The solution path of Riemann hypothesis

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Abstract

The Riemann hypothesis was proposed by mathematician Bernhard Riemann in 1859. The usual view is that Riemann makes a guess that all non trivial zeros are located on the critical line after simply calculating a few zeros, but this is not the case. Riemann even knew that the probability of counterexamples occurring was very low at that time, so he shyly put forward such a hypothesis. This article provides a detailed explanation of the conditions for the existence of counterexamples in Riemann's hypothesis from his perspective, and provides a calculation method for counterexamples.

When you carefully read this paper, you will know that both mainstream methods currently have flaws. One is to rigorously prove the Riemann hypothesis, but due to the existence of counterexamples to the Riemann hypothesis, no matter how hard one tries, they cannot achieve this. Another method is to calculate counterexamples to the Riemann hypothesis through computers, but this is futile because the counterexamples are located near infinity. Unlike conventional mathematical papers, this paper does not focus on a specific field, but rather uses a cocktail approach to prove my point. Not only does it require knowledge of analytic number theory, but it also requires joint efforts in multiple fields such as probability theory and topology.

Keywords: `Riemann hypothesis`, Riemann Zeta function, counterexample

Contents

1. Current mainstream theories

There is no fixed method to prove the Riemann hypothesis, and a wide range of mathematical tools are required, starting from the limits in mathematical analysis, to differentiation, integration, series, differential equations, and then to residues of complex functions, contour integration, Cauchy Riemann equations, probability theory, functional analysis, integral transformations, numerical calculations, and various branches of mathematics. The biggest problem currently is that mathematicians generally believe that the Riemann hypothesis holds, but it cannot be rigorously proven. By using elliptic integration, it is possible to calculate that all low order non trivial zeros are located on the critical line, but there is no way to deal with high-order zeros. An infinitely small and almost negligible interference term has put the study of Riemann hypothesis in a dilemma. Due to the current efforts of mathematicians in this direction, a significant breakthrough is sure to be achieved in the future, but the difficulty will be very high.

Therefore, I want to create a new mathematical system through a novel approach to prove or falsify the Riemann hypothesis. This method is based on the Riemann hypothesis that there is a counterexample that causes changes in the image, and then locates the numerical value of the counterexample through these small changes. Essentially, this is a method of combining numbers and shapes, which is exactly the original method adopted by Riemann at that time. It can be seen how profound Riemann's understanding of complex functions and analytical extensions is. His brain quickly draws various graphs and accurately defines the meaning of each value, which is also my area of expertise.

That is to say, in the case where the elliptic integration problem cannot be solved, I adopted a lateral research method to study the Riemann hypothesis, but the difficulty was greatly reduced. Essentially, the core issue of Riemann hypothesis is analytical extension, which greatly reduces the probability of counterexamples occurring.

2. Three commonly used graphs for studying Riemann hypothesis

Thanks to the current development of computers, we can clearly see the graph of the Riemann Zeta function. The first step is to list the Riemann Zeta functions.According to the definition of the Riemann Zeta function, within the critical band

$$\zeta(s) = \frac{1}{1 - 2^{1-s}} \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^s} \tag{1}$$

This Riemann Zeta function is analytically extended and is a result of extending the function from the real field to the complex field. At least you need to have studied complex functions to understand them. Generally speaking, they will be introduced in the last chapter. It is to cut the coordinate system from the real axis, rotate it, and then reassemble it into a new coordinate system. Due to the rotation of the coordinate system, the definition of a line has changed. The first figure depicts the variation of the real and imaginary parts of Zeta (s) along the critical line starting from the real axis

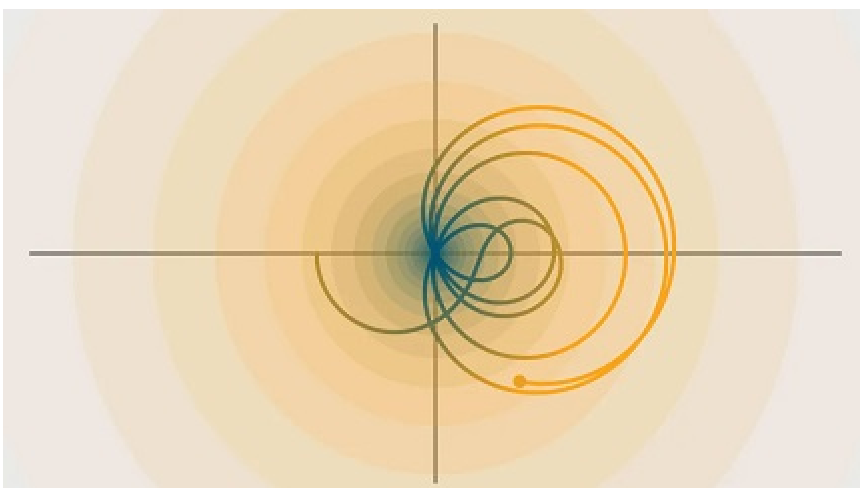

Figure 1:

In the second picture, I marked the real part of Zeta (s) in red and the imaginary part in blue. When the real part of s is -2 and -4, we can see the first two zeros in the lower left corner. Between 0 and 1, I have marked the critical zone and indicated the intersection of the real and imaginary parts of Zeta. These are non trivial zero Riemann functions. At higher values, we see more zeros and two seemingly random functions whose density increases as the imaginary part of s increases.

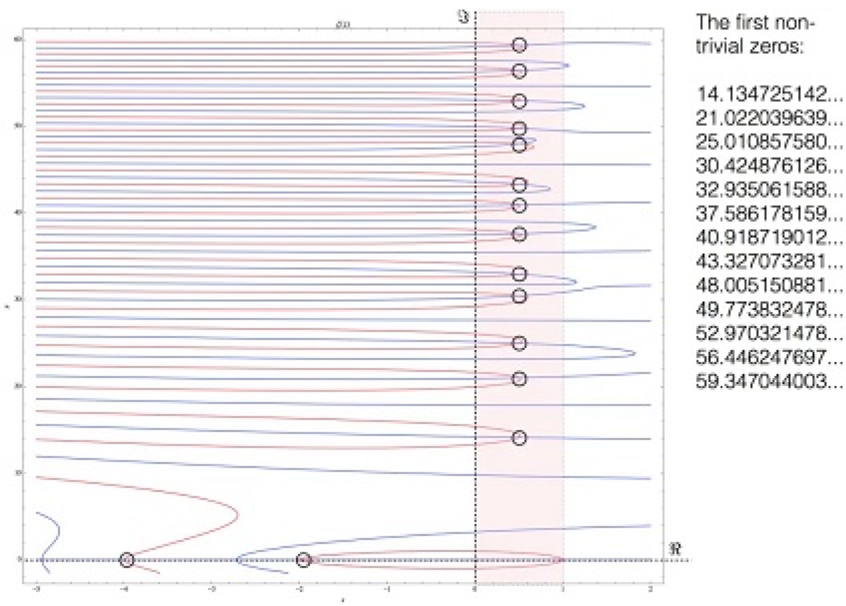

Figure 2:

In the third figure, Re (s)=1/2 is the horizontal axis. The real part Re (s) of Zeta (s) is shown in red, and the imaginary part Im (s) is shown in blue. The non trivial zero point is the intersection point of the red blueprint on the horizontal line.

