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New Prime Number Theory

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Abstract

This paper introduces a novel approach to estimating the sum of prime numbers by leveraging insights from partition theory, prime number gaps, and the angles of triangles. The methodology is applied to infinite sums and the nth sum, and several ways of defining the nth sum of a prime number are proposed. By using the Ramanujan infinite series of natural numbers, it is possible to derive an infinite series of prime numbers.

1 Introduction

Prime numbers and number theory were long considered to be abstract and pure mathematical topics without any practical applications beyond their inherent beauty and complexity. However, in the 1970s,it was discovered that prime numbers could be used as the foundation for creating public key cryptography algorithms, as well as hash tables and pseudo random number generators. Additionally, rotor machines with prime or co-prime numbers of pins on each rotor were developed to create a complete cycle of possible rotor positions, allowing for more secure communication. In addition to cryptography and computer science, prime numbers have also been used in music composition. Some musicians have leveraged the unique properties of prime numbers to produce pieces that go beyond traditional rules and structures, creating a sense of innovation and freedom. Furthermore, the search for the largest prime number has become a popular pursuit among mathematicians and computer scientists, with organisations such as the Electronic Frontier Foundation offering financial rewards for its discovery. Although finding the largest prime number may not have any direct practical applications in the real world, it inspires a motivated audience to delve into the study of prime numbers, which could lead to new breakthroughs and advancements in mathematics and computer science. While the study of prime numbers may not have direct applications in practical contexts, it can still attract a wide range of enthusiasts who appreciate the beauty and complexity of mathematics. By delving into the properties and relationships of prime numbers, scholars can uncover essential structures and principles that underlie the

vast and fascinating world of mathematics. The discovery of a new solution to the prime number theorem is an exciting achievement in the field of mathematics. The sequence of prime numbers has long been a source of fascination for mathematicians, and finding new and exact solutions to the sum and the infinite sum is a significant contribution to our understanding of this sequence .[4][5][6]
The use of the theories of partition and gap prime numbers in this discovery highlights the importance of these mathematical concepts in the study of the distribution of prime numbers. The results of this work have the potential to advance our understanding of the prime number theorem and inform future research in number theory and related fields. It is inspiring to see the dedication and persistence of mathematicians in their quest to understand the mysteries of prime numbers. This new result is a testament to the power of human curiosity and the pursuit of knowledge.[1][3]
Srinivasa Ramanujan's discovery of the Ramanujan Summation in the early 1900s has had a profound impact on the field of physics, specifically in the study of the Casimir Effect. The effect, as predicted by Hendrik Casimir, suggests that two uncharged conductive plates in a vacuum will experience an attractive force due to the presence of virtual particles created by quantum fluctuations. To model the amount of energy between the plates, Casimir used the Ramanujan summation, highlighting the significance of this mathematical technique. The Ramanujan Summation has continued to prove its worth as a valuable tool in understanding the behaviour of physical systems, even almost a century after its discovery. Its application in the Casimir Effect is just one example of how this technique has contributed to advancements in various branches of physics. , I will use this result to find the sum of the infinite prime number series. My plan to use the Ramanujan summation to find the sum of the infinite prime number series is also a promising avenue for research. The prime number theorem is an important topic in number theory, and finding new and exact solutions to its problems can further our understanding of this mathematical concept. [9][8][7][2]

2 Drive a Formula For Prime-Counting Function One

It is very interesting the prime number starting from 2 and it has two partitions.
2 = 2
2 = 1+1
P (2) =2 let we take a set $S = \{1, 2\}$
Choice the values for making sum of table 1 , 2 (right sides) from the set S always and L.H.S side of the table we take the prime number .

Now we create a table one

prime no	partition
2	1+1
3	1+1+1
5	1+1+1+1+1
7	1+1+1+1+1+1+1
11	1+1+1+1+1+1+1+1+1+1+1
. . .	....
sp	2n+1(n-1)+2(n-2)+2(n-3)+4(n-4)...

Table 1: prime sum table one

Making formula

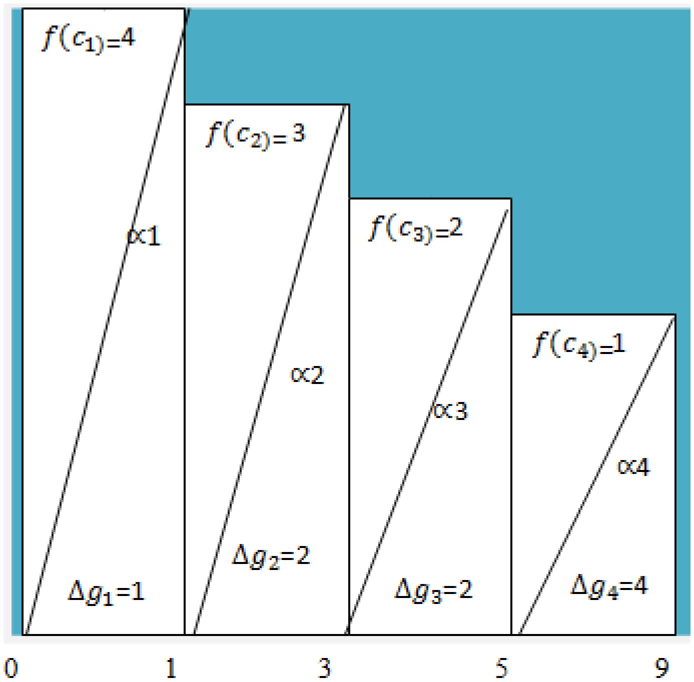
$$\pi(n) = 2n + 1(n-1) + 2(n-2) + 2(n-3) + 4(n-4)...$$

