pi r^2 = h_r^{\ 2}$, where h_r is Planck's constant in "radial coordinates", and $S = \frac{h_r}{\sqrt{2\pi}}$.

For the square with side s, setting $\pi = 1$ yields $S = \frac{h_o}{\sqrt{2}}$ where h_o is Planck's constant in "orthogonal coordinates".

Note the interaction terms can only be ignored through the use of complex numbers, ($i^2 = -1$ where

$$\psi = c\tau + iv\tau'$$
$$\psi\psi^* = (c\tau + iv\tau')(c\tau - iv\tau') = (c\tau)^2 + (v\tau')^2$$

(Imaginary numbers are complex only for those who think they are somehow real).

That is, physically real negative numbers refer only to the increase (γ) /decrease ($\frac{1}{\gamma}$) from the unit metric (initial state) $(1_{c\tau})^2 = \left(\frac{c\tau}{c\tau}\right)^2$ to the final state $(1_{c\tau'})^2 = \left(\frac{c\tau'}{c\tau'}\right)^2$ via the angle $\pm\theta, \mp\theta$ (depending on the quadrant) in the Relativistic Unit Circle.

(Negative numbers in this context represent $(c\tau')^2 - (c\tau)^2$ for $\tau' < \tau$ $(v < c)$ and $(c\tau)^2 - (c\tau')^2$ for $(v > c)$) If $v = 0$, $c\tau = \left(\sqrt{c\tau}\right)^2$, $\tau' = \tau$

Prime number interactions then represent elastic collisions in one "dimension" where particle count is preserved… (geometry is irrelevant)….

The Minkowski Metric

The problem with the Minkowski metric is not only that he thinks he can look back as well as left and right, but that he also forgot about up and down:

$$Forward = 1^2$$
$$Back = -1 = i^2$$
$$Left = -1 = i^2$$
$$Right = -1 = i^2$$
$$(Forward, Back, Left, Right) \triangleq (1^2, -1, -1, -1) \Rightarrow \begin{vmatrix} 1^2 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & -1 \end{vmatrix}$$
$$Up = -1 = i^2$$
$$Down = -1 = i^2$$
$$(1^2, -1, -1, -1, -1, -1)$$
$$(Forward, Back, Left, Right, Up, Down) \triangleq (1, -1, -1, -1, -1, -1) \Rightarrow 0 \begin{vmatrix} 1^2 & 0 & 0 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 & 0 & 0 \\ 0 & 0 & -1 & 0 & 0 & 0 \\ 0 & 0 & 0 & -1 & 0 & 0 \\ 0 & 0 & 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & 0 & 0 & -1 \end{vmatrix}$$

(Only god can look in more than one direction at the same time).

The Derivative

Consider the definition of the line $(x' = Ax_0 + b)$ and the relations:

Radiation– decrease in Initial Condition ($\tau' = \tau$)

$$x' = x_0 \tan\theta + b,\ \ b = \lim_{\beta \to 0}(\beta^2 + 2\frac{\beta}{\gamma}),\ \beta = \frac{v}{c},\ \gamma = \frac{\tau'}{\tau} < 1_{(\tau'=\tau)},\ x' < x_0 \text{ (radiation)}$$

$$\beta^2 = \left(1_{(\tau'=\tau)}\right)^2 - \left(\frac{1}{\gamma}\right)^2, \text{ (affine term)}$$

$$\left(1_{(\tau'=\tau)}\right)^2 = \left(\frac{1}{\gamma}\right)^2 + \beta^2 \Leftrightarrow \left(1_{(\tau'=\tau)}\right)^2 = \cos^2\theta + \sin^2\theta, \text{ (affine term)}$$

Spin (S)

$$2\frac{\beta}{\gamma} = S^2 = \left(\frac{h}{2}\right)^2 \Leftrightarrow S = \frac{h}{\sqrt{2}}, \text{ (interaction term)}$$

$$x_0 = m_0,\ x' = m'$$

Note that both the affine term and the interaction term tend to zero as $\beta \to 0$ since $\beta = \frac{v}{c}$ and the initial condition $x_0 = c_0\tau$ goes to zero as $c_0 \to 0$ (and thus v/c) goes to zero, independently of τ .

