Pineapple Theorem

A theorem for calculating primes and proof of the Goldbach's conjecture

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Abstract

Obtained from the mathematical observation of pineapples by the author, the pineapple theorem is a number theorem which asserts a trigonometric relationship between a positive real number $\mathbb{R}^+$ and its factor $\mathbb{R}_a{}^+$. The algorithm generates prime numbers, tests whether a given positive integer $\mathbb{Z}^+$ is composite or prime number; the theorem further expands to proving the long-standing goldbach's conjecture as well as the Euclid theorem.

Key terms: *Number theory, prime number, Goldbach conjecture, Euclid theorem, pineapple theorem, Kawinga coefficient, Kawinga number, Kawinga prime*

Definition of terms:

Pineapple theorem*, is a pure mathematical formulae showing the relationship between a positive real number (α) and its given factor (β);* ***Kawinga coefficient*** *(K_c) is a real number extracted from the pineapple formulae that is a coefficient of the factor (β);* ***Kawinga number (****K_N**)** *is a Kawinga coefficient that generates a prime factor,* ***Kawinga prime (****K_c**)** *is the prime number generated from the Pineapple prime formulae.*

1.1 Introduction

Since the advent of mathematical consideration, number theory has been a fundamental and essential theorem of mathematics and many fields of mathematics have evolved from it. On the core of number theory is however the eccentric prime number theory which is devoted to the study of primes. Prime numbers are number divisible by 1 and itself, and many questions has arisen pertaining this field, sum of which are unsolvable up to date including the Goldbach's conjecture, which asserts that every even integer greater than 2 can be expressed as the sum of two primes [7]. In number theory, composite numbers can be broken down into a product of small integers and this is called integer factorization, if these factors are further restricted to prime numbers, the process is called prime factorization [1][2]. This concept is known in computer science and mathematics as the factorization problem as there is no algorithm efficient enough to solve for large primes. Practical applications of prime number theory is the vital cryptography such as RSA public-key encryption and the RSA digital signature.

1.1.1 Prime number generating and the test for primality

There is no known efficient formula for primes [1] ,however many algorithms have been proposed, to generate prime numbers of different forms; the Mersenne prime is a prime number that is one less than a power of two primes produced from the Merssaine formulae $2^p - 1$, where p is prime [5]. The Sophie Germain pimes from the from 2p+1, where p is prime [6]. These two methods are both fast, but however not consistent as the numbers reach infinity.

The property of being prime is called primality [1]. Fibonacci invented a simple but slow method of checking the primality of a given number, called trial division, which tests whether a given number is a multiple of any integer between 2 and its own square root. However, faster algorithms have been proposed which include the Miller–Rabin primality test [4], which is fast however having a small chance of error, and the AKS primality test, which yields somehow adorable results in polynomial time but is too slow to be practical [1][3]. Despite these methods, there is always a pitfall of inconsistency to some extent, which calls for mathematicians to continually seek more revelation upon the subject matter. For example the Miller–Rabin primality test is probabilistic, meaning it works with chance therefore cannot be completely relied on.

This purpose of this paper is to introduce a formula that generates a prime number whilst testing for primality at the same time, as well as to prove the Goldbach's conjecture and the Euclid theorem.

2.1 Kawinga Pineapple Theorem

Pineapple formulae

For a positive real number α and its factor β, the following formulae holds:

$$(\alpha-\beta)(\alpha\beta-1)\beta\sqrt{(\alpha^2+1)}+(\alpha-\beta)^2(\alpha+\beta)\sqrt{(\beta^2+1)} = h(\alpha-\beta)\beta\sqrt{(\beta^2+1)(\alpha^2+1)}\ \mathrm{Cos}\emptyset$$

Where $h = \sqrt{\frac{\alpha^2\beta^2+\beta^2(\alpha-\beta)^2+(\alpha-\beta)^2+\beta^2}{\beta^2}}$ and $\mathrm{Cos}\emptyset = Cos\left[\arctan\left(\frac{\alpha-\beta}{\beta}\sqrt{\frac{\beta^2+1}{\alpha^2+1}}\right)-\arctan\left(\frac{\alpha+\beta}{\alpha\beta-1}\right)\right]$

$$(\alpha-\beta) = \frac{h\sqrt{(\beta^2+1)(\alpha^2+1)}-(\alpha\beta-1)\sqrt{(\alpha^2+1)}}{(\alpha+\beta)\sqrt{(\beta^2+1)}}\beta\ \mathrm{Cos}\emptyset$$

$$\frac{h\sqrt{(\beta^2+1)(\alpha^2+1)}-(\alpha\beta-1)\sqrt{(\alpha^2+1)}}{(\alpha+\beta)\sqrt{(\beta^2+1)}}\mathrm{Cos}\emptyset = Kawinga\ Coefficient\ (K_c)$$

$K_c = \frac{\alpha}{\beta} - 1$

$\beta = \frac{\alpha}{K_c+1}$

$\beta \; is \; odd \; if \; K_C \; is \; even$ and $is \; odd \; if \; K_C \; is \; even$.

2.2 Prime number formulae and the test for primality

Pineapple prime formulae

The prime formulae is derived from the equation $\beta = \frac{\alpha}{K_c+1}$ and is written as,

$\boldsymbol{K_P} = \frac{\boldsymbol{\alpha}}{\boldsymbol{K_N+1}}$ = $\frac{K_N \alpha}{{K_N}^2+K_N}$**,** where:

$\boldsymbol{Kawinga \; number}, \boldsymbol{K_N}$, is a $Kawinga \; Coefficient \; (K_c)$ that is less or equal to $\frac{\alpha}{2} - 1$ and is the first integer that gives an integer value for β.