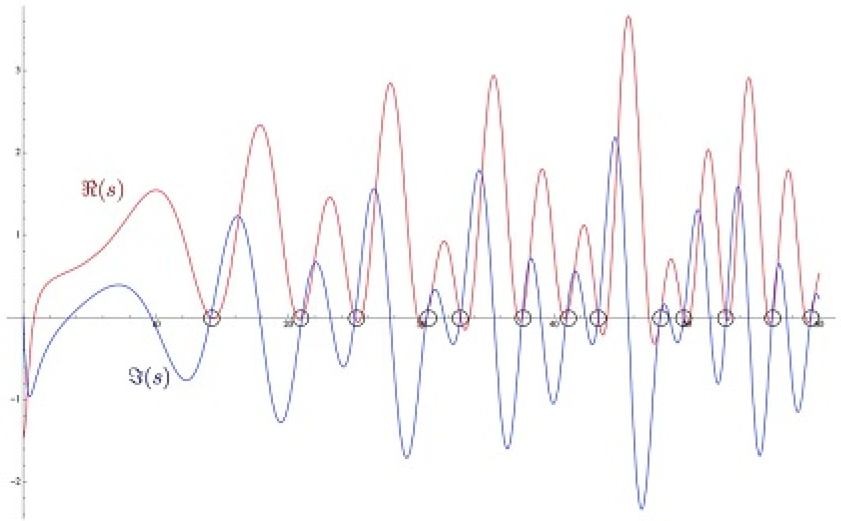

Figure 3:

3. A brand new method for finding non trivial zeros

In Figure 1, we can see that as t increases, the changes in the real and imaginary parts of Zeta (s) follow a pattern of constantly drawing circles. When the rate of change of the real part Re (s) of Zeta (s) with respect to t approaches 0, the approximate value of the non trivial zero point can be calculated.

$$\zeta\left(\mathrm{s}\right) = \frac{1}{1-2^{1-\mathrm{s}}}\sum_{\mathrm{n}=1}^{\infty}\frac{\left(-1\right)^{\mathrm{n}+1}}{\mathrm{n}^{\mathrm{s}}} \tag{2}$$

$$= \frac{1}{1-2^{1-\mathrm{r}-\mathrm{it}}}\sum_{\mathrm{n}=1}^{\infty}\frac{\left(-1\right)^{\mathrm{n}+1}}{\mathrm{n}^{\mathrm{r}+\mathrm{it}}} \tag{3}$$

$$= \frac{1}{1-\left(2^{1-\mathrm{r}}\right)\left(2^{-\mathrm{it}}\right)}\sum_{\mathrm{n}=1}^{\infty}\frac{\left(-1\right)^{\mathrm{n}+1}\mathrm{n}^{-\mathrm{it}}}{\mathrm{n}^{\mathrm{r}}} \tag{4}$$

$$= \frac{1}{1-\left(2^{1-\mathrm{r}}\right)\left(\mathrm{e}^{\ln 2^{-\mathrm{it}}}\right)}\sum_{\mathrm{n}=1}^{\infty}\frac{\left(-1\right)^{\mathrm{n}+1}\mathrm{e}^{\ln \mathrm{n}^{-\mathrm{it}}}}{\mathrm{n}^{\mathrm{r}}} \tag{5}$$

$$= \frac{1}{1-\left(2^{1-\mathrm{r}}\right)\left(\mathrm{e}^{-i\mathrm{t}\cdot\ln 2}\right)} \sum_{\mathrm{n}=1}^{\infty} \frac{(-1)^{\mathrm{n}+1}\mathrm{e}^{-i\mathrm{t}\cdot\ln n}}{\mathrm{n}^{\mathrm{r}}} \tag{6}$$

$$= \frac{1}{1-\left(2^{1-\mathrm{r}}\right)\left[\cos\left(-\mathrm{t}\cdot\ln 2\right)+\mathrm{i}\sin\left(-\mathrm{t}\cdot\ln 2\right)\right]}\cdot$$

$$\sum_{\mathrm{n}=1}^{\infty} \frac{(-1)^{\mathrm{n}+1}\left[\cos\left(-\mathrm{t}\cdot\ln n\right)+\mathrm{i}\sin\left(-\mathrm{t}\cdot\ln n\right)\right]}{\mathrm{n}^{\mathrm{r}}} \tag{7}$$

$$= \frac{1}{\left[1-\left(2^{1-\mathrm{r}}\right)\cos\left(-\mathrm{t}\cdot\ln 2\right)\right]-i\left(2^{1-\mathrm{r}}\right)\sin\left(-\mathrm{t}\cdot\ln 2\right)}\cdot$$

$$\sum_{\mathrm{n}=1}^{\infty} \frac{(-1)^{\mathrm{n}+1}\left[\cos\left(-\mathrm{t}\cdot\ln n\right)+\mathrm{i}\sin\left(-\mathrm{t}\cdot\ln n\right)\right]}{\mathrm{n}^{\mathrm{r}}} \tag{8}$$

$$= \frac{\left[1-\left(2^{1-\mathrm{r}}\right)\cos\left(-\mathrm{t}\cdot\ln 2\right)\right]+i\left(2^{1-\mathrm{r}}\right)\sin\left(-\mathrm{t}\cdot\ln 2\right)}{\left[1-\left(2^{1-\mathrm{r}}\right)\cos\left(-\mathrm{t}\cdot\ln 2\right)\right]^2+\left[\left(2^{1-\mathrm{r}}\right)\sin\left(-\mathrm{t}\cdot\ln 2\right)\right]^2}\cdot$$

$$\sum_{\mathrm{n}=1}^{\infty} \frac{(-1)^{\mathrm{n}+1}\left[\cos\left(-\mathrm{t}\cdot\ln n\right)+\mathrm{i}\sin\left(-\mathrm{t}\cdot\ln n\right)\right]}{\mathrm{n}^{\mathrm{r}}} \tag{9}$$

$$= \frac{\left[1-\left(2^{1-\mathrm{r}}\right)\cos\left(-\mathrm{t}\cdot\ln 2\right)\right]\sum_{\mathrm{n}=1}^{\infty}\frac{(-1)^{\mathrm{n}+1}\cos(-\mathrm{t}\cdot\ln n)}{\mathrm{n}^{\mathrm{r}}}}{\left[1-\left(2^{1-\mathrm{r}}\right)\cos\left(-\mathrm{t}\cdot\ln 2\right)\right]^2+\left[\left(2^{1-\mathrm{r}}\right)\sin\left(-\mathrm{t}\cdot\ln 2\right)\right]^2}-$$

$$\frac{\left(2^{1-\mathrm{r}}\right)\sin\left(-\mathrm{t}\cdot\ln 2\right)\sum_{\mathrm{n}=1}^{\infty}\frac{(-1)^{\mathrm{n}+1}\sin(-\mathrm{t}\cdot\ln n)}{\mathrm{n}^{\mathrm{r}}}}{\left[1-\left(2^{1-\mathrm{r}}\right)\cos\left(-\mathrm{t}\cdot\ln 2\right)\right]^2+\left[\left(2^{1-\mathrm{r}}\right)\sin\left(-\mathrm{t}\cdot\ln 2\right)\right]^2}+$$

$$i\frac{\left[1-\left(2^{1-\mathrm{r}}\right)\cos\left(-\mathrm{t}\cdot\ln 2\right)\right]\sum_{\mathrm{n}=1}^{\infty}\frac{(-1)^{\mathrm{n}+1}\sin(-\mathrm{t}\cdot\ln n)}{\mathrm{n}^{\mathrm{r}}}}{\left[1-\left(2^{1-\mathrm{r}}\right)\cos\left(-\mathrm{t}\cdot\ln 2\right)\right]^2+\left[\left(2^{1-\mathrm{r}}\right)\sin\left(-\mathrm{t}\cdot\ln 2\right)\right]^2}+$$

$$i\frac{\left(2^{1-\mathrm{r}}\right)\sin\left(-\mathrm{t}\cdot\ln 2\right)\sum_{\mathrm{n}=1}^{\infty}\frac{(-1)^{\mathrm{n}+1}\cos(-\mathrm{t}\cdot\ln n)}{\mathrm{n}^{\mathrm{r}}}}{\left[1-\left(2^{1-\mathrm{r}}\right)\cos\left(-\mathrm{t}\cdot\ln 2\right)\right]^2+\left[\left(2^{1-\mathrm{r}}\right)\sin\left(-\mathrm{t}\cdot\ln 2\right)\right]^2} \tag{10}$$

