Fermat's Theorem and the Lorentz Transform

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The relativistic unit circle

Let $(x,y)=(c,v)$ be a pair of independent real numbers. A relation between them that is true for all possible values can be characterized by the scaling factors t and t', so that the pair of numbers $(xt,yt')=(ct,vt')$ is given by the triangle equality:

$(xt')^2=(yt')^2+(xt)^2$ or, equivalently $(ct')^2=(vt')^2+(ct)^2$

Fermat's Theorem from the relativistic unit circle

There are cases:

1. Case $\beta=\frac{v}{c}=\frac{y}{x}=1$
2. Case $\beta=\frac{v}{c}=\frac{y}{x}<1$
3. Case $\beta=\frac{v}{c}=\frac{y}{x}>1$

Let $n\geq 2$ $c>0$ be positive integers.

1. Case $\beta=\frac{v}{c}=\frac{y}{x}=1$

   Then $\beta=\gamma=1$, so that two relativistic unit circles are defined.

   Let $A_0=2\pi r^2=\pi(1^2+1^2)=2\pi(\gamma^2+\beta^2)=2\pi(1^2),\ r=(\gamma^2+\beta^2)$ be the total area of the two relativistic unit circles for any real radius r.

Then $c^n A_0 = c^n\left(2\pi\right)(1^2) = c^n\left(2\pi\right)$. . Then $c = c\left(\sqrt[n]{2}\sqrt[n]{\pi}\right)$, so c cannot be an integer, since it is the product of an irrational and a transcendental number, and is in fact, a contradiction $1 \neq \left(\sqrt[n]{2}\sqrt[n]{\pi}\right)$.

If c could be an integer, one would have succeeded in squaring the circle.

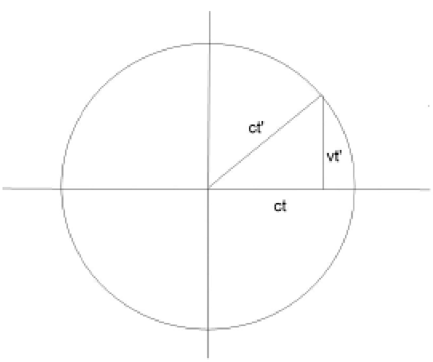
QED

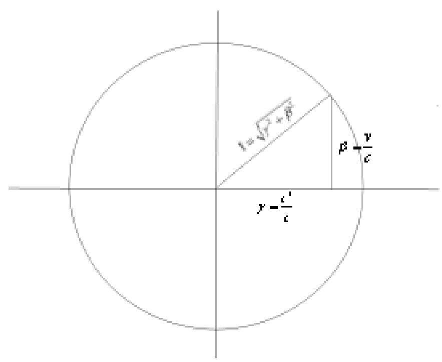
2. Case $\beta = \frac{v}{c} = \frac{y}{x} < 1$

The equation $\left(ct'\right)^2 = \left(vt'\right)^2 + \left(ct\right)^2$ can be thought of as an initial state (ct) , a "perturbation" (vt') resulting in the final state $\left(ct'\right)$ If the final state is invariant, then the initial and perturbation states can be related to it in terms of their ratios; dividing by ct' yields the equation $1^2 = \beta^2 + \gamma^2$, where $\gamma = \frac{1}{\sqrt{1-\beta^2}}$ and $\beta = \frac{v}{c} = \frac{y}{x}$

This graph of this equation is the relativistic unit circle:

The graph of these functions (referring to the variables $c, v, t,$ and t')



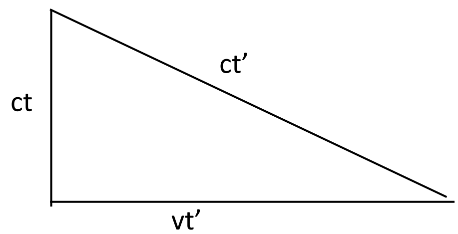


Let $A_0 = \pi r^2 = \pi(\gamma^2 + \beta^2) = \pi(1^2)$ be the area of the relativistic unit circle for any real radius r. Then $c^n A_0 = c^n \pi (1^2) = c^n \pi$. Then $c = c\sqrt[n]{\pi}$ is transcendental, so c cannot be an integer and is in fact a contradiction $1 \neq \sqrt[n]{\pi}$

