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Overview: How Does the Paper "The Continuity of Prime Numbers Can Lead to the Continuity of Even Numbers" Relate to the Goldbach Conjecture

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Abstract:

The paper "The continuity of prime numbers can lead to the continuity of even numbers" proposes three clever methods to prove the Goldbach conjecture from another path that humans never anticipated and was also the correct path. "The continuity of prime numbers can lead to the continuity of even numbers" A preprint has previously been published (Xie ling. 2021).

Keywords: *Number theory, Goldbach conjecture, The arrangement of prime and even numbers, Complete mathematical induction, Bertrand Chebyshev theorem.*

2020 Mathematics Subject Classification: 11P32,11U05, 11N05, 11P70.

Introduction

The Goldbach Conjecture proposed in 1742 (Euler, 1742): Euler's version, which states that any even number greater than 2 can be written as the sum of two prime numbers, also known as the "Strong Goldbach Conjecture" or the "Goldbach Conjecture on Even Numbers".

It was put forward in 1742, and today it has trapped excellent mathematicians of mankind.

Is this Goldbach conjecture correct? Or wrong?

Why can't humans find a way to prove or falsify?

A paper titled "The Continuity of Prime Numbers Can Lead to the Continuity of Even Numbers (hereinafter referred to as $\mathbb{GC}$)" (Xie, 2022). Connect with the Goldbach conjecture in a completely new way.

The paper ($\mathbb{GC}$) 'The continuity of prime numbers can lead to the continuity of even numbers' has previously been published in a preprint (Xie, 2021).

Version 1 posted 16 Jul, 2021 (Xie, 2021) is in draft form, where the characters in the manuscript have different colors to achieve continuity in certain numbers.

Some English expressions in the earliest manuscript (Xie, 2021) were incorrect: such as "limitless".

What the author wants to express is: limitless.

But in the manuscript, it is infinity.

I will provide detailed comments and interpret important parts of ($\mathbb{GC}$):

Section 1. background information.

Goldbach conjecture information; Information on relevant number theory knowledge; ($\mathbb{GC}$) The information expressed in the paper; I comment and interpret information on ($\mathbb{GC}$) papers.

Section 2. Definition and regulation of concepts

Provide a theoretical basis for the basic concepts of the paper ($\mathbb{GC}$) and comments.

Section 3. The continuity of prime numbers can lead to even continuity.

The ability of humans to operate and use calculators is always limited,

In a limited range of case studies, the continuity of prime numbers can lead to the continuity of even numbers.

This is an important mathematical tool for proving the Goldbach conjecture.

Section 4. The rules for generating even and prime numbers through the continuity of {prime and even}.

Use the operation case method to explain (2.4) in the second section for the convenience of readers' understanding.

Section 5. Simplified version demonstration

Through a simplified version demonstration, let readers know the logical model of the entire proof.

Section 6. Assign each equation of C_n to be equal to 2n+2.

As we all know, {6,8,10} are simple even numbers, and each even number can be expressed as the sum of two prime numbers. There is a reason to continue the above three even numbers to a sufficiently large even number 2n, and 2n can also be expressed as the addition of two prime numbers.

How can we prove that (2n+2) can also be expressed as the addition of two prime numbers? This section is how to find the combination relationship between (2n+2) and prime numbers.

Section 7. The final conclusion of the Goldbach conjecture

First, go and prove that the Goldbach conjecture is wrong. How can we prove that the Goldbach conjecture is not true?

The method is to assume that the Goldbach conjecture holds,

Find the condition (F) under which the Goldbach conjecture holds,

If (F) is not allowed to appear, it is also possible, which proves that the Goldbach conjecture is wrong.

If (F) is not allowed to appear, it will inevitably result in an error, which proves that the Goldbach conjecture is correct.

Quoting the knowledge from the previous six sections, Proved four theorems $\{\omega_1, \omega_2, \omega_3, \omega_4\}$, Found (F).

If (F) is not allowed to appear, the result is:

$$(p_0 - p_1 > 2n-4).$$

($\mathbb{GC}$) proved that the formula (p_0-p_1 $>$ 2n-4) is incorrect, therefore the Goldbach conjecture holds.

Definition and regulation of concepts

($\mathbb{GC}$) has defined and stipulated the concepts in the paper.

2.1 {Definition of prime number: A natural number greater than 1 that cannot be evenly divided by other natural numbers except for 1 and itself.**}**record: (2.1)

2.2 {Extreme settings: A may or may not be true. What conclusion can we get if we only prove that A is not.

$\{A \mid A = x, A = y\}, (A = x) \Rightarrow$ (QED). Take: $A \neq x$, only prove the $A = y$ conclusion.**}** record: (2.2)

2.3 {References cited (Erd˝os, 1932) Bertrand Chebyshev theorem: if the integer $n > 3$, then there is at least one prime p, which conforms to $n < p < 2n-2$. Another slightly weaker argument is: for all integers n greater than 1, there is at least one prime p, which conforms to $n < p < 2n$.} record: (2.3)

2.4 {The generation of even and prime numbers in this paper is specified as follows:

In this paper, the even number generation rules: the following five rules are met at the same time.

① Only odd primes are allowed as elements.

② Only two prime numbers can be added.(any combination of two odd primes).

③ Two prime numbers can be used repeatedly: $(3 + 3)$, or $(3 + 5)$, or $(p + p)$.

④ Meet the previous provisions, and all prime combination to the maximum(for example, $10 = 5 + 5$ must be: $10 = 5 + 5 = 3 + 7$,

For another example, the combination of 90 must be: $90 = 43 + 47 = 37 + 53 = 31 + 59 = 29 + 61 = 23 + 67 = 19 + 71 = 17 + 73 = 11 + 79 = 7 + 83$).

⑤ Take only one of$(p_a + p_b)$and$(p_b + p_a)$

In this paper, the generation rules of prime numbers: the following three rules are met at the same time.

① The first odd prime number is 3.

② Get the prime number from the even number. For example, $3 + 5 = 8$. Prime numbers 3 and 5 are the materials I can cite.

③ Get the prime number from the even number. It must be two prime numbers. For example, $3 + 5 = 8$. In the combination of even number 8, the prime numbers 3 and 5 are the materials I can cite.

For example, $1 + 7 = 8$. In the combination of even number 8, I cannot quote prime number 7.} record: (2.4)

A pseudo stop property is obtained in (2.4):

2.41 {Pseudo stop: Explain first. the first prime number 3, according to the even number generation regulations, gets $3 + 3 = 6$. Even number 6, according to the prime generation regulations, cannot generate 5, because $(1 + 5)$ does not meet the even number 6 in this paper, cannot generate quality 5. So there is a false stop: only 3, no 5, only 6, no 8. But you can artificially increase prime number 5, and you can also get 8 $\{3 + 5\}$. So it is a false stop.