Define

$$f(r,t)=\frac{\left[1-\left(2^{1-\mathrm{r}}\right)\cos\left(-\mathrm{t}\cdot\ln 2\right)\right]\sum_{\mathrm{n}=1}^{\infty}\frac{(-1)^{\mathrm{n}+1}\cos(-\mathrm{t}\cdot\ln n)}{\mathrm{n}^{\mathrm{r}}}}{\left[1-\left(2^{1-\mathrm{r}}\right)\cos\left(-\mathrm{t}\cdot\ln 2\right)\right]^2+\left[\left(2^{1-\mathrm{r}}\right)\sin\left(-\mathrm{t}\cdot\ln 2\right)\right]^2}-$$

$$\frac{\left(2^{1-\mathrm{r}}\right)\sin\left(-\mathrm{t}\cdot\ln 2\right)\sum_{\mathrm{n}=1}^{\infty}\frac{(-1)^{\mathrm{n}+1}\sin(-\mathrm{t}\cdot\ln n)}{\mathrm{n}^{\mathrm{r}}}}{\left[1-\left(2^{1-\mathrm{r}}\right)\cos\left(-\mathrm{t}\cdot\ln 2\right)\right]^2+\left[\left(2^{1-\mathrm{r}}\right)\sin\left(-\mathrm{t}\cdot\ln 2\right)\right]^2} \tag{11}$$

$$g(r,t)=\frac{\left[1-\left(2^{1-\mathrm{r}}\right)\cos\left(-\mathrm{t}\cdot\ln 2\right)\right]\sum_{\mathrm{n}=1}^{\infty}\frac{(-1)^{\mathrm{n}+1}\sin(-\mathrm{t}\cdot\ln n)}{\mathrm{n}^{\mathrm{r}}}}{\left[1-\left(2^{1-\mathrm{r}}\right)\cos\left(-\mathrm{t}\cdot\ln 2\right)\right]^2+\left[\left(2^{1-\mathrm{r}}\right)\sin\left(-\mathrm{t}\cdot\ln 2\right)\right]^2}+$$

$$\frac{\left(2^{1-\mathrm{r}}\right)\sin\left(-\mathrm{t}\cdot\ln 2\right)\sum_{\mathrm{n}=1}^{\infty}\frac{(-1)^{\mathrm{n}+1}\cos(-\mathrm{t}\cdot\ln n)}{\mathrm{n}^{\mathrm{r}}}}{\left[1-\left(2^{1-\mathrm{r}}\right)\cos\left(-\mathrm{t}\cdot\ln 2\right)\right]^2+\left[\left(2^{1-\mathrm{r}}\right)\sin\left(-\mathrm{t}\cdot\ln 2\right)\right]^2} \tag{12}$$

Then

$$\zeta\left(\mathrm{s}\right)=f(r,t)+i\cdot g(r,t) \tag{13}$$

Define

$$\alpha(r,t)=\left(2^{1-\mathrm{r}}\right)\cos\left(-\mathrm{t}\cdot\ln 2\right) \tag{14}$$

$$\beta(r,t)=\left(2^{1-\mathrm{r}}\right)\sin\left(-\mathrm{t}\cdot\ln 2\right) \tag{15}$$

$$\chi(r,t)=\sum_{\mathrm{n}=1}^{\infty}\frac{(-1)^{\mathrm{n}+1}\cos\left(-\mathrm{t}\cdot\ln n\right)}{\mathrm{n}^{\mathrm{r}}} \tag{16}$$

$$\delta(r,t) = \sum_{\mathrm{n}=1}^{\infty} \frac{(-1)^{\mathrm{n}+1} \sin\left(-\mathrm{t} \cdot \ln n\right)}{\mathrm{n}^{\mathrm{r}}} \tag{17}$$

So

$$f(r,t) = \frac{(1-\alpha(r,t)) \cdot \chi(r,t) - \beta(r,t) \cdot \delta(r,t)}{(1-\alpha(r,t))^2 + \beta^2(r,t)} \tag{18}$$

$$g(r,t) = \frac{(1-\alpha(r,t)) \cdot \delta(r,t) + \beta(r,t) \cdot \chi(r,t)}{(1-\alpha(r,t))^2 + \beta^2(r,t)} \tag{19}$$

Derive that

$$\frac{\partial \alpha(r,t)}{\partial t} = \frac{\partial \left[\left(2^{1-\mathrm{r}}\right) \cos\left(-\mathrm{t} \cdot \ln 2\right) \right]}{\partial t} \tag{20}$$

$$= -\left(2^{1-\mathrm{r}}\right) \sin\left(-\mathrm{t} \cdot \ln 2\right) \frac{\partial \alpha\left(-\mathrm{t} \cdot \ln 2\right)}{\partial t} \tag{21}$$

$$= \ln 2 \cdot \left(2^{1-\mathrm{r}}\right) \sin\left(-\mathrm{t} \cdot \ln 2\right) \tag{22}$$

$$= \ln 2 \cdot \beta(r,t) \tag{23}$$

$$\frac{\partial \beta(r,t)}{\partial t} = \frac{\partial \left[\left(2^{1-\mathrm{r}}\right) sin\left(-\mathrm{t} \cdot \ln 2\right) \right]}{\partial t} \tag{24}$$

$$= -\ln 2 \cdot \left(2^{1-\mathrm{r}}\right) \cos\left(-\mathrm{t} \cdot \ln 2\right) \tag{25}$$

$$= -\ln 2 \cdot \alpha(r,t) \tag{26}$$

$$\frac{\partial\chi(r,t)}{\partial t}=\frac{\partial\sum_{\mathrm{n=1}}^{\infty}\frac{(-1)^{\mathrm{n+1}}\cos(-\mathrm{t}\cdot\ln n)}{\mathrm{n^r}}}{\partial t}=\sum_{\mathrm{n=1}}^{\infty}\frac{(-1)^{\mathrm{n+1}}\ln n\sin\left(-\mathrm{t}\cdot\ln n\right)}{\mathrm{n^r}} \tag{27}$$

$$\frac{\partial^2\chi(r,t)}{\partial t^2}=\frac{\partial\sum_{\mathrm{n=1}}^{\infty}\frac{(-1)^{\mathrm{n+1}}\ln n\sin(-\mathrm{t}\cdot\ln n)}{\mathrm{n^r}}}{\partial t}=-\sum_{\mathrm{n=1}}^{\infty}\frac{(-1)^{\mathrm{n+1}}\ln^2 n\cos\left(-\mathrm{t}\cdot\ln n\right)}{\mathrm{n^r}} \tag{28}$$

$$\frac{\partial\delta(r,t)}{\partial t}=\frac{\partial\sum_{\mathrm{n=1}}^{\infty}\frac{(-1)^{\mathrm{n+1}}\sin(-\mathrm{t}\cdot\ln n)}{\mathrm{n^r}}}{\partial t}=-\sum_{\mathrm{n=1}}^{\infty}\frac{(-1)^{\mathrm{n+1}}\ln n\cos\left(-\mathrm{t}\cdot\ln n\right)}{\mathrm{n^r}} \tag{29}$$

$$\frac{\partial^2\delta(r,t)}{\partial t^2}=\frac{-\partial\sum_{\mathrm{n=1}}^{\infty}\frac{(-1)^{\mathrm{n+1}}\ln n\cos(-\mathrm{t}\cdot\ln n)}{\mathrm{n^r}}}{\partial t}=-\sum_{\mathrm{n=1}}^{\infty}\frac{(-1)^{\mathrm{n+1}}\ln^2 n\sin\left(-\mathrm{t}\cdot\ln n\right)}{\mathrm{n^r}} \tag{30}$$

