GOLDBACH CONJECTURE RESOLUTION

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Abstract

Goldbach's conjecture is one of the oldest and best-known unsolved problems in number theory and in all of mathematics.It states:Every even integer greater than 2 can be expressed as the sum of two primes.In this study I'll prove that this conjecture is true.

Keywords : GoldBach conjecture.

Designations:

IC : Impair composite numbers

IN : Impair number

P : Prime number

PN : Pair number

NS : number of solutions

1. INTRODUCTION

Goldbach's conjecture is one of the oldest and best-known unsolved problems in number theory and in all of mathematics. It states: Every even integer greater than 2 can be expressed as the sum of two primes [1].

Each pair number higher than 2 can be written as :

$$\left\{\begin{array}{l}2+2=4\\3+3=6\\3+5=8\\3+7=10\\3+9=12\\3+11=14\\3+13=16\\3+15=18\\3+17=20\\3+19=22\\3+21=24\end{array}\right\}=\left\{\begin{array}{l}2+2=4\\3+3=6\\3+5=8\\3+7=10\\3+11=14\\3+13=16\\3+17=20\\3+19=22\end{array}\right\}\cup\left\{\begin{array}{l}3+9=12\\3+15=18\\3+21=24\end{array}\right\}$$

(1) (2) (3)

In this example we took PN (pair number)max is 24 then we will generalize for higher values,so we see obviously that (1) = (2) $\cup$ (3).

(2) Represents 3+ P

(3) Represents 3 + IC [2]

So in general each PN(pair number) higher than 2 can be written as :

$$\left\{\begin{array}{l}2+2=4\\3+3=6\\3+5=8\\3+7=10\\3+9=12\\3+11=14\\3+13=16\\3+15=18\\3+17=20\\3+19=22\\3+21=24\\\vdots\\3+IN=PN\end{array}\right\}=\left\{\begin{array}{l}2+2=4\\3+3=6\\3+5=8\\3+7=10\\3+11=14\\3+13=16\\3+17=20\\3+19=22\\\vdots\\3+P=PN\end{array}\right\}\cup\left\{\begin{array}{l}3+9=12\\3+15=18\\3+21=24\\\vdots\\3+IC=PN\end{array}\right\}$$

(1) (2) (3)

So if we that (3) equal to the sum of 2 Prime number then we'll prove that each pair number higher than 2 is the sum of 2 Prime numbers.

So let's prove that 3+IC = sum of 2 Prime numbers.

IC (impair composite number) , an impair composite number can be written as

$$IC = \sum_{n=\frac{a-P_i^2}{2Pi}}^{\frac{b-P_i^2}{2Pi}} \{P_i(P_i+2n)\}\ n \in \mathbb{N}^+ \text{ [2]} \qquad (4)$$

Let's put:

$$\begin{cases} 3=1+2 \\ 5=3+2 \\ 7=5+2 \\ 9=7+2 \\ 11=9+2 \\ 13=11+2 \\ 15=13+2 \\ 17=15+2 \\ 19=17+2 \\ 21=19+2 \end{cases} \qquad (5)$$

And let's assign (a=1,b=3,c=5,d=7,e=9,f=11,g=13,h=15,i=17,j=19,k=21),changing this in (5) we get:

$$\begin{cases} b=a+2 \\ c=b+2 \\ d=c+2 \\ e=d+2 \\ f=e+2 \\ g=f+2 \\ h=g+2 \\ i=h+2 \\ j=i+2 \\ k=j+2 \end{cases} \qquad (6)$$

Our interest is (e=9=7+2 , h=15=13+2,k=21=19+2) which represents IC (impair composite numbers that we want to prove that they can be written as the sum of 2 Prime numbers . Here (a=1,b=3,c=5,d=7,f=11,g=13,i=17,j=19) represents the Prime numbers.

In the system (6) we have

$$e+b=d+2+a+2$$
$$e+b=c+2+2+b-2$$
$$e+b=c+2+2+d-2-2$$
$$e+b=c+d$$

Changing (e,b,c,d) by their respective values(9,3,5,7) we get

$$3+9=5+7$$

In this example we prove that 3+IC= 5+7 (IC=9),if we do the same process for (IC=15 and IC=21) we will find that

$3+15=5+13=7+11$ then (3+IC = 5+13=7+11) with (IC=15)

