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Goldbach's problems.

Abstract. The Goldbach-Euler binary problem is formulated as follows: Any even number, starting from 4, can be represented as the sum of two primes. The ternary Goldbach problem is formulated as follows: Every odd number greater than 7 can be represented as the sum of three odd primes, which was finally solved in 2013. [1]-[8].

In 1995, Olivier Ramare proved that any even number is the sum of no more than 6 primes.[9]

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Theorem. Difference between any odd number and a prime odd number is equal to any even number and vice versa the difference of any even number and of a prime odd number is equal to any odd number.

Proof.

$$2K + 1 - p = 2N \quad (01)$$

where $K = K_1, K_1 + 1, \dots, K_i = K_1 + i - 1, \dots \infty$

$$N = N_1, N_1 + 1, \dots, N_i = N_1 + i - 1, \dots \infty$$

p is a prime odd number.

K and N are an infinite, continuous series of integers that begin with

K_1, N_1, p - any prime number (fixed value, some

constant). Thus we have (01). And similarly:

$$2N - p = 2K + 1 \quad (02)$$

Corollary.

If the sum of six primes is any even number, then the sum of primes less than six is odd, any odd number, if even

any even number with corresponding initial values N_1, K_1 .

From the equality of the sum of six primes to any even number it follows:

$$p_1 + p_2 + p_3 + p_4 + p_5 + p_6 + 2 = p_7 + p_8 + p_9 + p_{10} + p_{11} + p_{12} \quad (03)$$

$$p_1 + p_2 + p_3 + p_4 + p_5 + p_6 - p_{12} + 2 = p_7 + p_8 + p_9 + p_{10} + p_{11} \quad (04)$$

$$2N - p_{12} + 2 = p_7 + p_8 + p_9 + p_{10} + p_{11} \quad (05)$$

$$2K + 1 = p_7 + \dots + p_{11} \quad (06)$$

$$p_7 + p_8 + p_9 + p_{10} + p_{11} + 2 = p_{12} + p_{13} + p_{14} + p_{15} + p_{16} \quad (07)$$

...

(the index under p is not critical)

$$p_1 + p_2 + p_3 + p_4 + 2 = p_5 + p_6 + p_7 + p_8 \quad (08)$$

$$p_1 + p_2 + p_3 + p_4 - p_8 + 2 = p_5 + p_6 + p_7 \quad (09)$$

$$p_5 + p_6 + p_7 = 2K + 1 \quad (10)$$

where $K = 3, 4, 5, \dots, \infty$

weak Goldbach problem.

$$p_1 + p_2 + p_3 + 2 = p_4 + p_5 + p_6 \quad (11)$$

$$p_1 + p_2 + p_3 - p_4 + 2 = p_5 + p_6 \quad (12)$$

$$p_5 + p_6 = 2N \quad (13)$$

where $N = 2, 3, \dots, \infty$

strong Goldbach problem.

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