Then

$$\frac{\partial f(r,t)}{\partial t}=\frac{\partial\frac{(1-\alpha(r,t))\cdot\chi(r,t)-\beta(r,t)\cdot\delta(r,t)}{(1-\alpha(r,t))^2+\beta^2(r,t)}}{\partial t} \tag{31}$$

$$=\frac{\left[(1-\alpha(r,t))^2+\beta^2(r,t)\right]\frac{\partial[(1-\alpha(r,t))\cdot\chi(r,t)-\beta(r,t)\cdot\delta(r,t)]}{\partial t}}{\left[(1-\alpha(r,t))^2+\beta^2(r,t)\right]^2}-$$

$$\frac{[(1-\alpha(r,t))\cdot\chi(r,t)-\beta(r,t)\cdot\delta(r,t)]\,\frac{\partial\left[(1-\alpha(r,t))^2+\beta^2(r,t)\right]}{\partial t}}{\left[(1-\alpha(r,t))^2+\beta^2(r,t)\right]^2} \tag{32}$$

$$=\frac{\left[(1-\alpha(r,t))^2+\beta^2(r,t)\right]\left[(1-\alpha(r,t))\frac{\partial\chi(r,t)}{\partial t}+\chi(r,t)\frac{\partial(1-\alpha(r,t))}{\partial t}\right]}{\left[(1-\alpha(r,t))^2+\beta^2(r,t)\right]^2}+$$

$$\frac{\left[(1-\alpha(r,t))^2+\beta^2(r,t)\right]\left[-\beta(r,t)\frac{\partial\delta(r,t)}{\partial t}-\delta(r,t)\frac{\partial\beta(r,t)}{\partial t}\right]}{\left[(1-\alpha(r,t))^2+\beta^2(r,t)\right]^2}-$$

$$\frac{\left[(1-\alpha(r,t))\cdot\chi(r,t)-\beta(r,t)\cdot\delta(r,t)\right]\left[2\cdot(1-\alpha(r,t))\cdot\frac{\partial(1-\alpha(r,t))}{\partial t}\right]}{\left[(1-\alpha(r,t))^2+\beta^2(r,t)\right]^2}-$$

$$\frac{\left[(1-\alpha(r,t))\cdot\chi(r,t)-\beta(r,t)\cdot\delta(r,t)\right]\left[2\cdot\beta(r,t)\cdot\frac{\partial(\beta(r,t))}{\partial t}\right]}{\left[(1-\alpha(r,t))^2+\beta^2(r,t)\right]^2} \tag{33}$$

$$=\frac{(2-2\cdot\alpha(r,t))\left[(1-\alpha(r,t))\frac{\partial\chi(r,t)}{\partial t}-\ln 2\cdot\chi(r,t)\beta(r,t)\right]}{\left[(1-\alpha(r,t))^2+\beta^2(r,t)\right]^2}+$$

$$\frac{(2-2\cdot\alpha(r,t))\left[-\beta(r,t)\frac{\partial\delta(r,t)}{\partial t}+\ln 2\cdot\delta(r,t)\alpha(r,t)\right]}{\left[(1-\alpha(r,t))^2+\beta^2(r,t)\right]^2}+$$

$$\frac{\left[(1-\alpha(r,t))\cdot\chi(r,t)-\beta(r,t)\cdot\delta(r,t)\right](2\cdot\ln 2\cdot\beta(r,t))}{\left[(1-\alpha(r,t))^2+\beta^2(r,t)\right]^2} \tag{34}$$

$$\frac{\partial g(r,t)}{\partial t}=\frac{\partial\frac{(1-\alpha(r,t))\cdot\delta(r,t)+\beta(r,t)\cdot\chi(r,t)}{(1-\alpha(r,t))^2+\beta^2(r,t)}}{\partial t} \tag{35}$$

$$=\frac{\left[(1-\alpha(r,t))^2+\beta^2(r,t)\right]\frac{\partial\left[(1-\alpha(r,t))\cdot\delta(r,t)+\beta(r,t)\cdot\chi(r,t)\right]}{\partial t}}{\left[(1-\alpha(r,t))^2+\beta^2(r,t)\right]^2}-$$

$$\frac{\left[(1-\alpha(r,t))\cdot\delta(r,t)+\beta(r,t)\cdot\chi(r,t)\right]\frac{\partial\left[(1-\alpha(r,t))^2+\beta^2(r,t)\right]}{\partial t}}{\left[(1-\alpha(r,t))^2+\beta^2(r,t)\right]^2} \tag{36}$$

$$
= \frac{\left[(1-\alpha(r,t))^2+\beta^2(r,t)\right]\left[(1-\alpha(r,t))\frac{\partial\delta(r,t)}{\partial t}+\delta(r,t)\frac{\partial(1-\alpha(r,t))}{\partial t}\right]}{\left[(1-\alpha(r,t))^2+\beta^2(r,t)\right]^2}+
$$

$$
\frac{\left[(1-\alpha(r,t))^2+\beta^2(r,t)\right]\left[+\beta(r,t)\frac{\partial\chi(r,t)}{\partial t}+\chi(r,t)\frac{\partial\beta(r,t)}{\partial t}\right]}{\left[(1-\alpha(r,t))^2+\beta^2(r,t)\right]^2}-
$$

$$
\frac{\left[(1-\alpha(r,t))\cdot\delta(r,t)+\beta(r,t)\cdot\chi(r,t)\right]\left[2\cdot(1-\alpha(r,t))\cdot\frac{\partial(1-\alpha(r,t))}{\partial t}\right]}{\left[(1-\alpha(r,t))^2+\beta^2(r,t)\right]^2}-
$$

$$
\frac{\left[(1-\alpha(r,t))\cdot\delta(r,t)+\beta(r,t)\cdot\chi(r,t)\right]\left[2\cdot\beta(r,t)\cdot\frac{\partial(\beta(r,t))}{\partial t}\right]}{\left[(1-\alpha(r,t))^2+\beta^2(r,t)\right]^2} \tag{37}
$$

$$
= \frac{(2-2\cdot\alpha(r,t))\left[(1-\alpha(r,t))\frac{\partial\delta(r,t)}{\partial t}-\ln 2\cdot\delta(r,t)\beta(r,t)\right]}{\left[(1-\alpha(r,t))^2+\beta^2(r,t)\right]^2}+
$$

$$
\frac{(2-2\cdot\alpha(r,t))\left[\beta(r,t)\frac{\partial\chi(r,t)}{\partial t}-\ln 2\cdot\chi(r,t)\alpha(r,t)\right]}{\left[(1-\alpha(r,t))^2+\beta^2(r,t)\right]^2}+
$$

$$
\frac{\left[(1-\alpha(r,t))\cdot\delta(r,t)+\beta(r,t)\cdot\chi(r,t)\right](2\cdot\ln 2\cdot\beta(r,t))}{\left[(1-\alpha(r,t))^2+\beta^2(r,t)\right]^2} \tag{38}
$$

We can calculate the non trivial zero point of Zeta (s) by using equation 34 to make its value equal to 0.

4. Verify the accuracy of the new method through computer validation

When r=0.5, we calculated the zeros of the Riemann Zeta function using a new method and compared them with actual values

Table 1:

Serial number	new method	actual values
1	14.36456	14.134725
2	20.86740	21.022039
3	25.2085	25.0108
4	30.15182	30.42487
5	33.25629	32.93506
6	37.53119	37.58617
7	40.8232	40.9187
8	43.55	43.32307
9	47.66915	48.00515
10	50.01409	49.77383
11	53.07871	52.97032
12	56.3267	56.44624
13	60.13283	59.34704

Through this verification method, I have at least proven that the numerous equations listed above are accurate.

