Short possible solution to Fermat's last theorem

MICHAEL LAWRENCE
Maldwyn Centre for Theoretical Physics, Ipswich, Suffolk, United Kingdom
lawrence@maldwynphysics.org
16 September 2018

It is shown that Fermat's last theorem can be reduced from four variables to three and recast in the form of the relativistic γ velocity function and the relativistic addition of real fractions of *c* when *n*=2. This same methodology then enables the elimination of all higher solutions due to the consistent existence of complex-only solutions in the new reduced form at higher than *n*=2. The only rational solutions to the reduced form correspond to powers of no higher than *n*=2 in Fermat's conjecture.

Keywords: Fermat; Last Theorem; Relativity; Addition; Velocity;

PACS numbers: 04.25.D-; 02.70.-c; 06.30.Gv;

1. RECASTING THE FERMAT EQUATION

The starting point is to recast the Fermat equation for real integers (using g rather than c in the equation to avoid confusion with velocity $\boldsymbol{c}$)

$$a^n + b^n = g^n$$

into real fractions, limited to a maximum of 1, by dividing each term by g^n so that

$$\{\frac{a}{g}\}^n + \{\frac{b}{g}\}^n = 1$$

This can be reduced to only three variables, setting $< b < g$, by defining $b/g = \beta$ and $g/a = \gamma$.

The equation looks like

$$\frac{1}{\gamma^n} = 1 - \beta^n$$

and can be restated as

$$\frac{1}{\gamma^n} = (1 - \beta^{\frac{n}{2}})(1 + \beta^{\frac{n}{2}})$$

which is the crucial step.

The point is that for β to be a real fraction and the result to contain only real parts, *n* must be an even number, with the smallest power term corresponding to $\frac{n}{2} = 1$, and β^x in both $(1 - \beta^x)$ and $(1 + \beta^x)$ brackets must have that same power term. This excludes all primes except $n = 2$.

For $n = 2$ the equation becomes

$$\beta^2 = 1 - 1/\gamma^2$$

which is the standard relativistic velocity relationship where velocity *v* is related to the speed of light $\boldsymbol{c}$ by $\beta = v/\boldsymbol{c}$, although more usually seen as

$$\gamma = \frac{1}{\sqrt{1 - \beta^2}}$$

and corresponding to the relativistic addition of two velocities [1].

For even $n > 2$ there are expansions of the 'negative' $(1 - \beta^x)$ brackets possible, but there is always at least one remaining 'positive' $(1 + \beta^x)$ bracket which has a higher power term, leading to irrational or complex solutions. The expansion of $n = 4$ shows this for *n*, where *n* is part of a geometric sequence of common ratio 2 starting at 1,

$$\frac{1}{\gamma^4} = (1 - \beta^{\frac{4}{2}})(1 + \beta^{\frac{4}{2}})$$

$$= (1 - \beta)(1 + \beta)(1 + \beta^2)$$

and the expansion of $n = 6$ is an example of this for all other even *n*

$$\frac{1}{\gamma^6} = (1 - \beta^{\frac{6}{2}})(1 + \beta^{\frac{6}{2}})$$

$$= (1 - \beta^{\frac{3}{2}})(1 + \beta^{\frac{3}{2}})(1 + \beta^3)$$

In both cases, there remains a 'positive' $(1 + \beta^x)$ bracket whose power terms *x* are not 1 and whose solutions are always irrational or complex.

So in order satisfy FLT in this new reduced three-variable form above for $n \geq 2$ there need to be positive values for each of $a, b,$ and g and

$\left(\frac{a}{g}\right), \left(\frac{b}{g}\right) < 1$

$\left(\frac{a}{g}\right), \left(\frac{b}{g}\right) > 0$

and

$\left(\frac{a}{g}\right), \left(\frac{b}{g}\right) \neq$ complex or irrational numbers.

What this means is that for a, b, g, as integers required by FLT, there are no rational fractions that are solutions for $n > 2$. In terms of a, b, g, if any fractions are solutions that are irrational or complex, then at least one of a, b, g could not be integers.

So there is no requirement for the unpacking of the fractional values of β or γ and there are no rational fractions which satisfy the equations when $n > 2$, and so no integers which satisfy the FLT in its original format when $n > 2$.

2. CONCLUSION

The highest value of n for which the FLT formulae work for all possible values, in its reduced form of γ, β, and thus a, b, g, is $n = 2$, and it is trivial to show that there are integer solutions that can be unpacked from the fractional values that satisfy the equation.

This possible solution to FLT is suggested for discussion.

3. REFERENCES

1 Lawrence M (2017) The Relativistic Addition of n (Scalar) Relative Velocities and a Short Possible Solution to Fermat's Last Theorem J Phys Math 8:251. doi: 10.4172/2090-0902.1000251