Existence of a Prime Number Between the Double of Other Primes Conjecture.

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0- Abstract:

In this paper I show how is possible to do a new application to the Bertrand's postulate doing a conjecture with 3 prime numbers and the double of 2 of them.

1- Introduction:

First we are going to define some useful tools: the set of the naturals, the subset of the composite numbers and the subset of the prime numbers,

$$(1) \quad A = m \cdot n \qquad \forall (m, n) \in (\mathbb{N} - [1])$$

$$(2) \quad P = (\mathbb{N} - A) - 1$$

Bertrand's postulate says that is always a prime between a natural number and the double of that number,

$$(3) \quad n < p < 2n \qquad \forall n \in \mathbb{N}; p \in P$$

Following the logic, if the prime numbers are a subset of the naturals,

$$(4) \quad P \subset \mathbb{N}$$

We can affirm that the next inequality is true.

$$(5) \quad p_1 < p_2 < 2p_1 \qquad \forall (p_1, p_2) \in P$$

2- Conjecture:

There always exits a prime p_{n+1} between p_n and $2p_n$ and there always exists a prime p_m between $2p_n$ and $2p_{n+1}$.

$$(6) \quad p_n < p_{(n+1)} < 2p_n < p_m < 2p_{(n+1)} \qquad \forall (p_n, p_m) \in P$$

References: https://en.wikipedia.org/wiki/Bertrand%27s_postulate