5. Definition of Zhiyang Zhang Curve

We refer to points that satisfy both of the following equations as Zhiyang Zhang Points, and according to the concept of analytical extension, these points do not exist in isolation. If these points are connected, a curve is formed, which is the curve I defined Zhiyang Zhang Curve.

$$\frac{\partial f(r,t)}{\partial t} = 0 \tag{39}$$

$$\frac{\partial g(r,t)}{\partial t} = 0 \tag{40}$$

Since the Riemann Zeta function is symmetric about the real number axis, we can at least find one curve. I calculated the points that satisfy these two equations through computer simulation.

Table 2:

r	**t**	**Equation (39)**	**Equation (40)**
0	2.05	-0.0244723773521	-0.0183082464082
0.05	2.1	-0.0234532115277	-0.0215708095147
0.1	2.16	-0.0129192207387	-0.0200245766013
0.15	2.2	-0.00362507715564	-0.00630811225035
0.2	2.25	0.00760573284656	0.00395336509812
0.25	2.3	0.0175231361095	0.0130844288407
0.3	2.35	0.025776012234	0.0202165497956
0.35	2.4	0.0324964874361	0.0251175544476
0.4	2.4	0.0308770136999	0.0331308500535
0.45	2.45	0.0363998574285	0.0341847819754
0.5	2.5	0.041104680597	0.034128844934

We can create a curve from the point above

Table 3:

r	t	Equation (39)	Equation (40)
0	8.56	0.114956944351	-0.743107557819
0.05	8.58	0.108399965635	-0.4843935291
0.1	8.61	0.0995857484577	-0.336137621415
0.15	8.63	0.0958068814812	-0.208160770345
0.2	8.64	0.0935868098532	-0.0864169060773
0.25	8.65	0.0908247762845	0.00518429688431
0.3	8.68	0.0883531508267	-0.0049399530501
0.35	8.7	0.0324964874361	0.0251175544476
0.4	8.72	0.0861805886247	0.0138432641493
0.45	8.73	0.0838248292633	0.0571088881507
0.5	8.74	0.0813780353427	0.0983923405983

6. The relationship between Riemann hypothesis counterexamples and Zhiyang Zhang Curve

This chapter is the soul of the entire paper, and if you can fully understand it, you will feel very wonderful. If the curve symmetric about the real axis is referred to as the first type of Zhiyang Zhang Curve, then the remaining curves can be referred to as the second type of Zhiyang Zhang Curve. Many mathematicians wonder why I proposed such a curve in the previous chapter and directly drew it. Let me tell you, because I saw a turning point in Figure 1, which requires the appearance of a Zhiyang Zhang Curve. In general, the appearance of any Zhiyang Zhang Curve will lead to a clear signal in the image, which indicates the birth of a counterexample to the Riemann hypothesis.

My conclusion is that the existence or absence of the second type of Zhiyang Zhang Curve is a sufficient and necessary condition for the existence of counterexamples to the Riemann hypothesis.

The following study investigates the probability of the occurrence of counterexamples to the Riemann hypothesis. Due to the relative independence of equations (39) and (40), although they both have countless solutions, the probability of accurately locating the two solutions at a point is very low. Essentially, the core issue of Riemann hypothesis is analytical extension, which greatly reduces the probability of counterexamples occurring. When two equations with infinite solutions have at least one solution that happens to be the same, a counterexample will appear. Since numbers are infinite, the probability of two numbers being exactly the same is almost zero, but you can try infinitely, so it cannot be proven that this possibility does not exist.

Here, I have great respect for Riemann, who can predict that the probability of a counterexample occurring is extremely low. This paper has made it clear that any attempt to prove the Riemann hypothesis cannot avoid the possibility of this counterexample occurring, and existing numerical calculation methods have become meaningless. Because you cannot find counterexamples within a limited number.

7. A simple function for determining the existence of counterexamples to Riemann hypothesis

Since the Zhiyang Zhang Curve is a curve, we can choose a relatively simple point to calculate, such as s=0+it, that is, when the real part is 0, the function will become relatively simple.Substitute s=0+it into equations (14)(15)(16)(17)(27)(29), simplify and obtain

$$\alpha(0,t) = \left(2^{1-0}\right)\cos\left(-\mathrm{t}\cdot\ln 2\right) = 2\cos\left(-\mathrm{t}\cdot\ln 2\right) \tag{41}$$

$$\beta(0,t) = \left(2^{1-0}\right)\sin\left(-\mathrm{t}\cdot\ln 2\right) = 2\sin\left(-\mathrm{t}\cdot\ln 2\right) \tag{42}$$

$$\chi(0,t) = \sum_{\mathrm{n}=1}^{\infty}\frac{(-1)^{\mathrm{n}+1}\cos\left(-\mathrm{t}\cdot\ln n\right)}{\mathrm{n}^{0}} = \sum_{\mathrm{n}=1}^{\infty}(-1)^{\mathrm{n}+1}\cos\left(-\mathrm{t}\cdot\ln n\right) \tag{43}$$

$$\delta(0,t) = \sum_{\mathrm{n}=1}^{\infty} \frac{(-1)^{\mathrm{n}+1} \sin(-\mathrm{t} \cdot \ln n)}{\mathrm{n}^0} = \sum_{\mathrm{n}=1}^{\infty} (-1)^{\mathrm{n}+1} \sin(-\mathrm{t} \cdot \ln n) \tag{44}$$

$$\frac{\partial \chi(0,t)}{\partial t} = \sum_{\mathrm{n}=1}^{\infty} \frac{(-1)^{\mathrm{n}+1} \ln n \sin(-\mathrm{t} \cdot \ln n)}{\mathrm{n}^0} = \sum_{\mathrm{n}=1}^{\infty} (-1)^{\mathrm{n}+1} \ln n \sin(-\mathrm{t} \cdot \ln n) \tag{45}$$

$$\frac{\partial \delta(0,t)}{\partial t} = -\sum_{\mathrm{n}=1}^{\infty} \frac{(-1)^{\mathrm{n}+1} \ln n \cos(-\mathrm{t} \cdot \ln n)}{\mathrm{n}^0} = -\sum_{\mathrm{n}=1}^{\infty} (-1)^{\mathrm{n}+1} \ln n \cos(-\mathrm{t} \cdot \ln n) \tag{46}$$

Define

$$\begin{aligned} F(0,t) = {} & (2 - 2 \cdot \alpha(0,t)) \left[(1 - \alpha(0,t)) \frac{\partial \chi(0,t)}{\partial t} - \ln 2 \cdot \chi(0,t) \beta(0,t) \right] + \\ & (2 - 2 \cdot \alpha(0,t)) \left[-\beta(0,t) \frac{\partial \delta(0,t)}{\partial t} + \ln 2 \cdot \delta(0,t) \alpha(0,t) \right] + \\ & \left[(1 - \alpha(0,t)) \cdot \chi(0,t) - \beta(0,t) \cdot \delta(0,t) \right] (2 \cdot \ln 2 \cdot \beta(0,t)) \end{aligned} \tag{47}$$

$$\begin{aligned} G(0,t) = {} & (2 - 2 \cdot \alpha(0,t)) \left[(1 - \alpha(0,t)) \frac{\partial \delta(0,t)}{\partial t} - \ln 2 \cdot \delta(0,t) \beta(0,t) \right] + \\ & (2 - 2 \cdot \alpha(0,t)) \left[\beta(0,t) \frac{\partial \chi(0,t)}{\partial t} - \ln 2 \cdot \chi(0,t) \alpha(0,t) \right] + \\ & \left[(1 - \alpha(0,t)) \cdot \delta(0,t) + \beta(0,t) \cdot \chi(0,t) \right] (2 \cdot \ln 2 \cdot \beta(0,t)) \end{aligned} \tag{48}$$

$$F(0,t) = 0 \tag{49}$$

$$G(0,t) = 0 \tag{50}$$

If equation (49) has a solution, then equation (39) also has a solution. If equation (50) has a solution, then equation (40) also has a solution.Below, we will solve the problem of the existence of counterexamples to Riemann hypothesis through the definition of calculus or the method of proof by contradiction. Therefore, we need to define a quantity to study. Define