Pseudo stop definition:

① the maximum even number among the continuous even numbers composed of k consecutive prime numbers $\{3,5,7,11,\dots,p_1\}$ is $2n$

② $\{3,5,7,11,\dots,p_1\}$can meet: $\{6,8,10,12,14,16,18,20,\dots,2n\}$

③ $\{3,5,7,11,\dots,p_1\}$ not satisfied: $\{2n + 2\}$

④ Odd prime p_0 : $p_0 \notin \{3,5,7,11,\dots,p_1\}$, satisfying: $2n + 2 = p_0 + p_y$.} record: (2.41)

2.42 {True stop: two prime numbers p_1 and p_2, satisfying: $p_1 + p_2 = 2n$. Any two prime numbers p_x and p_y cannot satisfy: $p_x + p_y = 2n + 2$.} record: (2.42)

{Friendly tip: if you prove the real stop ($p_x + p_y \neq 2n + 2$), you prove that the "Goldbach conjecture" is not tenable.}

2.5 { References cited (Mohanty, 1978) The theorem of an infinite number of primes:

the n bit after each prime can always find another prime.

For example, 3 is followed by 5, 13 is followed by 17; There must be an adjacent prime p_i after the prime p.} record: (2.5)

2.6 { Here we only discuss the following cases: prime number sequence and even number sequence

((2.5)) ⇒Prime number sequence:
$3, 5, 7, 11, 13, 17, 19, 23, \cdots\cdots$

Even number sequence:
$6, 8, 10, 12, 14, 16, 18, 20, \cdots\cdots$

Explain (2.6) in today's words: the prime number in the prime number sequence discussed in this paper is adjacent and continuous, and the first number is 3.

An even number in an even number sequence is contiguous and the first number is 6.} record: (2.6)

2.7 {Remember: all the primes I'll talk about below refer to odd primes (excluding 2). Prime symbol p, different primes use $p_1, p_2, p_3, \cdots, p_x$} record: (2.7)

3.1{ Goldbach conjecture (Euler, 1742). $3 \leq \forall n \in N, 2n = p_x + p_y$. set up△₁: $p_x \geq p_y$ } record: (3.1)

3.2 { Theorem: the continuity of prime numbers leads to the continuity of even numbers.

In mathematical language：

Known: $\{3,5,7,11,13,\cdots,p_2,p_1,p_0\} \in$ (prime)，The next neighbor of p_1 is p_0.

$$3<5<7<11<13<\cdots<p_2<p_1<p_0.$$

$\{6,8,10,12,14,16,\cdots,2n\} \in$ (continuous even number).

If : $\{3,5,7,11,13,\cdots,p_2,p_1\}$ $\Rightarrow\{6,8,10,12,14,16,\ldots,2n\}$.

inevitable:

$\{3,5,7,11,13,\cdots,p_2,p_1,p_0\}$ $\Rightarrow\{6,8,10,12,14,16,\ldots,2n,2(n+1)\}$.}record: (3.2)

Note: (3.1) and (3.2) are equivalent relationships.

The continuity of prime numbers can lead to even continuity

{The continuity of prime numbers can lead to the continuity of even numbers} →This is a great discovery by the author of the (𝔾ℂ) paper, cleverly linked to the Goldbach conjecture.

Nowadays, mathematicians studying the Goldbach conjecture use the sieve method: to remove non prime numbers from positive integers and search for (prime numbers+ prime numbers).

The Goldbach conjecture (Euler, 1742) tells us that a prime number plus a prime number yields any even number $2n$ $(2n \geq 6)$.

So, as long as the prime number is taken as the material to combine even numbers:

If we obtain continuous even numbers: $6,8,10,12,\cdots,2n,\cdots\cdots$

The Goldbach conjecture has been proven.

Use a unique method to prove the Goldbach conjecture.

I will provide an overview of how (𝔾ℂ) works.

(𝔾ℂ) (Xie, 2022) used three clever methods:

①Methods for generating prime and even numbers.

Use the simplest prime number {3,5} to generate even numbers, Find new prime numbers from these even numbers.

{Find new prime numbers from these even numbers}⇒ Question ξ.

Question ξ:

Human computer operation ability can be obtained from small even numbers:

$$\{6 = 3 + 3$$
$$8 = 5 + 3$$
$$10 = 7 + 3 = 5 + 5$$
$$\cdots\cdots$$
$$2n = p_a + p_b\}.$$

You can always get: $2n = p_a + p_b$

How do you know: $2n + 2 = p_x + p_y$?

I call this problem the ξ problem.

I will resolve the ξ issue on page 6, page 7.

Use {3,5, the newly found prime} to combine continuous even numbers.

The citation of new prime numbers also requires:Must be a prime number that appears in conjunction with another prime (refer to the second section for specific operations).

The above method is repeated.

②Arrange and combine them in order: A_n, B_n, C_n.

The setting of C_n is a wonderful idea, The condition that $\{p_x + p_y = 2n + 2\}$ holds must be within C_n.

The condition for $\{p_x + p_y = 2n + 2\}$ to hold is (F):

$$\{\, p_0\text{-}p_1 = 2$$

$$p_0\text{-}p_1 = 4$$

$$p_0\text{-}p_1 = 6$$

$$\cdots\cdots$$

$$p_0\text{-}p_1 = 2(n\text{-}3)$$

$$p_0\text{-}p_1 = 2(n\text{-}2)\}\ \text{Recorded as (F)}$$

That is to say, as long as one equation in (F) holds, then ($p_x + p_y = 2n + 2$) holds.

③Connect (Goldbach conjecture) with (Bertra nd Chebyshev theorem).

If you want to negate $\{p_x + p_y = 2n + 2\}$, you must negate (F).

Negating (F) yields:

$$\{\, p_0\text{-}p_1 \neq 2$$

$$p_0\text{-}p_1 \neq 4$$

$$p_0\text{-}p_1 \neq 6$$

$$\cdots\cdots$$

$$p_0\text{-}p_1 \neq 2(n\text{-}3)$$

$$p_0\text{-}p_1 \neq 2(n\text{-}2)\}$$

$$\Rightarrow\ p_0\text{-}p_1 > 2(n\text{-}2)$$

$$\Rightarrow\ (p_0 > p_1 + 2n\text{-}4)$$

The "Bertrand Chebyshev theorem" will inevitably be connected to ($p_0 > p_1 + 2n\text{-}4$).

(Note) Continuity of prime numbers: Prime numbers are arranged in order from smallest to largest.

(Odd Prime) Continuous:

$$3,5,7,11,13,17,\cdots,p,\cdots\cdots$$

$\therefore$ $\{3,5\}\in$(Continuity of prime numbers)

$\therefore$ $\{3,5,7\}\in$(Continuity of prime numbers)

$\therefore$$\{3,5,7,11\}\in$(Continuity of prime numbers)

$$\cdots\cdots$$

$\therefore$$\{3,5,7,11,13,17,\cdots,p\}\in$(Continuity of prime numbers)

The rules for generating even and prime numbers through the continuity of {prime and even}

This is the first brilliant method of the ($\mathbb{GC}$) paper, cleverly linked to the Goldbach conjecture.

This section is explained in demonstration form based on (2.4).

Generation of Prime and Even Numbers

($\mathbb{GC}$) is taking the two simplest and smallest odd prime numbers $\{3,5\}$ and starting to arrange and combine them.

$$3 + 3 = 6$$

$$5 + 3 = 8$$

$$5 + 5 = 10$$

Obtained continuous even numbers: $\{6,8,10\}$

($\mathbb{GC}$) also stipulates that new prime numbers can only be found from even numbers, and new prime numbers must be paired with another prime number to appear.

So: $5 + 5 = 10 = 3 + 7$. Obtained a new prime number 7.

The prime numbers that can be referenced become $\{3,5,7\}$.