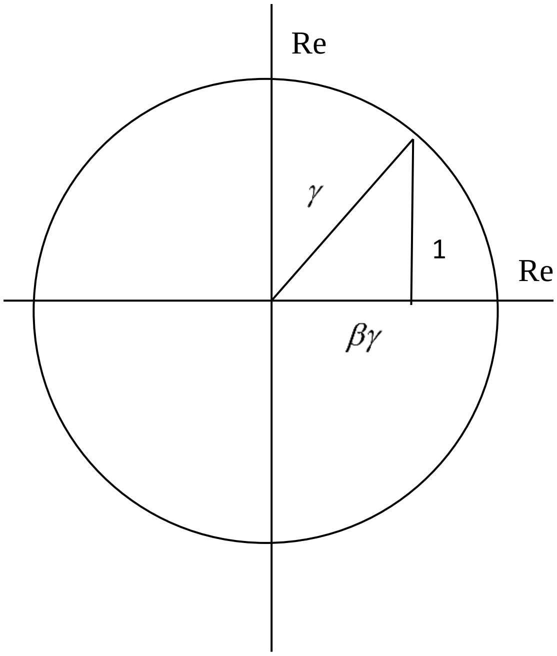
QED

3. Case $\beta = \frac{v}{c} = \frac{y}{x} > 1$

Here the roles of ct' and ct are reversed from case 2, with ct the invariant initial state, ct' the final state, while $\beta\gamma$ characterizes the “perturbation”, so that $\gamma = ct'$, $\beta\gamma = vt'$, and $ct = 1$.



Dividing by ct gives the relation between the states in the relativistic unit circle:



Then $\gamma^2 = 1^2 + (\beta\gamma)^2$ and $r^2 = 1^2 = \gamma^2 - (\beta\gamma)^2$, $r = 1$

$$A_0 = \pi r^2 = \pi(\gamma^2 - (\beta\gamma)^2) = \pi(1^2)$$

$$c^n A_0 = c^n \pi(1^2) = c^n \pi$$

Then $c = c\sqrt[n]{\pi}$, so c cannot be an integer, so neither is c^n, and is in fact a contradiction.

QED

Fermat's Theorem and the Lorentz equation

To solve the initial equation to derive the Lorentz transform, the initial equation must be squared to solve the problem, but it is important to note that π is not explicit (it can multiply both sides of the equation) $(x - vt)\alpha = c(\gamma x + \beta t)$.

This equation is then squared and coefficients are set equal to solve the final result:

$$x' = (x - vt)\gamma$$

$$t' = (t - \frac{vx}{c^2})\gamma$$

If one then stipulates that $x = ct \Leftrightarrow x' = ct'$, multiplying the bottom equation by c shows that the equations are identical, so that:

$2x' = 2(x - vt)\gamma$ and $x' = (x - vt)\gamma$

If one multiplies by π , one then has $2\pi(x') = 2\pi(x - vt)\gamma$, the "circumference" of the relativistic unit circle.

Squaring the equation $x' = (x - vt)\gamma$ yields $(x')^2 = (x - vt)^2\gamma^2 = (x^2 - 2xvt + (vt)^2)$

Setting $c = x'$, $a = x$, and $b = vt$ for a, b and c positive integers, one has

$c^2 = a^2 - 2ab + b^2$, which shows the role of the interaction term $2ab$ in the Lorentz equation.

(When solving the initial equation, one selects a root, so the actual equation is:

$c^2 = a^2 \pm 2ab + b^2$; selecting the positive term shows its relation to the Binomial Theorem for the case n=2 (and thus the proof of Fermat's theorem). Both terms together show the relation of "matter/anti-matter" in the Lorentz equation, and the foundation of its expression in the Pauli and Dirac equations.

Note that if the explicit v in the Lorentz equation is set to 0, one has:

$x' = x\gamma$, $ct' = (ct)\gamma$, and $t' = t\gamma$ (the "time dilation") equation.
and finally $c = a\gamma$ where c is irrational, since γ is irrational.

Note that $x' = (x - vt)\gamma = x\gamma - vt\gamma = x\gamma - \left[\left(\frac{v}{c}\right)ct\right]\gamma = x(\gamma - \beta\gamma)$ so that $v = 0 \Rightarrow \beta\gamma = 0$ (i.e., the interaction term $\beta\gamma = 0$) and therefore $x' = x\gamma$ and $t' = t\gamma$

For General Relativity, this means that the determinant of the diagonalized metric tensor can never be an integer for n > 2 (or even n=2 if there is an interaction term via the Binomial Theorem).

