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MY CONJECTURE BASED ON GOLDBACH'S CONJECTURE

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ABSTRACT: *In this paper, an attempt was made to present a review on Goldbach's conjecture as well as a remarkable result derived from it. In fact, according to Goldbach's conjecture, it can be concluded that if n is a natural number, there is at least one prime number between n and 2n, in a way that $n<p<2n$. In other words, it is claimed that Bertrand postulate is included in Goldbach's conjecture. Moreover, another characteristic of prime numbers will be presented which states that for each prime number, P, there are two other prime numbers such as P_a and P_b in a way that P is equidistant from P_a and P_b. Therefore, the present article claims that Bertrand Postulate is hidden within Goldbach's conjecture.*

KEYWORDS: Prime Numbers, *Goldbach's Conjecture, Bertrand Postulate*

INTRODUCTION

Number theory is called the queen of mathematics [1] and the discussion of prime numbers has been one of the most important topics in mathematics. However, the mathematicians have not been able to fully discover prime numbers. For example, the problem of calculating P_{n+1} from P_n, in which P_n is the n^{th} prime number, is still unresolved. Thus, it can be claimed that the unknown facts about the prime numbers outnumber the known ones. However, the theory of numbers is one of the most interesting topics of mathematics. For example, Goldbach's conjecture and Bertrand's postulate has gained a warm welcome by mathematicians and researchers worldwide.
According to Hardy [2] the elementary number theory should be emphasized as one of the most important topics for primary mathematics training. It does not need much background knowledge. The topic is clear and tangible. The reasoning methods are simple, general and limited. It really arouses the curiosity of the readers. My findings are consistent with the definition proposed by Hardy.
In this paper, an attempt is made to throw some light on some of the unknown aspects of Goldbach's conjecture.

My Conjecture based on Goldbach's Conjecture

Goldbach's conjecture is based on the fact that each integer greater than 2 can be written as the sum of two prime numbers.

I believe that if n is a natural number and P is prime, there is at least one prime number between n and 2n, so that $n<p<2n$. Moreover, if an even number is written as the sum of two prime numbers for k times, there will be k prime numbers between n and 2n.

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Proof: Based on Goldach's conjecture, if n is a prime number, 2n would be the sum of two natural numbers. If we assume that P_a is the a_{th} prime number and P_b is the b_{th} Prime number and a>b, then

$$2n = P_a + P_b$$

According to Goldbach's conjecture, it is quite manifest that if P_a and P_b are both less than n, then $2n>P_a + P_b$ and that if P_a and P_b are both greater than n, then $2n<P_a + P_b$.

In other words, if $P_a<n$ and $P_b<n$, then $2n> P_a + P_b$.

If $P_a>n$ and $P_b>n$, then $2n< P_a + P_b$.

Thus, a necessary and sufficient condition to satisfy the equation, $2n=P_a + P_b$, is that P_a be greater than n and P_b be less than n and since $P_a< 2n$, then P_a will be between n and 2n, so that $n<P_a< 2n$.

Therefore, based on Goldbach's conjecture, it can be concluded that there is at least one prime number between n and 2n. Therefore, my conjecture is proved.

Other Characteristics of Goldbach's Conjecture:

1. Based on Goldbach's conjecture, $2n = P_a + P_b$ and $n = \frac{P_a + P_b}{2}$, thus n can be a prime, odd and even number.
2. If P is a prime, then $P = \frac{P_a + P_b}{2}$ and $2P = P_a + P_b$. Therefore, it can be claimed that each prime number is exactly between two other prime numbers.
3. According to Goldbach's conjecture, it can be concluded that each odd and even number and in general each natural number is exactly between two prime numbers.

CONCLUSION

In this article, using Goldbach's conjecture an attempt was made to prove the fact that if n is a natural number and P is a prime, there is at least one prime number between n and 2n. Therefore,

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it can be claimed that Bertrand's postulate is included in Goldbach's conjecture. On the other hand, it was concluded that if 2n is written as the sum of two prime numbers k times, then there are k prime numbers between n and 2n. From the other characteristics of Goldbach's conjecture, it was concluded that all prime numbers – odd or even numbers and generally all natural numbers- result from prime numbers.

REFERENCES

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