**ALGEBRAS GROUPS AND GEOMETRIES 35** 389 - 394 (2018)

DOI 10.29083/AGG.35.04.2018

# ON RIEMANN CONJECTURE

**Jiang Yu**
Guangzeng Group, fourth floor, number 10,
Guangming East Road, Zengcheng City,
Post Code: 511316, Guangdong Province, China
jiangyugs@163.com

Received December 18, 2019
Revised April 8, 2020

**Abstract**

This paper explains the variation of the even and odd number sets in a natural number set, as well as the composite number and prime number sets in an odd number set using the contraction and extension of the coordinate axes. In this study, a new explanation of the Riemann function $\zeta(s)$ is also introduced.

**Key words:** Natural numbers, even numbers, odd numbers, composite numbers, prime numbers, pattern

## 1 Introduction

By considering the following, through the contraction and extension of coordinate axes, we demonstrate that linear transformations can produce both even and odd numbers from subsets of a set of composite numbers.

A natural number n means 0, 1, 2, 3, 4, …, including 0 and the positive integers. The set of natural numbers is represented by N. Natural numbers other than 0 and 1 are successors of the natural number 1, i.e.:

$$n=1+1+1+\ldots$$

This is the basic property of natural numbers. The number n is called a superposition of n natural numbers 1.

A number that can be divided by 2 is called an even number, and the even number set is represented by $N_0$. Numbers that are not divisible by 2 are called odd numbers, and the odd number set is represented by $N_1$.

In the odd number set $N_1$, any natural number indivisible by any factor except for 1 and itself is called a prime number. The set of prime numbers is represented by $N_S$. Natural numbers that are divisible by other factors are called composite numbers, and the set of composite numbers is represented by $N_m$.

## 2 Contraction and extension of coordinate axes

In the following considerations, we agree that n is a natural number, $n_n$ ($n_1$, $n_2$, …) is 0 or an integer, and x and y are arbitrary numbers.

The zeros and intervals of the Cartesian coordinates can be arbitrarily selected. Normally, we select the natural number 0 as the zero point of the coordinate and the natural number 1 as the coordinate interval. This coordinate system is called the "1 × 1" coordinate system and we get:

$$n=n_1. \tag{1}$$

Each interval point of the "1 × 1" coordinate system represents a natural number, and the set of natural numbers is N.

We can also choose the natural number 0 as the zero point of the coordinate and the superposition of $n^0$ consecutive natural numbers 1 as the coordinate interval. This coordinate system is called the "1 × $n^0$" coordinate system, and we have

$$n=n^0 n_1, \tag{2}$$

$$n^0=1+1+\ldots$$

This process is called a contraction of the coordinate system, the contraction coefficient is expressed by $\delta^-$, and we have:

$$\delta^-=n^0. \tag{3}$$

Each interval point of the "1 × $n^0$" coordinate system represents a natural number. When $\delta$=2, the set of natural numbers is mapped to $N_0$ or $N_1$, which is:

$$n=2n_1, \tag{4}$$

$$n=2n_1-1. \tag{5}$$

Each interval of the "1 × $n^0$" coordinate system is divided into $n^0$ equal parts. This process is called an extension of the coordinate system, and the extension coefficient is represented by $\delta^+$; thus, we have:

$$\delta^+=1/n^0. \tag{6}$$

When $\delta^-\delta^+=1$, we get the "1 × 1" coordinate system, and the set of natural numbers is N.

**3 Producing even and odd numbers from subsets of a set of composite numbers**

The following considerations are based on those given above.

Natural numbers other than 0 and 1 can be represented by the following equation:

$$n=2n_1+3n_2. \tag{7}$$

Given a choice of $n_1$ and $n_2$ that satisfies (7), we chose $x=n_1$ as the x-axis of the coordinate system and $y=n_2$ as the y-axis of the coordinate system. As a result, we have the following:

$$n=2x+3y, \tag{8}$$

When $n_2=0$, $n=2n_1$, $N\in 0, 2, 4, 6, \ldots$

When $n_2=1$, $n=2n_1+3$, $N\in 1, 3, 5, 7, 9, \ldots$; the natural number 1 is at $n_1=-1$, $n_2=0$.

Through the following considerations, we obtain the variation pattern of the composite set $N_m$ and the prime set $N_s$ in the odd number set $N_1$.

For the sake of simplicity, we chose the natural number 3 as the zero of the coordinates ($n=2n_1+3$), and a composite number in the odd number set $N_1$ can be represented by the following equation:

$$n=(2n_1+3)\times(2n_2+3)=2(2\,n_1\,n_2+3n_1+3n_2+3)+3. \tag{9}$$

Assume

$$n_3=2xy+3x+3y+3. \tag{10}$$

When $n\in N_m$, x and y have one or more than one integer solutions, we have:

$$x=f(n_1), \tag{11}$$

and

$$y=f(n_2). \tag{12}$$

When $n\in N_s$, x or y has no integer solutions, we have:

$$x=f(n_1)+k, \tag{13}$$

or

$$y=f(n_2)+k, \tag{14}$$

where $|k|<1$.

From Equation (9), when $n_2=0$ (when $n_1=0$, the proof is omitted), we have:

$$n=2(3n_1+3)+3. \tag{15}$$

From Equation (15), when $\delta^+=1/3$, we have:

$$n=2n_1+9. \tag{16}$$

We thus have the odd number set $N_1$. After a simple derivation, we obtain the following three equations:

$$x=n_1, \tag{17}$$

or

$$x=n_1+1/3, \tag{18}$$

or

$$x=n_1+2/3. \tag{19}$$

From Equation (16), when $\delta^+=1/2$, we have the following:

$$n=n_1+9. \tag{20}$$

We thus have the natural number set N. After a simple derivation, we obtain the following two equations:

$$x=n_1, \tag{21}$$

or

$$x=n_1+1/2. \tag{22}$$

Next, we consider Riemann function $\zeta(s)$.

Riemann function $\zeta(s)$ satisfies the following algebraic relations:

$$\zeta(s)=2^s\pi^{s-1}\sin\frac{\pi s}{2}\Gamma(1-s)\zeta(1-s). \tag{23}$$

We already know that the trivial zeros of Riemann function $\zeta(s)$ are at $s=-2n$ and the non-trivial zeros are at $\mathrm{Re}(s)=1/2$.

From Equation (21) and (22), let's translate the x-axis by 1/2, we have the following:

$$x'=x+1/2. \tag{24}$$

From Equation (23) and (24), we have the following:

$$\zeta(s') = 2^{s'}\pi^{s'-1}\sin\frac{\pi s'}{2}\Gamma(1-s')\zeta(1-s'). \qquad (25)$$

From Equation (25), we obtain the following conclusions:

The trivial zeros of Riemann function $\zeta(s')$ are at $s' = -(2n+1)$ and the non-trivial zeros are at $\mathrm{Re}(s') = 0$.

Assume

$$0<\mathrm{Re}(s)<1/2,$$

We have the following:

$$2n<|s|<2n+1,$$

Where $s$ is a non-integer.

## 4 Conclusion

Based on the equations above, it is proved that linear transformations can produce both even and odd numbers from subsets of a set of composite numbers.

## References

[1] Gong, Sheng. Concise Calculus (Fourth Edition) [M]. Beijing: Higher Education Press, 2006

[2] Min, Yan. Primary Number Theory [M]. Beijing: Higher Education Press, 2003.

[3] https://www.docin.com/p-1970518235.html