The Symmetry of N-domain and Hibert’s Eighth Problem

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Abstract  In this paper, we discuss the symmetry of N-domain and we find that using the symmetry characters of Natural Numbers we can give proofs of the Prime Conjectures: Twins Prime Conjecture, Goldbach Conjecture and Reimann Hypothesis.

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1. The proof of Twin Primes Conjecture and Goldbach conjecture
We have
\[ N \sim (0, 1, 2, 3, 4, \ldots) \]  all the natural numbers
\[ n \sim (1, 2, 3, 4, \ldots) \]  all the natural numbers excepted 0
\[ P \sim (2, 3, 5, 7, \ldots) \]  all the prime numbers
\[ p \sim (3, 5, 7, \ldots) \]  all the odd prime numbers
We notice that
\[ N \sim (0, n) \]
\[ P \sim (2, p) \]
Fig. 1. The Symmetry of N-domain

We can define a N domain as $2n \times 2$. We have a square with the vertexes are

$$0, 2n, pn, 2$$

with the center point of this square is $n$

And we can construct a N, P coordinate system show as on figure.1 (a)

The Horizontal axis has 3 points: 0 1 2

The N number axis have 2 points:

$$0, 2n$$

The n number axis have 5 points:

$$1, n - 1, n, n + 1, n + 2$$

The P number axis have 5 points: 2 $p_1$ $p_0$ $p_2$ $pn$ $p0, p1, p2, pn \in p$

we can also get

$$p_1 \to n - 1$$
$$p_0 \to n$$
$$p_2 \to n + 1$$
$$pn \to n + 2$$

And extend this domain to $(0, 1, 2, 3, 4)$ and $(-2n, 2n)$ as show on figure.1 (b)

$$-p_1 \to -(n - 1)$$
$$-p_0 \to -n$$
$$-p_2 \to -(n + 1)$$

And we can get a pyramid structure of all natural numbers as show on figure.1(c)

So we have

$$p_2 - p_1 \to n + 1 - (- (n - 1)) = 2n$$

This is the proof of Polignac’s conjecture. And when $n = 1$

$$p_2 - p_1 = 2$$

This is the proof of Twin Primes Conjecture.

And

$$2n = n + 1 + n - 1 \to p_2 + p_1$$
And \( n - 1 > 2 \) \( n > 3 \) So \( 2n > 6 \)
This mean that every even number bigger than six can be divided into two odd prime numbers in N domain. \textbf{This is the proof of Goldbach conjecture.}

2. The Proof of Riemann Hypothesis.

\[ \xi(s) = \sum_{n=1}^{\infty} \frac{1}{n^s} = \prod_{p \text{ prime}} \frac{1}{1-p^{-s}} \quad (s = a + bi) \]

\textbf{Riemann Hypothesis:} all the Non-trivial zero-point of Zeta-Function \( Re(s) = \frac{1}{2} \).

We have
0=1/2-1/2
1=1/2+1/2
\( i^2 = -1 \)
\( 1/2 = 1/2 \times (1/2+1/2i)(1/2-1/2i) \)

\[ 1 + \begin{bmatrix} 1 & i & 0 \\ 0 & \frac{1}{2} & 1 \\ 1 & -i & 0 \end{bmatrix} \begin{bmatrix} \frac{1}{2} \\ 1-i \\ 1/n+ni \end{bmatrix} = 0 \]

The \( tr(A) = 1/2 \times N \)
This is mean that all the non-trivial Zero points of Riemann zeta-function are on the 1/2 axis just show as Fig.2.2 This is the proof of Riemann Hypothesis.

\[ Fig.2.1 \text{ The pyramid structure of all natural numbers with a 1/2 line} \]

The 1/2 number axis have 5 points:
\[ 1/2, zp1, zp2, zp3, zp4 \]
Figure 2.2: All the non-trivial zero points of the Riemann zeta-function are on the 1/2 axis.

In fact, we should notice to:

\[ 1 + \frac{e^{i \pi} - e^{i 2n \pi}}{\sum \frac{1}{2N}} = 0 \]

\[ N \sim (0, 1, 2, 3, 4, \ldots) \] all the natural numbers.

\[ p \sim (3, 5, 7, \ldots) \] all the odd prime numbers.

\[ e = \lim_{n \to \infty} \left(1 + \frac{1}{n}\right)^n \]

\[ \frac{\pi^2}{6} = \sum_{n=1}^{\infty} \frac{1}{n^2} \]

This equation gives a structure of all \( N \) and \( P \) and a 1/2 fixed point.

Fig 2.3: The symmetry structure of all \( N \) and \( P \) and a 1/2 fixed point.