The permutation and combination of $\{3,5,7\}$ yields:

$$3 + 3 = 6$$

$$5 + 3 = 8$$

$$7 + 3 = 5 + 5 = 10$$

$$7 + 5 = 12$$

$$7 + 7 = 14$$

Obtained continuous even numbers: $\{6,8,10,12,14\}$

According to ($\mathbb{GC}$) regulations,

So: $7+7=14=11+3$. Obtained a new prime number 11.

The prime numbers that can be referenced become $\{3,5,7,11\}$.

The permutation and combination of $\{3,5,7,11\}$ yields:

$$3+3=6$$
$$5+3=8$$
$$7+3=5+5=10$$
$$7+5=12$$
$$11+3=7+7=14$$
$$11+5=16$$

According to ($\mathbb{GC}$) regulations,

So: $11+5=16=13+3$. Obtained a new prime number 13.

Obtained continuous even numbers:

$$\{6,8,10,12,14,16\}$$

Don't have a misunderstanding here:

$\{3+3=6$

$$5+3=8$$
$$7+3=5+5=10$$
$$7+5=12$$
$$11+3=7+7=14$$
$$11+5=16$$
$$11+7=18$$

Obtained continuous even numbers:

$$\{6,8,10,12,14,16,18\}\}.$$

This is a misunderstanding and has nothing to do with the$\{$ ($\mathbb{GC}$)(2.4)$\}$ regulations.

$\because\{$ ($\mathbb{GC}$)(2.4)$\}\Rightarrow$ $\{6,8,10,12,14,16\}$

There is another misconception:

$\{3+3=6$

$$5+3=8$$
$$7+3=5+5=10$$
$$7+5=12$$
$$11+3=7+7=14$$
$$11+5=16$$
$$11+7=18$$
$$11+11=22$$

These even numbers are not completely continuous (see 22):$\{6,8,10,12,14,16,18,22\}\}$.

This is a misunderstanding and has nothing to do with the $\{$ ($\mathbb{GC}$)(2.4)$\}$ regulations.

$\because\{$ ($\mathbb{GC}$)(2.4)$\}\Rightarrow$ $\{6,8,10,12,14,16\}$

According to ($\mathbb{GC}$) regulations,

So: $11+5=16=13+3$. Obtained a new prime number 13.

The prime numbers that can be referenced become $\{3,5,7,11,13\}$.

The permutation and combination of $\{3,5,7,11,13\}$ yields:

$$3+3=6$$
$$5+3=8$$
$$7+3=5+5=10$$
$$7+5=12$$
$$11+3=7+7=14$$
$$13+3=11+5=16$$
$$13+5=11+7=18$$
$$13+7=20$$

According to ($\mathbb{GC}$) regulations,

So: $13+7=20=17+3$. Obtained a new prime number 17.

Obtained continuous even numbers: $\{6,8,10,12,14,16,18,20\}$.

〖Show that the continuity of existing prime numbers leads to the continuity of even numbers.

$\{3,5\} \rightarrow \{6,8,10\}, \{10\} \rightarrow \{7\}$

$\{3,5,7\} \rightarrow \{6,8,10,12,14\}, \{14\} \rightarrow \{11\}$

$\{3,5,7,11\} \rightarrow \{6,8,10,12,14,16\}, \{16\} \rightarrow \{13\}$

$\{3,5,7,11,13\} \rightarrow \{6,8,10,12,14,16,18,20\}, \{20\} \rightarrow \{17\}$

Show the continuity of 'even numbers':

$\{6,8,10\} \rightarrow \{6,8,10,12,14\} \rightarrow \{6,8,10,12,14,16\} \rightarrow \{6,8,10,12,14,16,18,20\}$〗

So far, ($\mathbb{GC}$) has obtained that if a prime number is continued to the next prime number, it will inevitably result in even numbers being also continuous.

($\mathbb{GC}$) It is obtained that if prime numbers are limitless continuous (Mohanty, 1978), it will inevitably result in even numbers being limitless continuous. ⇒

$6 =$(Prime number)$+$ (Prime number)

$8 =$(Prime number)$+$ (Prime number)

$10 =$(Prime number)$+$ (Prime number)

$12 =$(Prime number)$+$ (Prime number)

……

$2n =$(Prime number)$+$ (Prime number)

……

⇒This proves the Goldbach conjecture.

But ($\mathbb{GC}$) uses an extreme rule:

it does not allow the previous situation to be limitless continuous, and it specifies that even numbers stop at $2n$ and prime numbers stop at p_1.

κ set: $\{3,5,7,11,13,17,\cdots, p_2, p_1\}$

The prime number $\{3,5,7,11,13,17,\cdots, p_2, p_1\}$ obtains permutation and combination:

$$\begin{cases} 3+3=6 \\ 5+3=8 \\ 7+3=5+5=10 \\ 7+5=12 \\ 11+3=7+7=14 \\ 13+3=11+5=16 \\ 13+5=11+7=18 \\ 17+3=13+7=20 \\ \cdots\cdots \\ p_{b1}+p_{b2}=p_{b3}+p_{b4}=\cdots=2(n-1) \\ p_{a1}+p_{a2}=p_{a3}+p_{a4}=\cdots=2n \end{cases}$$

Record as B_n

Why force a cease?

There are two reasons:

①Theoretical reasons.

To analyze its limitless continuation,

It should also be analyzed that it cannot continue limitless.

Force it to stop (it cannot continue limitless)→and if there is a contradiction, it must continue limitless.

②Realistic operations(Solve the ξ problem mentioned earlier).

Practical computer operation: Decomposing a large even number into the form of two prime numbers added together. You cannot operate a computing machine indefinitely, there will always be a stopping time for the operation.

Question ξ:

Human computer operation ability can be obtained from small even numbers:

$$\begin{cases} 6=3+3 \\ 8=5+3 \end{cases}$$

$$10 = 7 + 3 = 5 + 5$$

......

$$2n = p_{a1} + p_{a2} = p_{a3} + p_{a4} = \cdots$$
$$= p_{ai} + p_{aii}\}$$

Human computing power and computer operation ability always stop at an even number $(2n + 2)$.

I don't know:

$2n + 2 =$(Prime number)+ (Prime number)

So it is necessary to set B_n to stop at $2n$.

∵ Question ξ

∴ Even numbers must stop at a $2n$

Later, we will use mathematical logic to prove (not a calculator):

$2n + 2 =$(Prime number)+ (Prime number)

∴ Solved the ξ problem.

〖Note: The original paper (𝔾ℂ) was not publicly disclosed ξ Problem, but the original paper (𝔾ℂ) stopped at 2n, so it was also resolved ξ Question. Therefore, there is no need to publicize it ξ Question.〗

Simplified version demonstration

Through this simple case study, the author demonstrates the ideas and methods of argumentation to you. Facilitate readers' understanding of argumentation methods.

The author considers himself a person with poor mathematical knowledge, only knowing that 3 is a prime number.

Also know:

$$3 + 3 = 6$$

Of course, it is also known that there is a prime number p after 3: satisfying that 3 is adjacent to p as a prime number.

$$\Rightarrow p - 3 \geq 2$$

$$\Rightarrow p \geq 3 + 2$$

Can 8 be divided into the sum of two prime numbers? He doesn't know.

$$3 + 2 + 3 = 6 + 2 = 8$$

If $(3 + 2)$ is a prime number, then 8 is equal to the sum of two prime numbers.

