The Riemann hypothesis assumes that the first counterexample is located near s=0.383+(1.578 * 10 ^ 16) i

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abstract

We already know the distribution of non trivial zeros in the Riemann hypothesis, and there is a formula for calculating counterexamples. The first counterexample can be obtained using a computer, and its value is s=0.383+15786867949799975i
Firstly, we need to predict the position of the counterexample until s=0.5+10 ^ 28i, before the first negative value appears

$$\sum_{n=1}^{1000}\sum_{m=1}^{1000}\frac{(-1)^{n+m}\ln(n)\ln(m)\ln(m)\cos((\ln n-\ln m)t)}{\sqrt{mn}}$$

$= 0.256408507834$

$t = 1$

−10 10

$$\sum_{n=1}^{1000}\sum_{m=1}^{1000}\frac{(-1)^{n+m}\ln(n)\ln(m)\ln(m)\cos((\ln n-\ln m)t)}{\sqrt{mn}}$$

$= 4.53145530337$

$t = 10$

−10 10

$$\sum_{n=1}^{1000}\sum_{m=1}^{1000}\frac{(-1)^{n+m}\ln(n)\ln(m)\ln(m)\cos((\ln n-\ln m)t)}{\sqrt{mn}}$$

$= 62.2446119609$

$t = 100$

−10 100

$$\sum_{n=1}^{1000}\sum_{m=1}^{1000}\frac{(-1)^{n+m}\ln(n)\ln(m)\ln(m)\cos((\ln n-\ln m)t)}{\sqrt{mn}}$$

$= 707.889111094$

$t = 1000$

−10 1000

$$\sum_{n=1}^{1000}\sum_{m=1}^{1000}\frac{(-1)^{n+m}\ln(n)\ln(m)\ln(m)\cos((\ln n-\ln m)t)}{\sqrt{mn}}$$

$= 252.760436155$

$t = 10000$

−10 10000

$$\sum_{n=1}^{1000}\sum_{m=1}^{1000}\frac{(-1)^{n+m}\ln(n)\ln(m)\ln(m)\cos((\ln n-\ln m)t)}{\sqrt{mn}}$$

$= 1051.48981217$

$t = 100000$

−10 100000

$$\sum_{n=1}^{1000} \sum_{m=1}^{1000} \frac{(-1)^{n+m} \ln(n) \ln(m) \ln(m) \cos((\ln n - \ln m)t)}{\sqrt{mn}}$$

$= 371.397113155$

$t = 1000000$

−10 1000000

$$\sum_{n=1}^{1000} \sum_{m=1}^{1000} \frac{(-1)^{n+m} \ln(n) \ln(m) \ln(m) \cos((\ln n - \ln m)t)}{\sqrt{mn}}$$

$= 1006.43596511$

$t = 10000000$

−10 1×10^7

$$\sum_{n=1}^{1000} \sum_{m=1}^{1000} \frac{(-1)^{n+m} \ln(n) \ln(m) \ln(m) \cos((\ln n - \ln m)t)}{\sqrt{mn}}$$

$= 508.659082817$

$t = 100000000$

−10 1×10^8

$$\sum_{n=1}^{1000} \sum_{m=1}^{1000} \frac{(-1)^{n+m} \ln(n) \ln(m) \ln(m) \cos((\ln n - \ln m)t)}{\sqrt{mn}}$$

$= 61.2900907837$

$t = 1000000000$

−10 1×10^9

$$\sum_{n=1}^{1000}\sum_{m=1}^{1000}\frac{(-1)^{n+m}\ln(n)\ln(m)\ln(m)\cos((\ln n-\ln m)t)}{\sqrt{mn}}$$

$= 258.684299941$

$t = 10\,000\,000\,000$

−10 — 1×10^{10}

$$\sum_{n=1}^{1000}\sum_{m=1}^{1000}\frac{(-1)^{n+m}\ln(n)\ln(m)\ln(m)\cos((\ln n-\ln m)t)}{\sqrt{mn}}$$

$= 28.383975396$

$t = 100\,000\,000\,000$

−10 — 1×10^{11}

$$\sum_{n=1}^{1000}\sum_{m=1}^{1000}\frac{(-1)^{n+m}\ln(n)\ln(m)\ln(m)\cos((\ln n-\ln m)t)}{\sqrt{mn}}$$

$= 238.257468591$

$t = 1\,000\,000\,000\,000$

−10 — 1×10^{12}

$$\sum_{n=1}^{1000}\sum_{m=1}^{1000}\frac{(-1)^{n+m}\ln(n)\ln(m)\ln(m)\cos((\ln n-\ln m)t)}{\sqrt{mn}}$$

$= 632.115698693$

$t = 10\,000\,000\,000\,000$

−10 — 1×10^{13}

$$\sum_{n=1}^{1000}\sum_{m=1}^{1000}\frac{(-1)^{n+m}\ln(n)\ln(m)\ln(m)\cos((\ln n-\ln m)t)}{\sqrt{mn}}$$

