153. A logical proof of the Polignac's conjecture based on partitions of an even number of a new formulation

Daniel Sankei[1], Loyford Njagi[1], Josephine Mutembei[1]

[1]Department of Mathematics, Meru University of Science and Technology, Meru, Kenya.

Corresponding author's e-mail: danielsankei3@gmail.com

Subtheme: Pure and Applied Sciences for Climate Action

Abstract

Polignac's Conjecture, proposed by Alphonse de Polignac in the 19th century, is a captivating hypothesis that extends the notion of twin primes to a broader context. It posits that for any even positive integer 2k, there exist infinitely many pairs of consecutive prime numbers whose difference is 2k. This conjecture is a natural generalization of the Twin Prime Conjecture, which focuses solely on pairs of primes differing by two. The conjecture has significant implications for our understanding of the distribution of prime numbers and the nature of their gaps and its exploration serves as a testament to the enduring fascination and mystery surrounding prime numbers and their properties. However, despite extensive efforts by mathematicians over the years, Polignac's Conjecture remains unproven, standing as one of the many unsolved problems in number theory. This study utilizes a set of all odd partitions generated from an even number of a new formulation and we show that, from this set of all pairs of odd numbers there exist proper subsets containing infinitely many pairs of prime numbers whose differences is a fixed even gap. Finally, using these results and the facts that the difference of any two prime numbers is even and there exist infinitely many prime numbers, a logical proof of the Polignac's Conjecture is provided.

Key words: *Polignac's Conjecture, Twin Prime Conjecture, Even numbers, Odd numbers, Prime numbers,*

***This article is published in the Asian Research Journal of Mathematics Volume 20, Issue 3, Page 1-11, 2024; Article no.ARJOM.114355 ISSN: 2456-477X.*