So he doesn't allow: $(3 + 2)=$ (Prime number)

∵ $(3 + 2)\neq$(Prime number)

∴ $(p \geq 3 + 2)\Rightarrow p > 3 + 2$

$$\Rightarrow p \geq 3 + 3$$

∵ (Odd number) ≠(Even number)

∴ $(p \geq 3 + 3) \Rightarrow p > 3 + 3$

$$\Rightarrow p > 2 \times 3 > 3$$

∵ Bertrand Chebyshev theorem (Erd˝os, 1932)

∴ $2 \times 3 >$(Prime number)> 3

$\Rightarrow p > 2 \times 3 >$(Prime number)$> 3$

$\Rightarrow p >$(Prime number)> 3

Contradiction (because 3 and p are adjacent prime numbers)

∴ $8 =$ (Prime number)+ (Prime number)

(𝔾ℂ) used this principle to prove the Goldbach conjecture.

Assign each equation of C_n to be equal to 2n+2

(𝔾ℂ) ⇒Arrange and combine them in order: A_n, B_n, C_n.

{ C_n equals $2n + 2$ } This is the second wonderful method in the (𝔾ℂ) paper, cleverly linked to the Goldbach conjecture (When proving Theoremω₃ in Section 7, the second brilliant method is used).

{C_n equals $2n + 2$}, which inevitably leads to the final conclusion of the Goldbach conjecture: whether it holds or not.

A_1: {(2.1)+(2.4)+{3}}⇒

$\{3 + 3 = 6\}$ It is recorded as A_1

$\rightarrow 6$

According to the rule, 3 can only get $\{3 + 3 = 6\}$

Nonexistence: $5 + p = 6$

{Because 1 in $5 + 1 = 6$ is not defined as a prime number. If 1 is defined as a prime number, this paper will come to the same conclusion}

Note: $5 \notin \{3\}$.

Prime number 3, limit is used according to (2.4), cannot be: $6 \rightarrow 8$.

{(2.1)+(2.4)+{3}}⇒ prime number 3 can only get even number 6.

A pseudo stop occurred (2.41).

$$\because 3 + 3 + 2 = 6 + 2 = 8$$

$$\therefore 3 + 5 = 8$$

$$\therefore (2.41)$$

If you want to: $6 \rightarrow 8$, you must add an adjacent prime number 5.

$$\therefore \{3,5\}$$

$$\Rightarrow 3 \rightarrow 5$$

A_2: {(2.1)+(2.4)+{3,5}}⇒

$3 + 3 = 6$

$3 + 5 = 8$

$5 + 5 = 3 + 7 = 10$ $\quad \because \{10\} \Rightarrow \{7\} \quad \therefore \{3,5,7\} \Rightarrow$

$7 + 5 = 12$

$7 + 7 = 11 + 3 = 14.$ $\because \{14\} \Rightarrow \{11\} \quad \therefore \{3,5,7,11\} \Rightarrow$

$11 + 5 = 13 + 3 = 16$ $\because \{16\} \Rightarrow \{13\} \quad \therefore \{3,5,7,11,13\}\} \Rightarrow$

$11 + 7 = 13 + 5 = 18.$

$13 + 7 = 17 + 3 = 20.$ There is a new prime number 17 in continuity.

Note: $\{ (13 + 7), (17 + 3)\} \in 20$. even numbers ⇒:6,8,10,12,14,16,18,20.

Prime numbers are continuous, and there is a new prime number 17.

$3 \rightarrow 5 \rightarrow 7 \rightarrow 11 \rightarrow 13 \rightarrow 17.$

even numbers ⇒: $6 \rightarrow 8 \rightarrow 10 \rightarrow 12 \rightarrow 14 \rightarrow 16 \rightarrow 18 \rightarrow 20.$

Wonderful continuity:

{{{3,5} → { 6,8,10}.

$\{10\} \rightarrow (10 = 3 + 7) \rightarrow 7\} \rightarrow \{3, 5, 7\}\}.$

{{3, 5, 7} → { 6,8,10,12,14}.

$\{14\} \rightarrow (14 = 3 + 11) \rightarrow 11\} \rightarrow \{3, 5, 7, 11\}\}.$

{{3, 5, 7, 11} → { 6,8,10,12,14,16}.

$\{16\} \rightarrow (16 = 3 + 13) \rightarrow 13\} \rightarrow \{3, 5, 7, 11, 13\}\}.$

{{3, 5, 7, 11, 13} → { 6,8,10,12,14,16,18,20}.

$\{20\} \rightarrow (20 = 3 + 17) \rightarrow 17\} \rightarrow \{3, 5, 7, 11, 13, 17\}\}.$

{{3, 5, 7, 11, 13, 17} → { 6,8,10,12,14,16,18,20,22}.

$\{22\} \rightarrow (22 = 3 + 19) \rightarrow 19\} \rightarrow \{3, 5, 7, 11, 13, 17, 19\}\}.$

$\{\{3, 5, 7, 11, 13, 17, 19\} \to$ $\{6,8,10,12,14,16,18,20,22,24,26\}$.

$\{26\} \to (26 = 3 + 23) \to 23\} \to$ $\{3, 5, 7, 11, 13, 17, 19, 23\}\}$. }.Wonderful continuity is obtained: prime continuity, resulting in a new even continuity, and a new even number results in a new prime continuity.

According to the rule (2.4) and the existing computer capabilities, the prime number 23 should be continuous to the subsequent prime number,

According to the rule (2.4) and the existing computer capacity, the even number 26 should be continuous to the following even number,

A_2 has not stopped at this time.

Note the key point:

A_1pseudo stop, increase the adjacent prime number 5 to have A_2.

From $A_1 \to A_2 \to$ is it always Unlimited? Or will it stop?

Here's the wonderful thing:

(analysis I):

Always Unlimited: $A_1 \to A_2 \to \cdots\cdots$

There are:((2.5)+(2.6)$\Rightarrow$ $\{3,5,7,11,13,17,19,23,\cdots\cdots$

Get: $6,8,10,12,14,16,20,22,\cdots\cdots$

Conclusion : (3.1) (QED).

(2.2)$\Rightarrow$ Stop at A_n, cannot continue.

(analysis II): Stop at A_n, not to be continued.

Stop at A_n: $A_1 \to A_2 \to \cdots \to A_n$

κ -line with continuous Prime: $3,5,7,11,13,17,19,23,\cdots, p_2, p_1$

Get : $6,8,10,12,14,16,20,22,\cdots ,2(n-1) ,2n$

Terminate at A_n to obtain:

$$\{\{ \{(2.1)+(2.4)+\{ 3,5,7,11,\cdots ,p_2, p_1\} \Rightarrow \{6,8,10,12,\cdots,2(n\text{-}1) ,2n \}$$

$\Rightarrow \{ 6,8,10,12,\cdots ,2(n-1) ,2n \} \in A_n \}\}$ record: (3.3)

Terminate at A_n to obtain:

$\{\{(2.1)+(2.4)+[\{ 3,5,7,11,\cdots ,p_2, p_1\} \nRightarrow 2(n+1)]\} \Rightarrow \{2(n+1)\} \notin A_n\}$ record: (3.4)

{ Let: prime p satisfy: $p \notin \{ 3,5,7,11,\cdots, p_2, p_1\}$, (3.3) ,(3.4) .