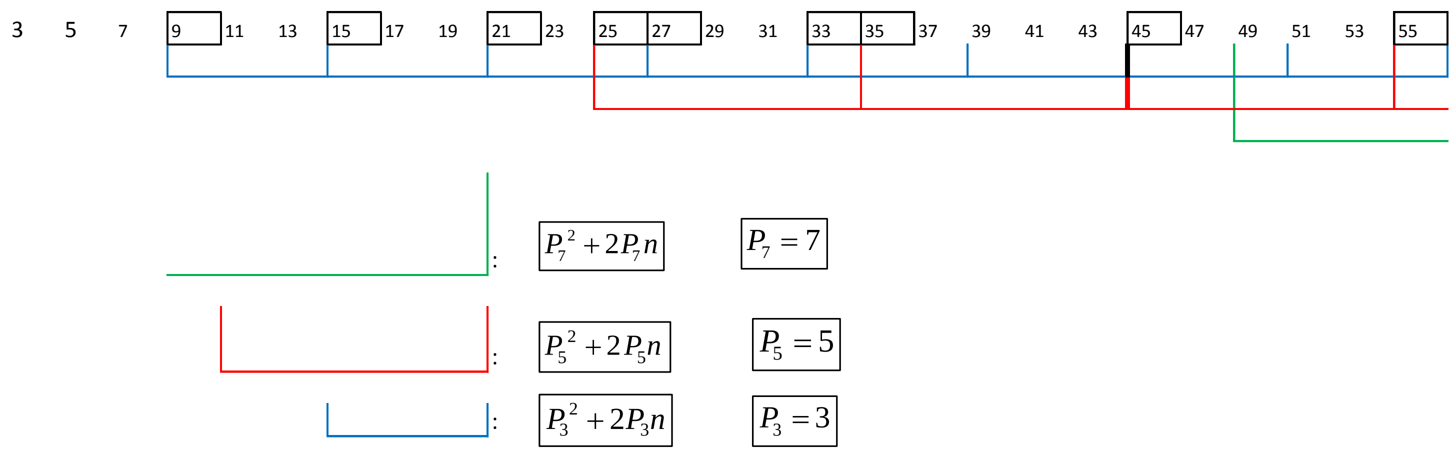
And

$3+21=5+19=7+17=11+13$ then (3+IC = 5+19=7+17=11+13) with (IC=21).

2. GRAPHIC INTERPRETATION

From this example sample example we see clearly that each 3+IC can be written as the sum of 2 prime numbers.

Let's see this graphically.



Figure(1)

The numbers framed (9,15,21,25,27,33,35,45,55) are the IC (impair composite numbers and the rest are the prime numbers , from the example above we saw that ($3+9=5+7$) and ($3+15=5+13=7+11$) and($3+21=5+19=7+17=11+13$),graphically this represents one step on from 3 equal to one step back from the IC , for example (3+9) one step on from 3 is 5 , and one step back from 9 is 7 then (3+9=5+7), example for (3+15) one step on from 3 is 5 and one step back from 15 is 13 then (3+15=5+13) , two steps on from 3 is 7 and two steps back from 15 is 11 then (3+15=7+11),this means mathematically :

$3+IC=(3+2.c)+(IC-2.c)$ with $c\in\mathbb{N}^{*+}$, then

$(3+2.c)+(IC-2.c)=P_i+P_j$ with (P_i and P_j are both prime numbers).

Number of solutions:

We saw above that for the examples ((3+15) and (3+21) may have multiple solutions) this means graphically between 3 and 15 we have 4 Prime numbers then the number of solution is 4/2=2. For the example (3+21) graphically we have 6 prime numbers then 6/2=3 solutions , but if we have number of prime number is impair for example (3+25) between 3 and 25 we have 7 prime numbers then 7/2=3.5 but the number of solutions is 3 then the number of solutions is:

$NS\leq\dfrac{\pi(x)}{2}$ with $\pi(x)$ is the number of prime numbers in given x which represents the number of impairs numbers.

When $\pi(x)$ tends to $+\infty$, NS tends to $+\infty$

In the case where pair number could be written as the sum of the same prime numbers example (10=5+5 , 14=7+7).

Mathematically this means :

$$3+IC=(3+2.c)+(IC-2.c)=(3+2.c)+(P_n^{\ 2}+2P_n-2.c).$$

When 3+IC = sum of the prime numbers , then

$(3+2.c)=(IC-2.c)$ with $IC=\sum_{n=\frac{a-P_i^2}{2Pi}}^{\frac{b-P_i^2}{2Pi}}\{P_i(P_i+2n)\}$ [2] we get

$(3+2.c)=(P_n^{\ 2}+2P_n.m-2.c)$ with $m\in\mathbb{N}^+$

By solving for m we get

$$m=\frac{3+4c-P_{n^2}}{2P_n} \qquad (7)$$

3. CONCLUSION

The system (6) can be written in general as

$$\begin{cases} b=a+2 \\ c=b+2 \\ d=c+2 \\ e=d+2 \\ f=e+2 \\ g=f+2 \\ h=g+2 \qquad \Rightarrow c+n=d+n_{n-1}=e+n_{n-2}=\ldots \\ i=h+2 \\ j=i+2 \\ k=j+2 \\ \vdots \\ n_{n-1}=n_{n-2}+2 \\ n=n_{n-1}+2 \end{cases}$$

Then each (3+IC) can be written as the sum of two prime numbers and we saw in paragraph 2 the number of solution that we can have and as the number of prime numbers is infinite then we can have infinite solution that satisfy 3+IC , here we have proved the GoldBach conjecture and it is true.

5. REFERENCES:

[1] Wikipedia website http://en.wikipedia.org/wiki/Goldbach's_conjecture

[2] Prime numbers finding algorithm and approval of the conjecture of twin primes http://vixra.org/pdf/1405.0011v1.pdf