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Two Problems of Number Theory

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Abstract
In the article, the author shows the transition from the ternary Goldbach problem to the binary and then to the solution of the problem of the infinity of twins. This article is the final one, in which the errors and shortcomings of his previous articles on this topic are corrected.

Keywords: Proposal, Solutions, to, Current, Problems

Content:
- Sum of 2 prime numbers.
- Gemini is endless.

Sum of 2 Prime Numbers
The sum of two primes is equal to any even number starting with 4. For this, solving Goldbach's ternary problem is necessary and sufficient.

Consider the algebraic sum of three primes, subject to the ternary problem.

We have:

$$p_1 + p_2 + p_3 + 2 = p_4 + p_5 + p_6 \qquad (01)$$

$$p_1 + p_2 - p_6 + 2 = p_4 + p_5 - p_3 \qquad (02)$$

$$p_1 - p_4 - p_5 + 2 = p_6 - p_2 - p_3 \qquad (03)$$

Thus:

$$p_1 + p_2 + p_3 = 2K_1 + 1 \qquad (04)$$

$$p_4 + p_5 - p_6 = 2K_2 + 1 \qquad (05)$$

$$p_1 - p_4 - p_5 = 2\ K_3 + 1 \qquad (06)$$

that is, according to (04) any odd number, starting with 7, K_1=3, and by (05),(06) any odd number starting from 3, K_2=K=1 We combine (05) and (06) according to the common odd, starting with 7. From which follows the necessary condition:

$$p_1 + p_2 + p_3 = p_4 + p_5 - p_6 = 2K + 1 \qquad (07)$$

where K is an integer starting with 3.

Let’s assume there is an even number that is not equal to the sum of two primes:

$$p_1+p_2+2\neq p_3+p_4 \quad (08)$$

which shows that in the infinite set of prime numbers there are no pairs of primes whose sum is equal to some even number.

Let’s move on to equivalents (08):

$$p_1\neq p_3+p_4-p_2-2 \quad (09)$$

and then according to (04) and (05):

$$p_1\neq p_5+p_6+p_7 \quad (10)$$

However, (10) is a contradiction if the ternary problem is solved, since this formula is its special case and in the set of primes there are always three primes equal in sum to a prime number starting with 7. Now following the equivalents in reverse order we are convinced of the inconsistency of (08) Therefore (08) equality and an even number, starting from 4 without exception, the sum of two prime numbers. Thus the sum of four primes is the sum of two pairs of primes, in which there is no even, the sum of two primes, starting with 4, which is excluded.

Gemini is Endless.

• For the infinity of twin primes, it is necessary and sufficient that Goldbach’s bipolar problem be satisfied, namely the sum of two primes is any even number starting with 4. From the solution of Goldbach’s ternary problem, taking into account (8)-(10), it follows that any prime starting with 7 can be represented as:

$$p_4=p_1+p_2+p_3 \quad (11)$$

$$p_8=p_5+p_6-p_7 \quad (12)$$

$$p_{12}=p_9-p_{10}-p_{11} \quad (13)$$

And then the difference between two prime numbers not equal to 2 according to (12), (13) is:

$$p_{12}-p_8=p_9-p_{10}-p_{11}-p_5-p_6+p_7\neq 2 \quad (14)$$

or:

$$p_9+p_7\neq p_{10}+p_{11}+p_5+p_6+2 \quad (15)$$

$$p_{10}+p_{11}+p_5+p_6+2=p_{13}+p_{14}+p_{15}+p_{16} \quad (16)$$

$$p_9+p_7\neq p_{13}+p_{14}+p_{15}+p_{16} \quad (17)$$

(17) contradicts 1.Sum of 2 prime numbers cannot be an inequality and therefore twin primes are infinite.

• Let’s consider the sum of two pairs of adjacent twin numbers:

$$p_1+p_2+p_3+p_4=2N \quad (18)$$

let’s set the value $2N=2p_2+2p_4+4$, them:

$$p_1-p_2+p_3-p_4=4 \quad (19)$$

With such equality, an infinity of prime numbers of twins is inevitable, which is achieved by replacing the next pair with the previous one.

We try to break the infinite process:

$$p_1-p_2+p_3-p_4\neq 4 \quad (20)$$

We have $p_3-p_4\neq 2$, but then there must be even numbers that cannot be represented by the sum of two prime numbers (point a), which do not exist (point 2)... Thus the process is not interrupted.

References

1. http://molodyvcheny.in.ua/files/conf/other/33feb2019/67.pdf
2. https://doi.org/10.30525/978-9934-588-11-2_17
3. http://molodyvcheny.in.ua/files/conf/other/49july2020/20.pdf
4. https://www.ej-math.org/index.php/ejmath/article/view/24/7
5. https://ppublishing.org/media/uploads/journals/article/AJT_5-6_p9-12.pdf
6. https://www.ajms.in/index.php/ajms/article/view/459/231
7. http://ijmcr.in/index.php/ijmcr/article/view/605/506
8. https://ijmcr.in/index.php/ijmcr/article/view/641/535
9. https://doi.org/10.22377/ajms.v7i03.494
10. Vol. 8 No. 01 (2024): Asian Journal of Mathematical Sciences (AJMS)
    a. https://doi.org/10.22377/ajms.v8i01.535