

Proof of Goldbach's Conjecture

"Flamenco Chuck" Keyser

05/03/2018

(see note 01/27/2019)

$$L = (p_1)^2 + (p_2)^2 = 2(p_1)(p_2) = 2N$$

Goldbach's conjecture ("Every (positive) even number is the sum of two primes.")

Clarification 4/11/2021 (Very Short Proof)

$$\text{Let } (c\tau') = (c\tau) - (v\tau'), (c\tau) \geq (v\tau')$$

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

$$(c\tau')^2 = 0 \Leftrightarrow (c\tau)^2 + (v\tau')^2 = 2(c\tau)(v\tau')$$

Setting $(c\tau')^2 = 0$ does not mean that $(c\tau') = 0$ unless $(c\tau) - (v\tau') = 0$; that is, $(c\tau) = (v\tau')$

Then $p \triangleq (c\tau) = (v\tau')$ (first order) and $p^2 \triangleq (c\tau)^2 = (v\tau')^2$ (second order), so that

$$\text{Then } L \triangleq p^2 + p^2 = [(c\tau)^2 + (v\tau')^2] = 2(p)(p) = 2p^2 = 2N$$

Since $\{p\}$ represents the set of all prime numbers, $p^2 \in \{p\}$ and is also prime. Therefore,

$L \triangleq p^2 + p^2$ is the sum of two primes, $2N$ is an even number and consists of the product of two primes, and they both have a common unique representation under the Fundamental Theorem of Arithmetic. Since the expression exhausts $\{p\}$, Goldbach's conjecture is proven.

Then $L = 2N \equiv \{e\}$, the complete set of even numbers $\{e\}$

Then $\{(c\tau')^2\} - \{e\} = \{o\}$ so that $\{(c\tau')^2\}$ is the complete set of odd and even integers $\{Z\}$ to the unit base, so that $\{Z\} = \{o\} + \{e\}$ and the system is complete, since every integer has a unique representation in sums of units $N = \sum_1^n (1_n)$.

Note that:

$$4(1^2) = (1+1)^2 = 1^2 + 1^2 + 2(1^2)$$

$$4(p^2) = (p+p)^2 = p^2 + p^2 + 2(p^2)$$

(This proof is fundamental to the numerical representation of existing physical systems in one and two dimensions (Including those represented by multinomials), where existence is represented by the sum of positive entities, and interaction is represented by the products of entities. If negative elements are not allowed, then neither is the square root of negative elements, so imaginary numbers must be excluded from physics.)

(Some clarifications probably needed in discussion below, but don't have time right now to revisit it)

[Discussion/example](#)

05/04/2018 Added note clarifying role of metric L/L=1

05/05/2018 Added clarifying comments regarding nomials, added examples

05/09/2018 Added clarifying comment on nomials

01/18/2019 Added clarification why proof is valid for all positive real numbers, not just integers

[Update](#) (02/05/2019)

[Thoughts on Goldbach](#) (additional points of proof) 10/10/2019

[Goldbach and Vectors](#)

Basic Proof

This proof rests on the concept that for "nomials" (as in the Binomial expansion), the arithmetic laws of multiplicative association to not apply, which preserves nomial identity under parametrization; that is,

$(c\tau)(v\tau') \neq (c\tau')(v\tau)$ (Nomials – no multiplicative laws association or distribution) [Proof of Fermat's Last Theorem](#) (and the mathematical foundation of Theory of Relativity)

Furthermore, in defining prime numbers, the following condition also holds:

$(c\tau)(v\tau') \neq (c\tau')(v\tau) = 0$ (Goldbach Proof) (Definition of prime numbers) (This discussion)

Consider the relation $(c\tau') = (c\tau) - (v\tau') = (c\tau, v\tau')$ where $c\tau \in \mathbb{R}_1$ and $v\tau' \in \mathbb{R}_2$ have no common factors $\mathbb{R}_1 \cup \mathbb{R}_2 = \{0\}$, and so are prime numbers relative to each other, and the product $(c\tau')$ is a multiplicative relation between \mathbb{R}_1 and \mathbb{R}_2 . (Or one can say that $x = (c\tau)$ and $x' = (v\tau')$ are independent variables in the same set where $\{x, x'\} \in \mathbb{R}$). These factors are nomials in the Binomial expansion for $n = 2$.

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

Setting $(c\tau')^2 = 0$ eliminates the multiplicative factor having common elements from each nomial, so that in

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

the nomials are relatively prime numbers except for common multiplicative factors on each side of the equation.

Clarification (added 01/18/2019)

Setting $ct' = 0$ in the initial analysis does not mean $c=0$ or $t' = 0$; it means that c and t' are independent ("orthogonal") variables; $c \cdot t' = 0$ and $c \cdot t = ct$. By change of variable, it means that v is also independent of t , which means the elements (ct) and $(v\tau')$ are independent, which is true for all real numbers involving scalar multiplication in a single dimension.