$$H(0,t) = F(0,t)F(0,t) + G(0,t)G(0,t) \tag{51}$$

$$H(0,t) = 0 \tag{52}$$

8. Mathematical induction method for solving equations

Although equation (51) is already simple enough, we still need enough patience for a mathematical problem that has existed for over 160 years.Redefine equations (43), (44), (45), and (46)

$$\chi(0,t,m) = \sum_{\mathrm{n}=1}^{m} (-1)^{\mathrm{n}+1} \cos\left(-\mathrm{t} \cdot \ln n\right) \tag{53}$$

$$\delta(0,t,m) = \sum_{\mathrm{n}=1}^{m} (-1)^{\mathrm{n}+1} \sin\left(-\mathrm{t} \cdot \ln n\right) \tag{54}$$

$$\frac{\partial \chi(0,t,m)}{\partial t} = \sum_{\mathrm{n}=1}^{m} (-1)^{\mathrm{n}+1} \ln n \sin\left(-\mathrm{t} \cdot \ln n\right) \tag{55}$$

$$\frac{\partial \delta(0,t,m)}{\partial t} = -\sum_{\mathrm{n}=1}^{m} (-1)^{\mathrm{n}+1} \ln n \cos\left(-\mathrm{t} \cdot \ln n\right) \tag{56}$$

So equations (47) and (48) will become

$$F(0,t,m) = (2-2\cdot\alpha(0,t))\left[(1-\alpha(0,t))\frac{\partial\chi(0,t,m)}{\partial t} - \ln 2\cdot\chi(0,t,m)\beta(0,t)\right]+$$

$$(2-2\cdot\alpha(0,t))\left[-\beta(0,t)\frac{\partial\delta(0,t,m)}{\partial t} + \ln 2\cdot\delta(0,t,m)\alpha(0,t)\right]+$$

$$\left[(1-\alpha(0,t))\cdot\chi(0,t,m) - \beta(0,t)\cdot\delta(0,t,m)\right](2\cdot\ln 2\cdot\beta(0,t)) \tag{57}$$

$$G(0,t,m) = (2-2\cdot\alpha(0,t))\left[(1-\alpha(0,t))\frac{\partial\delta(0,t,m)}{\partial t} - 2\ln 2\cdot\delta(0,t,m)\beta(0,t)\right]+$$

$$(2-2\cdot\alpha(0,t))\left[\beta(0,t)\frac{\partial\chi(0,t,m)}{\partial t} - \ln 2\cdot\chi(0,t,m)\alpha(0,t)\right]+$$

$$\left[(1-\alpha(0,t))\cdot\delta(0,t,m) + \beta(0,t)\cdot\chi(0,t,m)\right](2\cdot\ln 2\cdot\beta(0,t)) \tag{58}$$

So the problem we are studying will become

$$H(0,t,m) = F(0,t,m)F(0,t,m) + G(0,t,m)G(0,t,m) \tag{59}$$

$$H(0,t,m) = 0 \tag{60}$$

Next, we will investigate whether there is a solution to equation (60) for different natural numbers m, and extend it to the infinite case. The earliest known proof of using mathematical induction appeared in Francesco Maurolico's Arithmeticorum libri duo (1575).The principle of this method is to first prove that the proposition holds at a certain starting point, and then prove that the process from one value to the next is valid. When both points have been proven, any value can be derived by repeatedly using this method.

9. When m=1, the solution of the equation

$$\chi(0,t,1)=\sum_{\mathrm{n}=1}^{1}(-1)^{\mathrm{n}+1}\cos\left(-\mathrm{t}\cdot\ln n\right)=1 \tag{61}$$

$$\delta(0,t,1)=\sum_{\mathrm{n}=1}^{1}(-1)^{\mathrm{n}+1}\sin\left(-\mathrm{t}\cdot\ln n\right)=0 \tag{62}$$

$$\frac{\partial\chi(0,t,1)}{\partial t}=\sum_{\mathrm{n}=1}^{1}(-1)^{\mathrm{n}+1}\ln n\sin\left(-\mathrm{t}\cdot\ln n\right)=0 \tag{63}$$

$$\frac{\partial\delta(0,t,1)}{\partial t}=-\sum_{\mathrm{n}=1}^{1}(-1)^{\mathrm{n}+1}\ln n\cos\left(-\mathrm{t}\cdot\ln n\right)=0 \tag{64}$$

So

$$F(0,t,1)=(2-2\cdot\alpha(0,t))\left[(1-\alpha(0,t))\frac{\partial\chi(0,t,1)}{\partial t}-\ln 2\cdot\chi(0,t,1)\beta(0,t)\right]+$$

$$(2-2\cdot\alpha(0,t))\left[-\beta(0,t)\frac{\partial\delta(0,t,1)}{\partial t}+\ln 2\cdot\delta(0,t,1)\alpha(0,t)\right]+$$

$$\left[(1-\alpha(0,t))\cdot\chi(0,t,1)-\beta(0,t)\cdot\delta(0,t,1)\right](2\cdot\ln 2\cdot\beta(0,t)) \tag{65}$$

Substitute equations (41) and (42) to obtain

$$F(0,t,1)=2\left(1-\alpha(0,t)\right) \tag{66}$$

Similarly

$$G(0,t,1)=(2-2\cdot\alpha(0,t))\left[(1-\alpha(0,t))\frac{\partial\delta(0,t,1)}{\partial t}-\ln 2\cdot\delta(0,t,1)\beta(0,t)\right]+$$

$$(2-2\cdot\alpha(0,t))\left[\beta(0,t)\frac{\partial\chi(0,t,1)}{\partial t}-\ln 2\cdot\chi(0,t,1)\alpha(0,t)\right]+$$

$$[(1-\alpha(0,t))\cdot\delta(0,t,1)+\beta(0,t)\cdot\chi(0,t,1)]\,(2\cdot\ln 2\cdot\beta(0,t)) \quad (67)$$

Substitute equations (41) and (42) to obtain

$$G(0,t,1)=2\,(1-\alpha(0,t)-\alpha(0,t)\ln 2+4\ln 2+\beta(0,t)\ln 2) \quad (68)$$

For equation (66)

$$F(0,t,1)=2\,(1-\alpha(0,t))=2\,(1-2\cos(-\mathrm{t}\cdot\ln 2))=0 \quad (69)$$

$$\cos(-\mathrm{t}\cdot\ln 2)=\frac{1}{2} \quad (70)$$

Then

$$-\mathrm{t}\cdot\ln 2=2n\pi+\frac{\pi}{3},(n\in R) \quad (71)$$

$$t=\frac{2n\pi}{ln2}-\frac{\pi}{3ln2},(n\in R) \quad (72)$$

For equation (68)

$$G(0,t,1)=2\,(1-\alpha(0,t)-\alpha(0,t)\ln 2+4\ln 2+\beta(0,t)\ln 2)>0 \quad (73)$$

By setting the value of equation (72) to 0, a large number of t values can be calculated. But the value of equation (73) is always greater than 0, so we cannot find a t. Therefore, it is impossible to make a point of intersection. Although this attempt failed, it still provides us with a lot of guidance for our next step of work

10. When m=2, the solution of the equation

When m=2, we still calculate a simple trigonometric function in the end, which seems insignificant for us to solve problems such as the Riemann hypothesis.The work ahead is still quite complex.

