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Research Article

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ABSTRACT

Very simple method of proving Goldbach Conjecture, this proof which is simply being just algebraic process by taking the statement of the conjecture " All positive even integers $n \geq 4$ can be expressed as the sum of two primes. Two primes (p,q) such that $p+q=2N$ for n a positive integer are sometimes called a Goldbach partition (Oliveira e Silva)"and the researcher took this statement and build up the proof.

Keywords: Goldbach conjecture, Prime numbers, Even numbers.

Goldbach's original conjecture (sometimes called the "ternary" Goldbach conjecture), written in June 7, 1742 letter to Euler, states "at least it seems that every number that is greater than 2 is the sum of three primes" (Goldbach 1742; Dickson, 2005). Note that here Goldbach considered the number 1 to be a prime, a convention that is no longer followed. As re-expressed by Euler, an equivalent form of this conjecture (called the "strong" or "binary" Goldbach conjecture) asserts that all positive even integers $n \geq 4$ can be expressed as the sum of two primes. Two primes (p,q) such that $p+q=2N$ for n a positive integer are sometimes called a Goldbach partition (Oliveira e Silva). According to Hardy (1999), "It is comparatively easy to make clever guesses; indeed there are theorems, like 'Goldbach's Theorem,' which have never been proved and which any fool could have guessed."

Schnirelman (1939) proved that every even number can be written as the sum of not more than $300,000$ primes (Dunham 1990), which seems a rather far cry from a proof for *two* primes! Pogorzelski (1977) claimed to have proven the Goldbach conjecture, but his proof is not generally accepted (Shanks 1985). The following table summarizes bounds n such that the strong Goldbach conjecture has been shown to be true for numbers $\leq n$.

Goldbach conjecture: Every even integer greater than 4 can be expressed as the sum of two primes;

Proof:

Let $\wp = \{p / \{2n, 3n, 5n, 7n, 11n\}\},\ where\ \ n = 2, 3, ...$

$\wp$ is the set of odd primes since the only even prime is 2

Any odd number can be written as $2n+1 for\ n = 1, 2, ...$

Any point $p \in \wp$ can be written as $2n+1 for\ n = 1, 2, ...$

Any even number can be written as E= $2N$,$where\ n = 1, 2, ...3$

For any even E number other than 2, it's composite and can be expressed as sun of two numbers. Need to show that these two numbers are primes.

For any number N, $N = p+q\ \ we\ \ have\ three\ cases$

$$1) If\ \ p\ \ and\ \ q \in \wp where\ \ p = 2n + 1, q = 2m + 1 \Rightarrow p + q = 2n + 1 + 2m + 1 = 2m + 2n + 2$$
$$Now\ \ 2N = 2(2m + 2n + 2) = 4n + 4m + 4 = \left[\left(2(2m) + 1\right) + 1\right] + \left[\left(2(2n) + 1\right) + 1\right]$$
$$= (2k_1 + 1) + (2k_2 + 1)$$
$$where\ k_1 = 2m + 1\ and\ k_2 = 2n + 1, which\ is\ the\ sum\ of\ \ two\ odd\ \ primes$$
$$2) let\ \ p \in \wp and\ q \in E\ \ where\ \ p = 2n + 1 and\ q = 2m \Rightarrow N = p + q = 2n + 1 + 2m$$
$$= 2n + 2m + 1$$
$$Now\ \ 2N = 2(2n + 2m + 1) = 4m + 4n + 2 = \left(4m + 1\right) + \left(4n + 1\right) = (2(2m) + 1) + \left(2(2n) + 1\right)$$
$$which\ is\ the\ sum\ of\ \ two\ odd\ \ primes$$
$$3) let\ \ p \in E\ and\ q \in E\ \ where\ \ p = 2n\ and\ q = 2m \Rightarrow N = p + q = 2n + 2m = 2n + 2m + 1 - 1$$
$$Now\ \ 2N = 2(2n + 2m + 1 - 1) = 4m + 4n + 2 - 2 = \left((2^2 m - 2) + 1\right) + (4n + 1)$$
$$= [2(2m - 1) + 1] + \left(2(2n) + 1\right)$$
$$which\ is\ the\ sum\ of\ \ two\ odd\ \ primes \Rightarrow Any\ even\ number\ can\ be\ written\ as\ sum\ \ of\ \ two\ primes$$

The proof is supported with a computer program showing that the sum of any prime numbers is even.

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