This is why "Black holes have no hair"... ☺

Summary

These proofs imply that the process of "creating integers" is a linear process, and creating more than one either is performed in one dimension (Pythagorean triples), in two (Binomial theorem for n = 2), or requires 3 for the Binomial Theorem, case n > 3.

One can think of "c " as an "integer creation rate" (starting from n=0) related to an "integer creation time"t_c . In one's mind, one can imagine a point at which the integer creation time is complete (starting from $t_0 = 0$), so that ct_c creates the integer $m_0 = ct_c = n = 1$at $t_c = t_1$. If the process repeats, ct_c increases to $ct_2 = 2$ for the second integer, in which case $2t_c$ is then re-defined as$t' = t_2$. If c remains invariant, only a single integer has been created (a "black hole"), and unless c changes, the process is complete. (Changing c to $c' = 2c$ would create the second integer).

When t_c reaches the first integer, the particle created has an invariant "rest mass" $n = m_0 = 1 = ct_1$.

To describe a relation that is true for the intermediate process for a second integer, a second process must be defined with a second "integer creation rate" v and a second "integer creation time"$t_v = 2t_1$, with subsequent integers created by a process of induction.

However, the general description of the integer creation process requires that the variables v and c be scaled by the variable factors t and t', with the initial condition $m_0 = ct_c = n = 1$ so that the induction process is linear in the vector space (ct_1, vt') which leads to the relativistic unit circle. This provides a characterization in which the definition of the first integer means that all subsequent integers are intact).

This means the introduction of a second dimension, where v and c are related by the scaling factors t andt' in the relationship of the triangle equality:

$$\left(ct'\right)^2 = \left(vt'\right)^2 + (ct_1)^2$$

This can be solved so that $t' = t_1\gamma, \gamma = \dfrac{1}{\sqrt{1-\beta^2}}, \beta = \dfrac{v}{c}$

The relativistic triangle equality characterizes linear system in terms of γ for a given β.

For $0 < ct < ct_1 = n = 1$, the first particle is created when $ct = c$ at $t_c = t_1 = 1$

For $v < c$, $\beta = \frac{v}{c}$ increases from ct_1 at $vt' = 0$ to $vt' = ct_1$ at $vt' = ct_1$ by the independent process (since ct_1 is now invariant), during which the area of the unit relativistic circle is less than two; at the end of the process, two integers are created:

$ct_1 + vt' = ct_1 + ct_2 = 2ct_1 = n = 2m_0 = 2$ for $m_0 = ct_1 = 1$

The process of integer creation continues from $ct' = 2$ to $ct'' = 3$ for $\beta = \frac{v}{c} > 1, v > c$. As additional integers are created, the "final state" of the preceding step becomes the "initial state" of the next step. The general case is then described for invariant integers a and b (in two dimensions, because two particles) by the Binomial Theorem. However, the "final state" cannot be also an "intermediate state", which is why the proof from STR is consistent with that of the Binomial Theorem; such intermediate states do not define integers.

Therefore, the creation of integers is a one dimensional process along the radius that defines the original rest mass ($n = 1$) in the initial definition of the sequence; and the intermediate processes are irrational or transcendental, or both).

Since integers are created (and counted) in one dimension, this has obvious implications for cosmology, GTR - in particular, the metric tensor vis a vis QFT ....

Quantum Triviality

Not only that, but (I think) the impulse response of a conserved relativistic system in QFT must be an integer:

Quantum Triviality

(The number of particles n in such a system is contravariant with the Greens function $\frac{1}{n}$, so that $n\left(\frac{1}{n}\right) = 1$

And the equation of a single universe (or non-interacting galaxies) is $1^2 = \gamma^2 + \beta^2$ for $c = 1$

(There may be other non-interacting galaxies and/or universes)..:)

Use your imagination and perform thought experiments. May the Farce be with you… ☺

This process is relevant also to Gödel’s Theorem (and Wittgenstein's critique). If the syntax of a logical system is defined by integers, then the human mind can always add an additional combination of symbols (propositions/integers) in addition to the system that already exists (similar to the process of adding "virtual photons" to black holes. Therefore, by Gödel’s process of defining symbols (the constituents of propositions) as integers, the system can never be consistent and complete.

Wittgenstein's point is that there must be another guy who agrees with you, but he also has the option of adding symbol/integers that both of you must agree on for the system to be "complete". And there is not only that one other guy, either - there may be more ... This is in Wittgenstein's context that even mathematics is a "language game" and if you can't imagine a number greater than what the other guy says he imagines, you have to work to resolve the discrepancy until both of you can drink your beer and eat your pizza.