New approach to the Goldbach conjecture

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Introduction

The Golbach conjecture has been a mathematical problem that has defied many attempts to prove itself over the past 300 years.

While for any child it is evident that adding 2 primes greater than 2 yields an even number, Golbach went further by conjecturing that every para number can be expressed as the sum of 2 primes.

This is the so-called Goldbach strong conjecture.

Golbach's weak conjecture holds that every odd number can be expressed as the sum of 3 primes.

It has always been held that if Golbach's strong conjecture is proved, the weak conjecture would be much easier to prove from the strong conjecture.

However, at this point in the year 2026 it is admitted that Harold Helfgott gave in 2013 a proof of Golbach's weak conjecture, while the strong conjecture remains as the one that resists being proved.

The object of this work is to propose a definitive solution to this problem assuming that the proof of the weak conjecture is true and to try to make a definitive proof for the strong conjecture.

Starting point

If every odd number can be expressed as the sum of 3 primes, then

$p + q + r = 2n + 1$ (1)

Where p, q, and r are primes

And 2n+1 represents odd numbers.

Then

$p + q + r - 1 = 2n$ (2)

If for all r>=3 r will be prime and odd

Then

r-1=2m (3)

This is because r-1 must be an even number, although not every pair can be expressed as r-1.

So, by substituting (3) into (2)

$$p + q + 2m = 2n$$

$p + 1 = 2(n - m)$(4)

If 2 n represents all imagined parents and 2 m represents a subset of the pairs, then

2(n-m)=2n-2n

This expression necessarily encompasses an infinite set of even numbers

2n-2m=2z (5)

This brings us to

$p + q = 2z$ (6)

where 2 z represents all imagined pairs.

So if all imagined pairs can be expressed as the sum of 2 primes P and q, then Golbach's strong conjecture necessarily holds true and is true.

Conclusion

although historically it has been attempted to prove that Goldbach's weak conjecture is fulfilled and is demonstrated through the proof of Goldbach's strong conjecture, it is a fact that the proof of the strong conjecture can be made by assuming the weak conjecture as true. Then there is no longer the slightest doubt about its veracity and it is not necessary to resort to probabilistic methods or statistical techniques to prove that it is an unquestionable truth.