By employing unit logarithms for t and t' , one can show why the integer examples work, but the relation is true for all real numbers, and Goldbach's conjecture is proven...

(Note that if the $(c\tau)^2 + (v\tau')^2$ and $2(c\tau)(v\tau')$ have common factors (e.g. $v = c$ and $\tau' = \tau$), the factor $k = c\tau = v\tau'$ can be divided out, so that the nomials on both sides of the equation will be relatively prime:

$k[(c\tau)^2 + (v\tau')^2] = k[2(c\tau)(v\tau')] \Leftrightarrow (c\tau)^2 + (v\tau')^2 = [2(c\tau)(v\tau')]$, where $(c\tau)^2 + (v\tau')^2$ is an expression of prime numbers under addition, and $2(c\tau)(v\tau')$ is an expression of an even product of prime numbers and so must be different, since $a + b = 2ab \Leftrightarrow a = b = 1$ for a and b prime numbers

where $a + b = 1^1 = 1^1 = 2$ is a sum, but $2(ab) = 2(1^2)$ is a product of different powers of 1. (1 is not a prime number if it applies to all variables).

Note that $1_\tau = \log_\tau(\tau)$, $\tau \neq 1$, so that $p_1 = c\tau_c$, $p_2 = v\tau_v$, $p_1 = c\tau_c$, $p_2 = v\tau_v$ are also prime numbers with no common factors.

Then the expression $(c\tau_c)^2 + (v\tau_v)^2 = 2(c\tau_c)(v\tau_v)$ can be represented by the expression

$(p_1)^2 + (p_2)^2 = 2(p_1)(p_2) = L$ for some common number L (a "length" or "metric" in the prime space defined by the operations of addition and multiplication).

$(p_1)^2$ and $(p_2)^2$ are prime numbers and $2(p_1p_2) = L$ is an even number.

Then any number $m = nL$ will also be an even number.

Therefore, every even number is equal to the sum of two primes.

QED

Note: The length $L(p_1, p_2, p_1, p_2)$ is a general relation characterizing addition and subtraction in terms of a specific set of prime numbers. This is a metric for the set of real numbers, since

$1_{(p_1, p_2, p_1, p_2)} = \frac{L(p_1, p_2, p_1, p_2)}{L(p_1, p_2, p_1, p_2)}$ becomes the unit basis for $r = r * 1_{(p_1, p_2, p_1, p_2)}$ for any real number

system; that is, it is basis for the [Relativistic Unit Circle](#) as the foundation for the complete system of real numbers in one dimension in terms of the power of 2 and the addition and multiplication operators, and is the foundation of mathematics (which can then be extended to $n > 2$ to prove Fermat's Last Theorem).

Examples

Example 1

$$(c\tau_c)^2 + (v\tau_v)^2 = 2(c\tau_c)(v\tau_v) = 30$$

$$c = \sqrt{23}, v = \sqrt{7}, c = \sqrt{5}, v = \sqrt{3}$$

$$(c\tau_c) = (\sqrt{23\tau_c}), (v\tau_v) = (\sqrt{7\tau_v}), (c\tau_c) = (5)\tau_c, (v\tau_v) = (3)\tau_v$$

$$(c\tau_c)^2 = 23, (v\tau_v)^2 = 7, (c\tau_c) = 5, (v\tau_v) = 3$$

$$23 + 7 = 2(3 * 5) = 30$$

Example 2

There can be more than one partition of $L = p_1 + p_2$, the set of additive primes is not unique, and this is not a requirement of Goldbach's conjecture. Similarly, the multiplicative nomials need not be distinct, since the only requirement is that $L = 2(p_1 p_2) = 2(p^2)$ be an even number.

For example, in the expression $L = 16 = (8 + 8) = 2(4 * 4)$, 8 is not a prime number, but

$L = 16 = (2^3 + 2^3) = 2(2^2)(2^2) = (8 + 8) = (11 + 5) = (13 + 3) = (3^2 + 7)$ where the sums consist of prime numbers. Since 2 is a prime number, then so is $2^2 = 4$ but the Goldbach conjecture does not say that the nomials in the product $(4 * 4)$ have to be distinct; the only requirement is that

$L = 2(p_1 p_2) = 2(p^2)$ be an even number.

Note that $L = 16 = [15(1_{15}) + 1(1_1)] = 2(4 * 4)$, $(1_{15}) = \log_{15}(15)$, $(1_1) = \log_1(1)$, and

$$15(1_1) = 15 * \log_1(1) = 15.$$

Therefore $15(1_{15})$ and $1(1_1)$ are not relatively prime since (1_{15}) can be divided by (1_1) so 1_{τ} to any base τ is not a prime number.