$$\pi(n) = 2n + \sum_{i=1}^{n-1} g_i(n-i) \qquad g_i = p_{i+1} - p_i$$

$$\pi(n) = 2n + \sum_{i=1}^{n-1} g_i f(c_i) \qquad f(c_i) = (n-i)$$

Other form
let we draw a sequence.
$x_i = x_{i-1} + g_i$ i=1,2,3,4...(n-1)
Let $x_o = 0$ $where\ g_i = p_{i+1} - p_i$
$x_1 = x_o + g_1 = 0 + 1 = 1$
$x_2 = x_1 + g_2 = 1 + 2 = 3$
$x_3 = x_2 + g_3 = 3 + 2 = 5$ and so on
making a set $x_p = \{0, 1, 3, 5...x_{i-1}, x_i\}$ $f(c_i) = (n-i)$

2.1 Formula in Trigonometry Form



This graph would have the set x_p values plotted on the x-axis and the function values plotted on the y-axis.

we draw a formula

$$\pi(n) = 2n + \sum_{i=1}^{n-1} (f(c_i))^2 tan\alpha_i$$

, $tan\alpha_i = \frac{g_i}{f(c_i)}$ $\qquad f(c_i) = (n-i) \qquad i = 1, 2, 3...(n-1)$

3 Drive a Formula for Prime Counting Function Two

Now we create a table two

prime no	partition	
2	2 fix	
3	2 starting	+1
5	2+2	+1
7	2+2+2	+1
11	2+2+2+2+2	+1
...	....	
Sp	2n+2(n-1)+2(n-2)+4(n-3)+2(n-4)... +2+n	

Table 2: prime sum two

Making formula

$\pi(n) = 2n + 2(n-1) + 2(n-2) + 4(n-3) + 2(n-4)... + 2 + n$
$\pi(n) = 3n + 2(n-1) + 2(n-2) + 4(n-3) + 2(n-4)... + 2$
"By replacing n with n-1 in the equation, we can adjust for the absence of the first row, giving us the following expression"
$\pi(n) = 3(n-1) + 2(n-2) + 2(n-3) + 4(n-4) + 2(n-5)... + 2$
$\pi(n) = 3n - 3 + 2(n-2) + 2(n-3) + 4(n-4) + 2(n-5)... + 2$
$\pi(n) = 3n - 1 + 2(n-2) + 2(n-3) + 4(n-4) + 2(n-5)...$

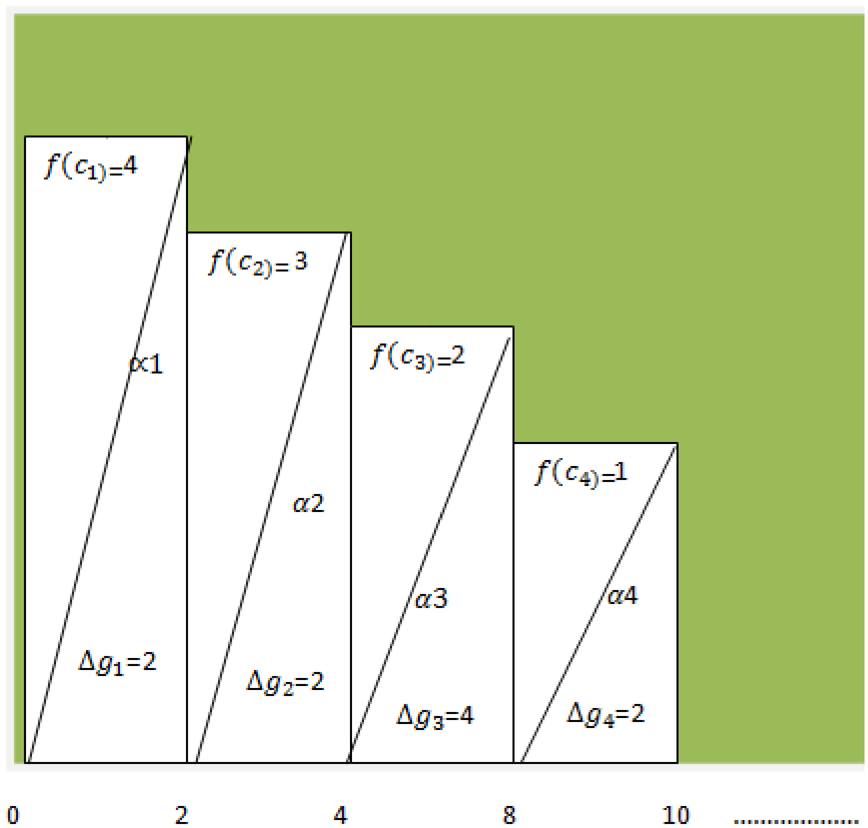
$\pi(n) = (3n-1) + \sum_{i=2}^{n-1} g_i(n-i) \qquad g_i = p_{i+1} - p_i \qquad i = 2, 3, 4...(n-1)$