$\therefore \{ p_1 < p, (p + \forall p) \notin \{6,8,10,12, \cdots,2(n\text{-}1) ,2n \},(p + \forall p) \notin A_n\}\}$ (1)

Take the prime number that is greater than p_1 and adjacent to p_1 as p_0,

$\because$ (1) $\Rightarrow \{(p_0 + 3) \notin \{6,8,10,12,\cdots,2n\text{-}1) ,2n \},(p_0 + 3) \notin A_n\}$

$$\Rightarrow \{p_0 + 3 \neq 2n$$
$$p_0 + 3 \neq 2(n\text{-}1)$$
$$p_0 + 3 \neq 2(n\text{-}2)$$
$$p_0 + 3 \neq 2(n\text{-}3)$$
$$\cdots$$
$$p_0 + 3 \neq 10$$
$$p_0 + 3 \neq 8$$
$$p_0 + 3 \neq 6$$
$$p_0 + 3 \geq 6\}$$
$$\Rightarrow p_0 + 3 > 2n$$

$\therefore$ $p_0 + 2 \geq 2n$ $\because$ (Odd number) $\neq$ (Even number)

$\therefore$ $p_0 + 2 > 2n \Rightarrow p_0 + 1 \geq 2n$ Record as (W)

Starting from (Analysis II)

The principle of mathematical complete induction:

it is correct in the front, until A_n.

Take the continuous prime number $\{3,5,7,11,\cdots, p_2, p_1\}$ from small to large.

A_n : {(2.1)+(2.4)+{ $3,5,7,11,\cdots, p_2, p_1$}}⇒

{3+3=6

5+3=8

7+3=5+5=10. set up: (7+3=5+5)

sequence: 7>5

7+5=12

11+3=7+7=14. set up$\triangle_2$: (11+3=7+7) sequence: 11>7

13+3=11+5=16. set up$\triangle_2$: (13+3=11+5) sequence: 13>11

13+5=11+7=18. set up$\triangle_2$: (13+5=11+7) sequence: 13>11

17+3=13+7=20. set up$\triangle_2$:

(17+3=13+7) sequence: 17>13

19+3=17+5=11+11=22. set up$\triangle_2$:

(19+3=17+5=11+11) sequence:

19>17>11

19+5=17+7=13+11=24. set up$\triangle_2$:

(19+5=17+7=13+11) sequence:

19>17>13

……

$p_{c1} + p_{c2} = p_{c3} + p_{c4} = \cdots = 2(n\text{-}2)$

$p_{b1} + p_{b2} = p_{b3} + p_{b4} = \cdots = 2(n\text{-}1)$

$p_{a1} + p_{a2} = p_{a3} + p_{a4} = \cdots = 2n$ } It is recorded as: A_n

⇒:$6,8,10,12,14,16,18,\cdots, 2(n\text{-}1),2n$.

In A_n, it is specified: $p_{a1} \geq p_{a2}$

In A_n it is specified that : $p_{a1} > p_{a3}$

{Reason: $p_{a1} + p_{a2} = 2n$ must exist.

$p_{a3} + p_{a4} = 2n$, not necessarily. If $p_{a3} + p_{a4} = 2n$, exists p_{a1} and p_{a3} if one of them is big, put the big one in the first place according to the regulations.

If: ($p_{a1} = p_{a3}$) ⇒ $(p_{a1} + p_{a2} = 2n) \cong (p_{a3} + p_{a4} = 2n)$

(2.4) ⇒ Delete duplicate formula $p_{a3} + p_{a4} = 2n$ }. ∴$p_{a1} > p_{a3}$

A_n is simplified as B_n.

{3+3=6

5+3=8

7+3=5+5=10.

7+5=12

11+3=7+7=14.

13+3=11+5=16.

13+5=11+7=18.

17+3=13+7=20.

19+3=17+5=11+11=22.

19+5=17+7=13+11=24.

……

$p_{c1} + p_{c2} = p_{c3} + p_{c4} = \cdots = 2(n\text{-}2)$

$p_{b1} + p_{b2} = p_{b3} + p_{b4} = \cdots = 2(n\text{-}1)$

$p_{a1} + p_{a2} = p_{a3} + p_{a4} = \cdots = 2n$ } It is recorded as: B_n

Add numbers to each equation of B_n, ensuring that each equation is equal to $2n + 2$

{Level 2(n-2): $3 + 2(n\text{-}2) + 3 = 2(n\text{+}1)$,

Level 2(n-3): $5 + 2(n\text{-}3) + 3 = 2(n\text{+}1)$,

Level 2(n-4): $7 + 2(n\text{-}4) + 3 = 5 + 2(n\text{-}4) + 5 = 2(n\text{+}1)$,

Level 2(n-5): 7+2(n-5)+5=2(n+1)

Level2(n-6): 11+2(n-6)+3=7+2(n-6)+7=2(n+1)

Level2(n-7):13+2(n-7)+3=11+2(n-7)+5=2(n+1)

Level2(n-8):13+2(n-8)+5=11+2(n-8)+7=2(n+1)

Level2(n-9):17+2(n-9)+3=13+2(n-9)+7=2(n+1)

Level2(n-10):19+2(n-10)+3=17+2(n-10)+5=11+2(n-10)+11=2(n+1)

Level2(n-11):19+2(n-11)+5=17+2(n-11)+7=13+2(n-11)+11=2(n+1)

......

Level 6 : $p_{c1} + 6 + p_{c2} = p_{c3} + 6 + p_{c4} = \cdots = 2(n+1)$

Level 4 : $p_{b1} + 4 + p_{b2} = p_{b3} + 4 + p_{b4} = \cdots = 2(n+1)$

Level 2:$p_{a1} + 2 + p_{a2} = p_{a3} + 2 + p_{a4} = \cdots = 2(n+1)$}Record as C_n

"Line β " in C_n: $2 \to 4 \to 6 \to 8 \to \cdots \to 2(n-4) \to 2(n-3) \to 2(n-2)$

In C_n. (Level 2): $\{p_{a1}, p_{a2}, p_{a3}, p_{a4}, \dots, p_{an}\}$, any element is modeled as p_{ai}, and each prime is abbreviated as p_a.

In C_n. (Level 4): $\{p_{b1}, p_{b2}, p_{b3}, p_{b4}, \dots, p_{bn}\}$, any element is modeled as p_{bi}, and each prime is abbreviated as p_b,

The same analogy follows (at each level).

Important note: in C_n, $p_{a1} > p_{b1}$ and their size relationship are not specified.

From $2n$ of B_n to $2n + 2$ of C_n, a complete mathematical induction is formed.

(𝔾ℂ) cleverly set C_n and obtained many useful conditions:

If $p_a + 2 = p$,

(Level 2): $\{p_a + 2 + p_{ai} = 2(n+1)\} \Rightarrow \{p + p_{ai} = 2(n+1)\}$ ⇒(3.1) (QED).

If $p_b + 4 = p$, The same logic ⇒(3.1) (QED).

If $p_c + 6 = p$, The same logic: ⇒(3.1) (QED).

......

If $7 + 2(n-4) = p$, The same logic: ⇒(3.1) (QED).

If $3 + 2(n-4) = p$, The same logic: ⇒(3.1) (QED).

If $5 + 2(n-4) = p$, The same logic: ⇒(3.1) (QED).