$$\chi(0,t,2)=\sum_{\mathrm{n=1}}^{2}(-1)^{\mathrm{n+1}}\cos\left(-\mathrm{t}\cdot\ln n\right)=1-\cos\left(-\mathrm{t}\cdot\ln 2\right) \tag{74}$$

$$\delta(0,t,2)=\sum_{\mathrm{n=1}}^{2}(-1)^{\mathrm{n+1}}\sin\left(-\mathrm{t}\cdot\ln n\right)=-\sin\left(-\mathrm{t}\cdot\ln 2\right) \tag{75}$$

$$\frac{\partial\chi(0,t,2)}{\partial t}=\sum_{\mathrm{n=1}}^{2}(-1)^{\mathrm{n+1}}\ln n\sin\left(-\mathrm{t}\cdot\ln n\right)=-\ln 2\cdot\sin\left(-\mathrm{t}\cdot\ln 2\right) \tag{76}$$

$$\frac{\partial\delta(0,t,2)}{\partial t}=-\sum_{\mathrm{n=1}}^{2}(-1)^{\mathrm{n+1}}\ln n\cos\left(-\mathrm{t}\cdot\ln n\right)=\ln 2\cdot\cos\left(-\mathrm{t}\cdot\ln 2\right) \tag{77}$$

Define

$$u=\cos\left(-\mathrm{t}\cdot\ln 2\right) \tag{78}$$

$$v=\sin\left(-\mathrm{t}\cdot\ln 2\right) \tag{79}$$

Substitute equation (41)(42)(74)(75)(76)(77) into equation (57)(58) to obtain

$$F(0,t,2)=(2-2\cdot\alpha(0,t))\left[(1-\alpha(0,t))\frac{\partial\chi(0,t,2)}{\partial t}-\ln 2\cdot\chi(0,t,2)\beta(0,t)\right]+$$

$$(2-2\cdot\alpha(0,t))\left[-\beta(0,t)\frac{\partial\delta(0,t,2)}{\partial t}+\ln 2\cdot\delta(0,t,2)\alpha(0,t)\right]+$$

$$[(1-\alpha(0,t))\cdot\chi(0,t,2)-\beta(0,t)\cdot\delta(0,t,2)]\,(2\cdot\ln 2\cdot\beta(0,t)) \tag{80}$$

$$=(2-4u)\,[-\ln 2\cdot(1-2u)v-2\ln 2\cdot(1-u)v]+$$

$$(2-4u)\,[-2\ln 2\cdot uv-2\ln 2\cdot uv]+$$

$$[(1-2u)\cdot(1-u)+2v\cdot v]\,(4\cdot\ln 2\cdot v) \tag{81}$$

$$=(2-4u))(4\cdot\ln 2\cdot uv-3\cdot\ln 2\cdot v-4\cdot\ln 2\cdot uv)+$$

$$(1+2uu-3u+2vv))(4\cdot\ln 2\cdot v)$$

$$=(2\ln 2\cdot v)(4uu-1+4vv) \tag{82}$$

Because

$$uu+vv=1 \tag{83}$$

Therefore

$$F(0,t,2)=6\cdot\ln 2\cdot v \tag{84}$$

$$F(0,t,2)=0 \tag{85}$$

Resolve as

$$v = 0 \tag{86}$$

$$G(0,t,2) = (2 - 2\cdot\alpha(0,t))\left[(1-\alpha(0,t))\frac{\partial\delta(0,t,2)}{\partial t} - \ln 2\cdot\delta(0,t,2)\beta(0,t)\right]+$$

$$(2 - 2\cdot\alpha(0,t))\left[\beta(0,t)\frac{\partial\chi(0,t,2)}{\partial t} - \ln 2\cdot\chi(0,t,2)\alpha(0,t)\right]+$$

$$\left[(1-\alpha(0,t))\cdot\delta(0,t,2) + \beta(0,t)\cdot\chi(0,t,2)\right](2\cdot\ln 2\cdot\beta(0,t)) \tag{87}$$

$$= (2-4u)\left[\ln 2(1-2u)u + 2\ln 2\cdot vv\right]+$$

$$((2-4u)\left[-2\ln 2\cdot vv - 2\ln 2\cdot u(1-u)\right]+$$

$$\left[-(1-2u)v + 2v\cdot(1-u)\right](4\cdot\ln 2\cdot v) \tag{88}$$

$$= (2-4u)(-3\cdot\ln 2\cdot u) + v(4\cdot\ln 2\cdot v) \tag{89}$$

$$= 2\ln 2\cdot(8uu - 3u + 2vv) \tag{90}$$

$$= 2\ln 2\cdot(6uu - 3u + 2) > 0 \tag{91}$$

Equation (92) seems to have no solution.Therefore, it is also impossible to make a point of intersection.

11. When m=3, the solution of the equation

When m=1 or m=2, observing equations (61)(62)(63)(64) and (74)(75)(76)(77), there is only one angle variable in the trigonometric function. Therefore, their solution is periodic, very definite in position, without the characteristics of Riemann hypothesis, which appears random, and it is possible to find a situation where two solutions are consistent. When $m \geq 3$, the situation becomes completely different.

$$\chi(0, t, 3) = \sum_{\mathrm{n}=1}^{3} (-1)^{\mathrm{n}+1} \cos(-\mathrm{t} \cdot \ln n)$$

$$= 1 - \cos(-\mathrm{t} \cdot \ln 2) + \cos(-\mathrm{t} \cdot \ln 3) \tag{92}$$

$$\delta(0, t, 3) = \sum_{\mathrm{n}=1}^{3} (-1)^{\mathrm{n}+1} \sin(-\mathrm{t} \cdot \ln n)$$

$$= -\sin(-\mathrm{t} \cdot \ln 2) + \sin(-\mathrm{t} \cdot \ln 3) \tag{93}$$

$$\frac{\partial \chi(0, t, 3)}{\partial t} = \sum_{\mathrm{n}=1}^{3} (-1)^{\mathrm{n}+1} \ln n \sin(-\mathrm{t} \cdot \ln n)$$

$$= -\ln 2 \cdot \sin(-\mathrm{t} \cdot \ln 2) + \ln 3 \cdot \sin(-\mathrm{t} \cdot \ln 3) \tag{94}$$

$$\frac{\partial \delta(0, t, 3)}{\partial t} = -\sum_{\mathrm{n}=1}^{3} (-1)^{\mathrm{n}+1} \ln n \cos(-\mathrm{t} \cdot \ln n)$$

$$= \ln 2 \cdot \cos(-\mathrm{t} \cdot \ln 2) - \ln 3 \cdot \cos(-\mathrm{t} \cdot \ln 3) \tag{95}$$

Define

$$o = \cos\left(-\mathrm{t} \cdot \ln 3\right) \tag{96}$$

$$p = \sin\left(-\mathrm{t} \cdot \ln 3\right) \tag{97}$$

So

$$\alpha(0,t) = 2\cos\left(-\mathrm{t} \cdot \ln 2\right) = 2u \tag{98}$$

$$\beta(0,t) = 2\sin\left(-\mathrm{t} \cdot \ln 2\right) = 2v \tag{99}$$

$$\chi(0,t,3) = 1 - u + o \tag{100}$$

$$\delta(0,t,3) = -v + p \tag{101}$$

$$\frac{\partial \chi(0,t,3)}{\partial t} = -\ln 2 \cdot v + \ln 3 \cdot p \tag{102}$$

$$\frac{\partial \delta(0,t,3)}{\partial t} = \ln 2 \cdot u - \ln 3 \cdot o \tag{103}$$