$$\pi(n) = (3n-1) + \sum_{i=2}^{n-1} g_i f(c_i) \qquad f(c_i) = (n-i) \qquad i = 2, 3, 4...(n-1)$$

Note sum always positive take
let we draw a sequence.

$x_{i-1} = x_{i-2} + g_i$ i=2,3,4...(n-1)
Let $x_o = 0$ *where* $g_i = p_{i+1} - p_i$ $i = 2, 3, 4...(n-1)$
$x_1 = x_o + g_2 = 0 + 2 = 2$
$x_2 = x_1 + g_3 = 2 + 2 = 4$
$x_3 = x_2 + g_4 = 4 + 4 = 8$ and so on
making a set x_p
$x_p = \{0, 2, 4, 8...x_{i-2}, x_{i-1}\}$ $f(c_i) = (n-i)$

3.1 Formula in Trigonometry Form



This graph would have the set x_p values plotted on the x-axis and the function values plotted on the y-axis.
we draw a formula

$$\pi(n) = (3n-1) + \sum_{i=2}^{n-1} (f(c_i))^2 tan\alpha_i$$

$tan\alpha_i = \frac{g_i}{f(c_i)}$ $\qquad f(c_i) = (n-i) \quad i = 2, 3...(n-1)$

4 For Ramanujan Summation

For those of you who are unfamiliar with this series, which has come to be known as the Ramanujan Summation after a famous Indian mathematician named Srinivasa Ramanujan, it states that if you add all the natural numbers, that is 1, 2, 3, 4, and so on, all the way to infinity, you will find that it is equal to -1/12.we drived some results from this

$$S(N)_\infty = \frac{-1}{12}$$

$$S(E)_\infty = 2(\frac{-1}{12}) = \frac{-1}{6}$$

$$S(O)_\infty = S(N)_\infty - S(E)_\infty = \frac{1}{12}$$

$$S(E)_\infty - S(O)_\infty = \frac{-1}{6} - \frac{1}{12} = \frac{-1}{4}$$

$$2 - 1 + 4 - 3 + 6 - 5... = \frac{-1}{6} - \frac{1}{12} = \frac{-1}{4}$$

$$1 + 1 + 1 + 1 + 1 \cdots = \frac{-1}{4}$$

Very important result

$$1 + 1 + 1 + 1 \cdots = \sum_{n=1}^{\infty} 1 = \frac{-1}{4}$$

4.1 Sum of Table Two

The value of the largest element in set S, also known as the "supermum", is 2. Therefore, when partitioning odd numbers, we always include 2 as the first term so on and 1 as the last term. The result is obtained by adding together the L.H.S and R.H.S of the table two.
$\pi(\infty) = 2 + 3 + 5 + 7... = (2 + 2 + 2 + 2...) + (1 + 1 + 1 + 1...)$

$$\pi(\infty) = 2\sum_{n=1}^{\infty} 1 + \sum_{n=1}^{\infty} 1 = \frac{-3}{4}$$

$$\pi(\infty) = \frac{-3}{4} \sim \frac{-\pi}{4}$$

5 Application

Using the 2.1 sum formula, we can obtain the sum of the first 5th and 6th prime numbers. The results of this calculation are as follows:

Working with gap e.g

$g = \frac{90^0 - \alpha_1}{n-1}$ $\qquad \alpha_{i+1} = \alpha_i + g$

$$\alpha_1 = \arctan \frac{1}{5-1} = 14^\circ$$

$$g = \frac{90^0 - 14^0}{5-1} = 19^0$$

Simmerly find next valuess

$$\alpha_2 = \alpha_1 + g = 14^o + 19^o = 33^o$$

For first 5th values prime sum is equal to

$$\pi(5) = 10 + (4)^2 tan14^o + (3)^2 tan33^o + (2)^2 tan52^o + (1)^2 tan71^o = 27.954$$

Simmerly next

$$\pi(6) = 41.12$$

- For fast results we use 3n-1 sum formula.
- we also use radian or degree angles

6 Conclusion

Interdisciplinary research is becoming increasingly important in today's world, as it allows experts from different fields to collaborate and leverage their expertise to solve complex problems.this paper introduces a distinctive methodology for estimating prime numbers sum using partition theory, prime number gaps, and triangle angles, and applies it to analyze infinite sums and nth terms in various shapes. The insights gained from this approach shed new light on the nature of prime numbers and their connections with other mathematical concepts. .

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