Thus calculus with spin and without spin is equivalent “in the limit”, and so works for all cases in which light does not interact with matter.

$$\varphi = L + M$$

$$\varphi^2 = (L+M)^2 = L^2 + M^2 = Tr\begin{vmatrix} L^2 & 0 \\ 0 & M^2 \end{vmatrix}$$, where the trace is equivalent to the sum of number of elements (single valued wff’s) in L^2 plus the number of elements (single valued wff’s) in M^2

For interaction between light and matter, they must be parameterized, so that

$$(\varphi') = L' + M'$$

$$(\varphi')^2 = L'^2 + M'^2 + 2(L'M') = Tr\begin{vmatrix} L^2 & 0 \\ 0 & M^2 \end{vmatrix} + h^2,\ h^2 = 2S^2, h = (L'M')$$

$$S \triangleq \frac{h}{\sqrt{2}}$$

For $x_0 = 0$ nothing exists, and the physical system is empty (the "null" set, $\{0\}$

An imaginary number is defined by $i = \sqrt{-1}$, so that $i^2 = -1$

An imaginary (linear) connection between light (L') and matter (M') (or vice versa) is then characterized by the relations:

$$\psi = L' + iM'$$
$$\psi\psi^* = (L' + iM')(L' - iM') = (L')^2 + (M')^2$$
$$\psi = M' + iL'$$
$$\psi\psi^* = (M' + iL')(M' - iL') = (L')^2 + (M')^2$$

(Physical interactions represented by imaginary numbers are complex only if one thinks they are somehow real.)

Absorption – increase from an Initial Condition (i.e. $(\tau' = \tau)$)

$$x' = x\tanh\theta + b,\quad b = \lim_{\beta\gamma\to\infty}\left[(\beta\gamma)^2 + 2\beta\gamma\right],\ \beta = \frac{v}{c},\ \gamma = \frac{\tau'}{\tau} > 1_{(\tau'=\tau)},\ x' > x \text{ (absorption)}$$

$$\gamma^2 = \left(1_{(\tau'=\tau)}\right)^2 + (\beta\gamma)^2,\ \text{(affine term)}$$

$$(\cosh\theta)^2 = \left(1_{(\tau'=\tau)}\right)^2 + (\sinh\theta)^2,\ \text{(affine term)}$$

$$2(\beta\gamma) = S^2 = \left(\frac{h}{2}\right)^2 \Leftrightarrow S = \frac{h}{\sqrt{2}},\ \text{(interaction term)}$$

$$x = m_0,\ x' = m'$$

Note that $x' \to \infty$ as $\theta \to \frac{\pi}{2}$

In either case, negation is defined as a decrease in θ in the RUC.

For radiation, from an initial positive final condition $\gamma_{rad} = \frac{\tau'}{\tau} < 1$ to a (more positive) final condition.

For absorption, from an initial positive final condition $\gamma_{abs} = \frac{\tau'}{\tau} > 1$ to a (less positive) final condition.

In both cases, the final condition can be taken as the initial condition for a new interaction.

Prime Numbers and the Multinomial Expansion (Euler's corollary)

Consider the number $L = L = (c\tau)^2 + (v\tau')^2 = M = 2(c\tau)(v\tau') = 2N$ expressed as a product of prime numbers by the Fundamental Theorem of Arithmetic, so that $L \neq L'$ for any other number L' expressed as a product of primes where at least one of the primes in L' is different from all those in L so that the numbers L and L' are relatively prime. These numbers are called "nomials" where $a \triangleq L \text{ and } b \triangleq L'$. Consider the expression

$c = a + b$ so that $c^2 = (a+b)^2 = a^2 + b^2 + 2b$ and $c^2 = a^2 + b^2 \Leftrightarrow 2ab = 0$ so that $c^2 = a^2 \text{ or } c^2 = b^2 \Leftrightarrow 2ab = 0$

Consider the multinomial expression where (using Einstein's summation convention)

$c_{i,j} = \sum_{i,j}(a_i + b_j)$ Then $(c_{i,j})^n = \left(\sum_{i,j}(a_i + b_j)\right)^n = \sum_i (a_i)^n + \sum_j (b_j)^n + rem(a_i, b_j, n)$, where

$(c_{i,j})^n = \sum_i (a_i)^n + \sum_j (b_j)^n$ if and only if $rem(a_i, b_j, n) = 0$ which I believe proves Euler's corollary to Fermat's theorem.