Substitute equation (98)(99)(100)(101)(102)(103) into equation (57)(58) to obtain

$$F(0,t,3) = (2 - 2 \cdot \alpha(0,t)) \left[(1 - \alpha(0,t))\frac{\partial \chi(0,t,3)}{\partial t} - \ln 2 \cdot \chi(0,t,3)\beta(0,t)\right] +$$

$$(2-2\cdot\alpha(0,t))\left[-\beta(0,t)\frac{\partial\delta(0,t,3)}{\partial t}+\ln 2\cdot\delta(0,t,3)\alpha(0,t)\right]+$$

$$[(1-\alpha(0,t))\cdot\chi(0,t,3)-\beta(0,t)\cdot\delta(0,t,3)]\,(2\cdot\ln 2\cdot\beta(0,t)) \tag{104}$$

$$=(2-4\cdot u)\,[(1-2u)(-\ln 2\cdot v+\ln 3\cdot p)-\ln 2\cdot(1-u+o)\cdot 2v]+$$

$$(2-4\cdot u)\,[-2v(\ln 2\cdot u-\ln 3\cdot o)+\ln 2\cdot(-v+p)(2u)]+$$

$$[(1-2u)\cdot(1-u+o)-2v\cdot(-v+p)]\,[2\cdot\ln 2\cdot(2v)] \tag{105}$$

$$G(0,t,3)=(2-2\cdot\alpha(0,t))\left[(1-\alpha(0,t))\frac{\partial\delta(0,t,3)}{\partial t}-2\ln 2\cdot\delta(0,t,3)\beta(0,t)\right]+$$

$$(2-2\cdot\alpha(0,t))\left[\beta(0,t)\frac{\partial\chi(0,t,3)}{\partial t}-\ln 2\cdot\chi(0,t,3)\alpha(0,t)\right]+$$

$$[(1-\alpha(0,t))\cdot\delta(0,t,3)+\beta(0,t)\cdot\chi(0,t,3)]\,(2\cdot\ln 2\cdot\beta(0,t)) \tag{106}$$

$$=(2-4\cdot u)\,[(1-2u)(-\ln 2\cdot v+\ln 3\cdot p)-2\ln 2\cdot(-v+p)(-2v)]+$$

$$(2-4\cdot u)\,[-2v(-\ln 2\cdot v+\ln 3\cdot p)-\ln 2\cdot(1-u+o)(1-2u)]+$$

$$[(1-2u)\cdot(-v+p)+2v\cdot(1-u+o)]\,[2\cdot\ln 2\cdot(2v)] \tag{107}$$

Through (106)(107), we can learn that

$$F(0,t,3)=0 \tag{108}$$

$$G(0,t,3)=0 \tag{109}$$

The equation (108) and (109) have countless solutions, but it is currently impossible to calculate whether they have the same solution. Because this mathematical tool has not yet been created.
If equation (108) and (109) are difficult, you cannot see the structure of the solution. So let me give a simpler example

$$\sin(-\mathrm{t}\cdot\ln 2)=0 \tag{110}$$

$$\sin(-\mathrm{t}\cdot\ln 3)=0 \tag{111}$$

Equations (110) and (111) have countless solutions, and we know that t=0 is their common solution. But do these two equations have other common solutions? Currently, algebra has not studied this direction, so I will present a new algebraic structure later to investigate the structure and properties of solutions in infinite number fields.

12. General conclusion

After all, the Riemann hypothesis studies infinite series, so I still need this chapter to make the theory more comprehensive and to verify the accuracy of the formulas listed earlier.

$$F(0,t,m)=0 \tag{112}$$

$$G(0,t,m)=0 \tag{113}$$

$$F(0,t,m+1)=0 \tag{114}$$

$$G(0,t,m+1)=0 \tag{115}$$

If equations (112)and (113) have a common solution, can we infer that equations (114) and (115) also have a common solution?

$$\chi(0,t,m+1)-\chi(0,t,m)=(-1)^{\mathrm{m}}\cos\left[-\mathrm{t}\cdot\ln(m+1)\right] \tag{116}$$

$$\delta(0,t,m+1)-\delta(0,t,m)=(-1)^{\mathrm{m}}\sin\left[-\mathrm{t}\cdot\ln(m+1)\right] \tag{117}$$

$$\frac{\partial\chi(0,t,m+1)}{\partial t}-\frac{\partial\chi(0,t,m)}{\partial t}=(-1)^{\mathrm{m}}\ln(m+1)\sin\left[-\mathrm{t}\cdot\ln(m+1)\right] \tag{118}$$

$$\frac{\partial\delta(0,t,m+1)}{\partial t}-\frac{\partial\delta(0,t,m)}{\partial t}=-(-1)^{\mathrm{m}}\ln(m+1)\cos\left[-\mathrm{t}\cdot\ln(m+1)\right] \tag{119}$$

Define

$$j = (-1)^{\mathrm{m}} \cos\left[-\mathrm{t} \cdot \ln(m+1)\right] \tag{120}$$

$$k = (-1)^{\mathrm{m}} \sin\left[-\mathrm{t} \cdot \ln(m+1)\right] \tag{121}$$

So

$$\chi(0,t,m+1) - \chi(0,t,m) = j \tag{122}$$

$$\delta(0,t,m+1) - \delta(0,t,m) = k \tag{123}$$

$$\frac{\partial \chi(0,t,m+1)}{\partial t} - \frac{\partial \chi(0,t,m)}{\partial t} = k \cdot \ln(m+1) \tag{124}$$

$$\frac{\partial \delta(0,t,m+1)}{\partial t} - \frac{\partial \delta(0,t,m)}{\partial t} = -j \cdot \ln(m+1) \tag{125}$$

$$F(0,t,m+1) - F(0,t,m)$$

$$= (2 - 4 \cdot u)\left[(1-2u) \cdot k \cdot \ln(m+1) - \ln 2 \cdot j \cdot 2v\right] +$$

$$(2 - 4 \cdot u)\left[-2v \cdot (-j) \cdot \ln(m+1) + \ln 2 \cdot k \cdot 2u\right] +$$

$$\left[(1-2u) \cdot j - 2v \cdot k\right](2 \cdot \ln 2 \cdot 2v) \tag{126}$$

$G(0,t,m+1) - G(0,t,m)$

$$= (2 - 4 \cdot u) \left[(1-2u)(-j) \cdot \ln(m+1) - 2\ln 2 \cdot k(-2v)\right] +$$

$$(2 - 4 \cdot u) \left[-2vk \cdot \ln(m+1) - \ln 2 \cdot j(1-2u)\right] +$$

$$\left[(1-2u) \cdot k + 2v \cdot j\right] (2 \cdot \ln 2 \cdot 2v) \tag{127}$$

There is currently no mathematical tool to prove the most crucial step of mathematical induction.Whether there is a connection between these functions and how they are derived requires the creation of a new algebra.

13. Introduction to Zhiyang Zhang Algebra

To establish a new discipline, it is necessary to determine the research object, its purpose, and the methods to be used.What we need to study now is how to handle the solutions of some trigonometric functions to determine their mechanisms.

The main difference between rational and irrational numbers lies in their definitions, properties, and ranges. Rational numbers are numbers that can be expressed as the ratio of two integers, including integers, positive numbers, negative numbers, and fractions. Rational numbers can be written as finite decimals or infinite cyclic decimals. Unreasonable numbers cannot be expressed as the ratio of two integers, they are infinite non cyclic decimals. Rational numbers are countable within the range of real numbers, and their operations (addition, subtraction, multiplication, division) can be performed like integers. The set of rational numbers is an extension of the set of integers, encompassing all numbers that can be expressed in fractional form. Unreasonable numbers are uncountable within the range of real numbers. They cannot be expressed as the ratio of two integers, but are a part of real numbers. The existence of irrational numbers expands the range of real numbers and provides richer mathematical structures.

We have always known many irrational numbers, but we have not studied their relationship and believe that they are completely unrelated to each other. But in order to address the challenges presented in this paper, you need to accurately state the relationship between π and $\ln n$, which is the first direction of our research.

And our second direction of research is to create a study on the distribution and properties of infinite numbers in equation solutions. If calculus solves the problems of limits and infinitesimal through the method of infinitesimal elements, then this new algebra studies the properties of infinite elements. Of course, we need to provide a strict definition and use some new mathematical symbols to fully describe this mathematical phenomenon, while also ensuring the completeness of the theory.

Acknowledgements

Here, I thank my newborn son. His birth gave me a 25 day vacation to focus on organizing manuscripts. He is a great little boy.

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