If $5 + 2(n-3) = p$, The same logic: ⇒(3.1) (QED).

If $3 + 2(n-3) = p$, The same logic: ⇒(3.1) (QED).

If $3 + 2(n-2) = p$, The same logic: ⇒(3.1) (QED).

If they are all $\neq p$, they will have wonderful events.

(𝔾ℂ) The first prime number after p_1 is p_0,

$\Rightarrow p_0 - p_1 \geq 2$

The conclusion of this wonderful event will be:

$$\{p_0 - p_1 \neq 2$$
$$p_0 - p_1 \neq 4$$
$$p_0 - p_1 \neq 6$$
......
$$p_0 - p_1 \neq 2(n-3)$$
$$p_0 - p_1 \neq 2(n-2)\}$$

These are important evidence to prove the Goldbach conjecture.

C_n will obtain the ultimate conclusion of the Goldbach conjecture: right or wrong.

The final conclusion of the Goldbach conjecture

Method of (𝔾ℂ): Find the conditions for $\{2(n+1) = p_x + p_y\}$ to hold.

If these conditions are removed, it will not lead to incorrect conclusions and can prove that:

$\{2(n+1) \neq p_x + p_y\}$,This proves that the Goldbach's conjecture is not true.

If removing these conditions leads to incorrect conclusions, it proves that the Goldbach's conjecture is true.

The principle is:

If you want to prove that $\{2(n+1) = p_x+p_y\}$ is not valid: $\{2(n+1) \neq p_x+p_y\}$

The condition (F) that holds $\{2(n+1) = p_x+p_y\}$ must be found.

If the condition (F) can be negated, it proves that $\{2(n+1) = p_x+p_y\}$ does not hold.

If the condition (F) cannot be denied, it proves that $\{2(n+1) = p_x+p_y\}$ must hold.

($\mathbb{GC}$) specifies that $p_x \geq p_y$, which can be seen in the sorting of all previous equations.

Theorem (ω1):

$\{p_1$ and p_0 are adjacent prime numbers. $p_0 > p_1\} \Rightarrow p_0 \ngtr 2p_1. (2p_1 > p_0)$

Proof:

Assumptions: $p_0 > 2p_1$.

$\Rightarrow: p_0 > 2p_1 > p_1$.

(2.3)+$\{p_0 > 2p_1 > p_1\} \Rightarrow p_0 > 2p_1 > p_g > p_1$.

$\Rightarrow \{p_0 > p_g > p_1\}$contradiction. $\because$(p_1 and p_0 are adjacent prime numbers.)

$\because p_0 \neq 2p_1$ ((Odd number) ≠ (Even number))

$\therefore p_0 \ngtr 2p_1 \Rightarrow 2p_1 > p_0$

Theorem(ω_1) (QED).

Theorem(ω2):

A_n, B_n, C_n, If :$\{ 2n+2 = p_x + p_y$. set upΔ_1: $p_x \geq p_y\}$

There must be: $p_x = p_0$

Proof:

If: $p_x + p_y = 2(n+1)$ (2)

(w)+(2) : $p_0 + 3 \geq p_x + p_y$ (3)

$\{$(w): $p_0 + 1 \geq 2n \Rightarrow p_0 + 1 + 2 \geq 2n + 2 = p_x + p_y \Rightarrow$

$p_0 + 3 \geq p_x + p_y \}$

$\because$ (the smallest prime in $\varkappa$ is 3)

$\therefore p_y \geq 3$

$\therefore$ (3)$\Rightarrow p_0 \geq p_x$
(4)

$\because$\{(3.4)$\Rightarrow \{\{3,5,7,11,\cdots,p_2,p_1\}$+(2.4)$\} \nRightarrow 2(n+1) = p_x + p_y\}$ (5)

$\therefore$ \{(1)+(5)$\Rightarrow p_x \notin \{3,5,7,11,\cdots,p_2,p_1\} \Rightarrow p_x > p_1$ (6)

reason:\{ Hypothesis: $p_x \in \{3,5,7,11,\cdots,p_2,p_1\}$

$\because p_x \geq p_y \Rightarrow \{p_x, p_y\} \in \{3,5,7,11,\cdots,p_2,p_1\}$

$\{3,5,7,11,\cdots,p_2,p_1\} \Rightarrow p_x + p_y = 2(n+1)$ Contradiction with (5).

$\therefore p_x \notin \{3,5,7,11,\cdots,p_2,p_1\} \Rightarrow p_x > p_1\}$

$\{(4)+(6)\} \Rightarrow p_0 \geq p_x > p_1$ (7)

Because $p_0 > p_1$, and the prime number: p_0 and p_1 adjacent.

$\{p_0$ and p_1 adjacent. +(7)$\} \Rightarrow \therefore p_x = p_0$

(ω_2) (QED).

Theorem(ω3):

Known: $\{A_n, B_n, C_n$,(2.2),(2.4), $p_1$and $p_0$are adjacent prime numbers , $p_0 > p_1$,

β line: 2→4→6→8→ ⋯ →2(n-6)→2(n-5)→2(n-4)→2(n-3)→2(n-2)

κ line: 3→5→7→11→13→17→19→ ⋯ $\rightarrow p_2 \rightarrow p_1$

(2.2) Extreme law : Not allowed: $2n+2=p_x+p_y\}$

There must be: p_0-$p_1 > 2(n-2)$

Proof:

$p_1$and p_0 are adjacent prime , $p_0 > p_1$.

$\{\because$ there is no prime number between $p_1$and p_0

$\therefore p_1$ takes precedence over other prime numbers and approaches p_0.

Application

If: p_0-p_x=2, There must be: $p_1 = p_x$

$\because$ there is no odd number between p_0 and p_x, $\because$ $p_0 > p_1 \geq p_x$

If: $p_1 \neq p_x$ There must be: $p_0 > p_1 > p_x \rightarrow p_1$ is even $\rightarrow$ contradictory

$\therefore p_1 = p_x$

If: $p_0 - p_x = 4, p_0 - p_1 \neq 2$. There must be: $p_1 = p_x$

$\because$ The integer between p_0 and p_x has only an odd number t .

$\because p_0 - p_1 \neq 2 \rightarrow p_1 \neq t$

$\because$ $p_0 > p_1 \geq p_x$, If: $p_1 \neq p_x$ $\rightarrow p_0 > p_1 > p_x$ $\rightarrow p_1$ is even $\rightarrow$ contradictory.

$\therefore p_1 = p_x$

If: $p_0 - p_x = 6, p_0 - p_1 \neq 2, p_0 - p_1 \neq 4$. There must be: $p_1 = p_x$

$\because$ The integer between p_0 and p_x has only two odd numbers t, t_1.

$\because \{p_0 - 2 \neq p_1, p_0 - p_1 \neq 4\} \rightarrow p_1 \neq \{t, t_1\}$

$\because p_0 > p_1 \geq p_x$, If: $p_1 \neq p_x \rightarrow p_0 > p_1 > p_x \rightarrow$ p_1 is even $\rightarrow$ contradictory.

$\therefore p_1 = p_x$

The same logic is extended (omitted).} Record as (M)

If $\{2(n+1) = p_x + p_y\}$ holds.

(𝔾ℂ) proved in theorem (ω_2) that $p_x = p_0$

$$\Rightarrow 2(n+1) = p_0 + p_y$$

What is the value of prime p_y.