Kawinga prime ($\boldsymbol{K_P}$) is a prime number generated from the function f (α, K_N) **.**

Theorem: If β is ***first integer*** value of f (α,K_N) **,** where $\alpha \in \mathbb{Z} \; and \; K_N \in \mathbb{Z} \leq \frac{\alpha}{2} - 1$ then β is a prime number (prime factor of $\boldsymbol{\alpha}$) and it is called Kawinga prime (K_P)**.**

$\boldsymbol{Lemma \; 1}$: K_N is an even number for $\boldsymbol{K_P} > 2$ and is odd for $\boldsymbol{K_P} = 2$,

It implies that K_P is a prime factor of α and α has factors K_P and $K_P + 1$, which are both odd and this becomes a solution to prime factorization.

By inserting values of $\mathbf{K_N}$, we can test whether a given integer $\boldsymbol{\alpha}$ is prime or composite, whilst looking forward to generating a prime $\boldsymbol{K_P}$ at the same time.

2.3 Explaining the inequality $\boldsymbol{K_N} \leq \frac{\alpha}{2} - 1$

The least factor (least value of β) gives the largest $value\ of\ K_N$, therefore since the least possible factor of any integer α is 2, the threshold inequality becomes $\boldsymbol{K_N} \leq \frac{\alpha}{2} - 1$ **.**

2.4 Infinitude and Proof of Euclid's theorem using pineapple formulae

Theorem: There are infinitely many prime numbers [8]

$K_P = \frac{\alpha}{K_N+1}$, and $\alpha\ > 2\ \cap\ \alpha > K_N\ + 1$

Since the largest possible value of K_N is $\frac{\alpha}{2}$, it follows that the optimized function will be having the maximum value of K_N and is given by:

$K_P\ = \frac{\alpha}{\frac{\alpha}{2}+1}$ = $K_P\ = \frac{2\alpha}{\alpha+2}$ for which $2\alpha >\ \alpha + 2$, $\forall\alpha > 2$,

This shows that infinite values of α are always greater than infinite values of $K_N\ + 1$ and therefore the function f(α, K_N) $is\ an\ infinite\ function\ and$ keeps generating values of $K_P\ to\ infinity$, thus there are infinitely many primes.

2.5 Proof of Goldbach's conjecture using pineapple formulae

Theorem: every even integer greater than 2 can be expressed as the sum of two primes [7]

2.4.1 Given two prime numbers $\boldsymbol{\beta_1\ > 2\ and\ \beta_2\ > 2,}$

$\beta_1\ = \frac{K_N\alpha_1}{{K_N}^2+K_N}$ and $\beta_2\ = \frac{K_M\alpha_2}{{K_M}^2+K_M}$, where $K_N\ \ and\ K_M\ \in Kawinga\ number$

$\beta_1 + \beta_2\ = \frac{K_N\alpha_1}{{K_N}^2+K_N} + \frac{K_M\alpha_2}{{K_M}^2+K_M}$

$\beta_1 + \beta_2 = 2\ (\frac{(K_N\ /2)\ \alpha_1}{{K_N}^2+K_N}) + 2\ (\frac{(K_M\ /2)\alpha_2}{{K_M}^2+K_M})$ while $\frac{K_N}{2}, \frac{K_M}{2}\ \in \mathbb{Z}$ from lemma 1.

Therefore $\beta_1 + \beta_2$ is an even number for all values of $\beta_1 > 2\ and\ \beta_2 > 2$.

2.4.2 Proof when $\boldsymbol{\beta_1 = 2\ and\ \beta_2 > 2}$

Now since α is even for $\beta_1 = 2, it\ implies\ that$:

$\beta_1 = \frac{2\,K_N(\alpha_1/2)}{{K_N}^2+K_N}, \beta_1 = \frac{(K_M)\alpha_2}{{K_M}^2+K_M}$, where $K_N\ \ and\ K_M\ \in Kawinga\ number$

$\beta_1 + \beta_2 = 2(\frac{K_N(\alpha_1/2)}{{K_N}^2+K_N}) + 2\,(\frac{(K_M/2)\alpha_2}{{K_M}^2+K_M}) \in even\ number$, since $\frac{\alpha_1}{2}, \frac{K_M}{2} \in \mathbb{Z}$

2.4.3 Proof when $\boldsymbol{\beta_1 = 2\ and\ \beta_2 = 2}$

$\beta_1 = \frac{2\,K_N(\alpha_1/2)}{{K_N}^2+K_N}, \beta_2 = \frac{2\,K_M(\alpha_2/2)}{{K_M}^2+K_M}$

$\beta_1 + \beta_2 = 2(\frac{K_N(\alpha_1/2)}{{K_N}^2+K_N}) + 2\,(\frac{K_M(\alpha_2/2)}{{K_M}^2+K_M}) \in even\ number\ set\ , \frac{\alpha_1}{2}, \frac{\alpha_2}{2} \in \mathbb{Z}$

Therefore this holds as proof of the goldbach conjecture.

Conclusion

The pineapple theorem is a theorem that asserts a relationship between a real number α and its factor β so as to derive a prime number theorem that has usefulness in generating prime numbers, prime factorization and testing for primality.

Inserting a very large of an integer, α, can also be useful in the generating of a very large prime number.

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