GEOMETRICAL EQUIVALENTS OF GOLDBACH CONJECTURE AND FERMAT LIKE THEOREM

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Abstract. Five geometrical equivalents of Goldbach conjecture are given, calling one of them Fermat Like Theorem.

Keywords—Goldbach circle, Fermat like theorem.

1. Introduction

The well-known Goldbach conjecture [1] states that every even number, greater than 4, can be written as the sum of two odd primes. The purpose of this paper is to state a few geometrical equivalents of Goldbach conjecture.

2. Goldbach Circle

All the different forms of the conjecture can be obtained by considering the *Goldbach Circle* as given in Figure 1. Here, ADB is a right-angled triangle, inscribed in a circle of radius n, an integer greater than 2.

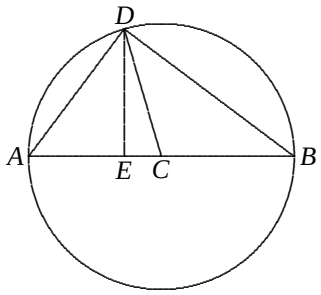

Figure 1. Goldbach Circle

Further, diameter $AB = 2n$, radius $CD = n$, $AE = p_1$ a prime, $EB = p_2$ a prime, $DE = \sqrt{p_1 p_2}$, $AD = \sqrt{p_1(p_1 + p_2)}$, $BD = \sqrt{p_2(p_1 + p_2)}$, and $EC = (p_2 - p_1)/2$. From the figure, we can write several different versions of Goldbach conjecture.

Version 1: For every n, there is a right-angled triangle ADE with sides, $AD = \sqrt{2np_1}$, $AE = p_1$, and $DE = \sqrt{p_1 p_2}$.

Version 2: For every n, there is a right-angled triangle BDE with sides, $BD = \sqrt{2np_2}$, $BE = p_2$, and $DE = \sqrt{p_1 p_2}$.

Version 3: For every n, there is a right-angled triangle DEC with sides, $CD = n$, $DE = \sqrt{p_1 p_2}$, and $EC = (p_2 - p_1)/2$.

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Version 4: For every n, there is a right-angled triangle ADB with sides, $AB = 2n$, $AD = \sqrt{2np_1}$, and $BD = \sqrt{2np_2}$.
Version 5: Corresponding to every n, there is a Goldbach Circle.

3. Conclusion

If we call $g = \sqrt{p_1 p_2}$ a *geometric prime* and $h = (p_2 - p_1)/2$ a *difference prime*, we can write version 3 as

$$n^2 = g^2 + h^2,$$

which looks similar to Fermat's last theorem in form. Hence, we may call this version *Fermat Like Theorem* which, of course, is only a conjecture.

References

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