If $2n > 2p_1$, it is in contradiction with (B_n). (p_1 is the largest prime in B_n, combined to form $2n$)

$\therefore 2p_1 \geq 2n$

$\because 2p_1 \geq 2n \Rightarrow 2p_1 + 2 \geq 2n + 2$

$\because p_0 > p_1 \Rightarrow p_0 \geq p_1 + 1$

$\because$(Odd number) $\neq$ (Even number)

$\therefore p_0 > p_1 + 1 \Rightarrow 2p_0 > 2p_1 + 2$

$$\because \{(2p_0 > 2p_1 + 2), (2p_1 + 2 \geq 2n + 2)\}$$
$$\therefore \Rightarrow 2p_0 > 2n + 2$$

$$\because \{(2p_0 > 2n + 2), (2n + 2 = p_0 + p_y)\}$$
$$\therefore \Rightarrow p_0 > p_y$$

$$\therefore p_y \in \{3,5,7,11, \ldots, p_2, p_1\}$$

Obtained the range of p_y:

$$p_y \in \{3,5,7,11,\cdots, p_2, p_1\}$$

$\because$ $\{3,5,7,11,\cdots, p_2, p_1\}$+ (2.4)$\Rightarrow C_n$

$\because$ {Level 2, level 4, level 6, ⋯, Level 2 (n-3), level 2 (n-2)}$\in C_n$

$\therefore$ $\{3,5,7,11,\cdots, p_2, p_1\} \in$ {Level 2,level 4, ⋯,Level 2 (n-3), level 2 (n-2)}

$\therefore$ $p_y \in$ {Level 2, level 4, level 6, ⋯, Level 2 (n-3), level 2 (n-2)}

If { Level 2: $p_y \in p_a$}

$$2(n+1) = p_0 + p_y$$

$$\Rightarrow 2(n+1) = p_0 + p_a$$

$\{p_y \in p_a\} \Rightarrow (p_y = p_{ai})$.

$\therefore$ 2n+2=p_0+p_y $\Rightarrow$2n+2=p_0+p_{ai}

$\because$ Level 2: p_{ai}

$\therefore$Level2:
(p_{aii}+2+p_{ai}=2(n+1))$\in$\{p_{a1}+2+p_{a2}=p_{a3}+2+p_{a4}=⋯=2(n+1)\}

{(2n+2= p_0 + p_{ai}),(p_{aii} +2+ p_{ai} =2(n+1))} $\Rightarrow$ p_{aii}+2=p_0

(p_{aii}+2=p_0)+(M) $\Rightarrow$ p_{aii}=p_1

$\therefore$ (p_{aii}+2=p_0) $\Rightarrow$ (p_1+2=p_0) $\Rightarrow$ (p_0-p_1=2)

∴Level 2: $\{2n+2= p_x + p_y\} \Rightarrow (p_0 - p_1 =2)$ Record as (i)

If: Level 2: $(p_a + 2 = p)$

$(p_a + 2 = p) \Rightarrow$ (Level 2) $\Rightarrow p+p_{ai}=2n+2 \Rightarrow (p_x+p_y=2n + 2)$

$\{(\omega_2) +(p+p_{ai}=2n+2)\} \Rightarrow p_0 \in\{p,p_{ai}\}$ $\because(1) \Rightarrow p_0 \notin p_{ai}$

$\therefore p = p_0$ $\therefore (p_a+2=p)=(p_a+2= p_0)$

$(M)+(p_a+2= p_0) \Rightarrow (p_1+2=p_0)$

$\therefore p_a= p_1$

$\therefore (p_a+2= p)=(p_a+2= p_0)\cong(p_1+2= p_0)$

$\therefore (p_a+2= p_0)=(p_1+2= p_0) \Rightarrow (p_x+p_y=2n+2)$

Get: $(p_0-p_1=2) \Rightarrow (p_x+p_y=2n+2)$ Record as (ii)

(i)+(ii) Get: $\{(p_x+p_y =2n+2) \Leftrightarrow (p_0-p_1=2)\}$ Record as (j)

(j) The formula proves that the condition of ($2n+2=p_x+p_y$) in Level 2 is: $p_0-p_1=2$

(2.2)Extreme laws do not allow: $2n+2=p_x+p_y \Rightarrow 2n+2\neq p_x+p_y$

$\therefore\{(j)+(2n+2\neq p_x+p_y)\} \Rightarrow p_0-p_1 \neq 2.$

Certifiable: 〖If $\{(j)+(2n+2\neq p_x+p_y)\} \Rightarrow p_0-p_1=2$.

(ii) $\Rightarrow (p_x + p_y =2n+2)$, contradicts $(2n+2\neq p_x+p_y)$.〗

$\therefore\{(j)+(2n+2\neq p_x+p_y)\} \Rightarrow p_0-p_1 \neq 2$ (8)

〖Simply put, at level 2 of C_n: $\{p_{a1} + 2 + p_{a2} = p_{a3} + 2 + p_{a4} =\cdots= 2(n+1)\}$, we quickly find the condition $\{p_a + 2 = p\}$ for the Goldbach conjecture to hold,

$\because$ Level 2: $\{p_a + 2 = p\}\Rightarrow(2n+2= p_x+p_y)$.

and obtain $\{p-p_a=2\}\cong\{p_0-p_1=2\}$,

$\{p_0-p_1=2\}$ is the condition for the Goldbach conjecture to hold at the second level of C_n.

Reminder: $\{C_n$ each term equals $2n+2\}$ This is the second wonderful method in the (𝔾ℂ) paper, cleverly linked to the Goldbach conjecture : cleverly identifying the conditions under which the Goldbach conjecture holds (F).

$(p_0-p_1=2) \in(F)$

Do not allow $(p_0-p_1=2)$ to be established:

$(p_0-p_1 \neq 2)$

So $\{2n+2=p_x+p_y\}$ does not hold in {Level 2}.

$\Rightarrow (p_0-p_1 \neq 2)$〗

If: $p_y \in\{\text{Level } 4\}$

$\Rightarrow\{p_y \in p_b\} \Rightarrow (p_y= p_{bi})$.

$\therefore 2n+2= p_0+p_y \Rightarrow 2n+2= p_0+p_{bi}$

$\because$ Level 4: p_{bi}.

$\therefore$ Level 4: $(p_{bii}+4+p_{bi}=2(n+1))\in\{p_{b1}+4+p_{b2}=p_{b3}+4+p_{b4}=\cdots=2(n+1)\}$

$\{(2n+2= p_0 + p_{bi}),(p_{bii} +4+ p_{bi} =2(n+1))\} \Rightarrow p_{bii}+4=p_0$

$(p_{bii}+4=p_0)+(M)+(8)\Rightarrow p_{bii}=p_1$

$\therefore (p_{bii}+4=p_0) \Rightarrow (p_1+4=p_0) \Rightarrow (p_0-p_1=4)$

$\therefore$ Level 4: $\{2n+2=p_x+p_y\}\Rightarrow (p_0-p_1=4)$

If: Level 4: $p_b+4=p$,

$(p_b +4=p) \Rightarrow$ (Level 4) $\Rightarrow p+ p_{bi} =2n+2 \Rightarrow (p_x+p_y=2n+2)$

$(\omega 2)+(p+p_{bi}=2n+2) \Rightarrow p = p_0$

$\therefore (p_b+4=p)= (p_b+4= p_0)$

$(M)+(8)+(p_b+4= p_0) \Rightarrow (p_1+4= p_0)$.

$\therefore p_b= p_1$

$\therefore (p_b+4= p)=(p_b+4= p_0)\cong(p_1+4= p_0)$

$\therefore (p_b+4= p_0)=(p_1+4= p_0) \Rightarrow (p_x+p_y=2n+2)$

Get: $(p_0\text{-}p_1=4) \Rightarrow (p_x+p_y=2n+2)$

The same logic leads to:

$\{(p_x+p_y=2n+2) \Leftrightarrow (p_0\text{-}p_1=4)\}$ Record as (jj)

(jj) The formula proves that the condition of ($2n+2=p_x+p_y$) in Level 4 is:

$p_0\text{-}p_1=4$

(2.2)Extreme laws do not allow: $2n+2=p_x+p_y \Rightarrow 2n+2 \neq p_x+p_y$

The same logic as (8): $\{(jj)+(2n+2 \neq p_x+p_y)\} \Rightarrow p_0\text{-}p_1 \neq 4$ (9)

If: $p_y \in \{\text{Level } 6\}$

The same logic leads to:

$\{2n+2 \neq p_x+p_y\} \Rightarrow p_0\text{-}p_1 \neq 6$ (10)

……Recursive derivation →

line: 2→4→6→8→ …→2(n-6)→2(n-5)→2(n-4)→2(n-3)→2(n-2)

C_n: (Level 2 (n-2)) also follows the same principle: $p_0\text{-}p_1 \neq 2(n-2)$

$$\{p_0>p_1$$
$$p_0\text{-}p_1 \neq 2$$
$$p_0\text{-}p_1 \neq 4$$
$$p_0\text{-}p_1 \neq 6$$
$$p_0\text{-}p_1 \neq 8$$
$$\cdots\cdots$$
$$p_0\text{-}p_1 \neq 2(n-3)$$
$$p_0\text{-}p_1 \neq 2(n-2)\} \Rightarrow p_0\text{-}p_1 > 2(n-2)$$

Theorem(ω_3) (QED).

(𝔾ℂ) The third clever method:Linking $\{p_0\text{-}p_1 > 2(n-2)\}$ with the Bertrand Chebyshev theorem (Erd˝os, 1932) proves the Goldbach conjecture.

(𝔾ℂ) In Theorem(ω_3) It has been proven in that the condition for $\{2(n+1)=p_x+p_y)\}$ to hold is that at least one can:

$$\{ p_0\text{-}p_1 = 2$$
$$p_0\text{-}p_1 = 4$$
$$p_0\text{-}p_1 = 6$$
$$\cdots\cdots$$
$$p_0\text{-}p_1 = 2(n\text{-}3)$$
$$p_0\text{-}p_1 = 2(n\text{-}2)\}$$ Record as: (F)

(F) As long as one equation holds,

Then $\{2n+2=p_x+p_y\}$ is established.

$\{2n+2=p_x+p_y\}$ is not allowed to be established,The F condition must be negated.

Negating the (F) condition yields:

$$\{ p_0\text{-}p_1 \neq 2$$
$$p_0\text{-}p_1 \neq 4$$
$$p_0\text{-}p_1 \neq 6$$
$$\cdots\cdots$$
$$p_0\text{-}p_1 \neq 2(n\text{-}3)$$
$$p_0\text{-}p_1 \neq 2(n\text{-}2)\}$$
$$\Rightarrow p_0\text{-}p_1 > 2(n\text{-}2)$$

Theorem(ω4):

$\{p_0\text{-}p_1 > 2(n\text{-}2)\}$ contradicts (ω_1).

Proof:

$\because p_0\text{-}p_1 > 2(n-2) = 2n-4$

$\therefore p_0\text{-}p_1 \geq 2n-3$

$\because$ (Even number)≠(Odd number)

$\therefore p_0\text{-}p_1 > 2n\text{-}3$ (11)

$\because B_n \Rightarrow (p_1+p_i) \in \{6,8,10,\ldots 2(n\text{-}1),2n\}$

$\therefore 2n \geq p_1+p_i$

$$\Rightarrow 2n-3 \geq p_1+p_i-3 \qquad (12)$$

$\therefore \{(11),(12)\} \Rightarrow p_0\text{-}p_1 > 2n\text{-}3 \geq p_1+p_i-3$

$\therefore p_0\text{-}p_1 > p_1+p_i-3$

$\therefore p_0 > 2p_1+p_i-3$

$\because p_i \geq 3$(In κ, the smallest prime number is 3)

$p_0 > 2p_1+p_i-3 \Rightarrow p_0 > 2p_1$

($p_0 > 2p_1$) contradicts (ω_1).

Theorem(ω_4) (QED).

$\because$ ($p_0 > 2p_1$) contradicts (ω_1).

$\therefore$ (F) At least one condition holds. ⇒

$$2(n+1) = p_x + p_y$$

Complete the mathematical complete induction:

A_1: $\{3,5\}$ The Goldbach conjecture holds.

A_n: $\{3,5,7,\ldots.p_1\}$ The Goldbach conjecture holds.

A_{n+1} : $\{3,5,7,\ldots.p_1,p_0\}$ The Goldbach conjecture holds.

"Authenticity stop" will not appear, so it is always infinite.

⇒ The Goldbach conjecture holds. (3.1) (QED).

Evaluation and Summary

1. Cleverly arranged and combined: A_n, B_n, C_n.

2. Assuming (Goldbach conjecture) that it doesn't hold, cleverly arranging p_0. and p_1 yields:

$$p_0 - p_1 > 2(n-2)$$

3. Connect (Goldbach conjecture) with (Bertrand Chebyshev theorem).

Cleverly combining the simplest prime numbers to create even numbers, and then obtaining new prime numbers from even numbers. Such operations are both practical and theoretically feasible for humans, and can always reach an even number of $2n$. The Goldbach conjecture is valid. When the even number ($2n+2$) is reached, the computer is no longer used for verification, but mathematical logic methods are used to prove that the Goldbach conjecture also holds when $(2n+2)$ is reached.

We have found the necessary conditions for the Goldbach conjecture to hold at $(2n+2)$. If we do not allow these conditions to hold, it would violate (Bertrand Chebyshev theorem).

The principle behind the Goldbach conjecture is that the continuity of prime numbers can lead to the continuity of even numbers.

So the Goldbach conjecture always holds.

($\mathbb{GC}$) ω_1 obtained the odd prime number spacing formula:

The prime number p_x and prime number p_{x+1} belong to the prime adjacency relationship, And: $p_{x+1} > p_x$

$\omega_1 \Rightarrow \{2p_x > p_{x+1}$

$\Rightarrow p_x > p_{x+1} - p_x \geq 2\}$

⇒The distribution of prime numbers and the generalized prime spacing formula.

Convey thanks

Research Plaza with Preprint.

convey thanks: Yearbook of Mathematics and Physics.

Statement

The continuity of prime numbers can lead to the continuity of even numbers. A preprint has previously been published (Xie, 2021).

Conflict of interest

The author has no conflict of interest related to the content of this article.

All authors warrant that they have no relationship with any organization or entity or are involved in any subject or material of financial or non-financial interest discussed herein.

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