$= 978.215950751$

$t = 100\,000\,000\,000\,000$

−10 … 1×10^{14}

$$\sum_{n=1}^{1000}\sum_{m=1}^{1000}\frac{(-1)^{n+m}\ln(n)\ln(m)\ln(m)\cos((\ln n-\ln m)t)}{\sqrt{mn}}$$

$= 196.834718053$

$t = 1\,000\,000\,000\,000\,000$

−10 … 1×10^{15}

$$\sum_{n=1}^{1000}\sum_{m=1}^{1000}\frac{(-1)^{n+m}\ln(n)\ln(m)\ln(m)\cos((\ln n-\ln m)t)}{\sqrt{mn}}$$

$= 210.725575078$

$t = 10\,000\,000\,000\,000\,000$

−10 … 1×10^{16}

$$\sum_{n=1}^{1000}\sum_{m=1}^{1000}\frac{(-1)^{n+m}\ln(n)\ln(m)\ln(m)\cos((\ln n-\ln m)t)}{\sqrt{mn}}$$

$= 737.111365437$

$t = 100\,000\,000\,000\,000\,000$

−10 … 1×10^{17}

$$\sum_{n=1}^{1000} \sum_{m=1}^{1000} \frac{(-1)^{n+m} \ln(n) \ln(m) \ln(m) \cos((\ln n - \ln m) t)}{\sqrt{mn}}$$

$= 285.407089678$

$t = 1\,000\,000\,000\,000\,000\,000$

−10 ... 1×10^{18}

$$\sum_{n=1}^{1000} \sum_{m=1}^{1000} \frac{(-1)^{n+m} \ln(n) \ln(m) \ln(m) \cos((\ln n - \ln m) t)}{\sqrt{mn}}$$

$= 149.517105505$

$t = 10\,000\,000\,000\,000\,000\,000$

−10 ... 1×10^{19}

$$\sum_{n=1}^{1000} \sum_{m=1}^{1000} \frac{(-1)^{n+m} \ln(n) \ln(m) \ln(m) \cos((\ln n - \ln m) t)}{\sqrt{mn}}$$

$= 1\,916.69929281$

$t = 100\,000\,000\,000\,000\,000\,000$

−10 ... 1×10^{20}

$$\sum_{n=1}^{1000} \sum_{m=1}^{1000} \frac{(-1)^{n+m} \ln(n) \ln(m) \ln(m) \cos((\ln n - \ln m) t)}{\sqrt{mn}}$$

$= 398.45591475$

$t = 1\,000\,000\,000\,000\,000\,000\,000$

−10 ... 1×10^{21}

$$\sum_{n=1}^{1000}\sum_{m=1}^{1000}\frac{(-1)^{n+m}\ln(n)\ln(m)\ln(m)\cos((\ln n-\ln m)t)}{\sqrt{mn}}$$

$= 367.506095792$

$t = 10\,000\,000\,000\,000\,000\,000\,000$

−10 … 1×10^{22}

$$\sum_{n=1}^{1000}\sum_{m=1}^{1000}\frac{(-1)^{n+m}\ln(n)\ln(m)\ln(m)\cos((\ln n-\ln m)t)}{\sqrt{mn}}$$

$= 273.454991872$

$t = 100\,000\,000\,000\,000\,000\,000\,000$

−10 … 1×10^{23}

$$\sum_{n=1}^{1000}\sum_{m=1}^{1000}\frac{(-1)^{n+m}\ln(n)\ln(m)\ln(m)\cos((\ln n-\ln m)t)}{\sqrt{mn}}$$

$= 694.390455931$

$t = 1\,000\,000\,000\,000\,000\,000\,000\,000$

−10 … 1×10^{24}

$$\sum_{n=1}^{1000}\sum_{m=1}^{1000}\frac{(-1)^{n+m}\ln(n)\ln(m)\ln(m)\cos((\ln n-\ln m)t)}{\sqrt{mn}}$$

$= 611.133538345$

$t = 10\,000\,000\,000\,000\,000\,000\,000\,000$

−10 … 1×10^{25}

$$\sum_{n=1}^{1000} \sum_{m=1}^{1000} \frac{(-1)^{n+m} \ln(n) \ln(m) \ln(m) \cos((\ln n - \ln m)t)}{\sqrt{mn}}$$

$$= 1361.36038802$$

$$t = 100\,000\,000\,000\,000\,000\,000\,000\,000$$

-10 … 1×10^{26}

$$\sum_{n=1}^{1000} \sum_{m=1}^{1000} \frac{(-1)^{n+m} \ln(n) \ln(m) \ln(m) \cos((\ln n - \ln m)t)}{\sqrt{mn}}$$

$$= 1153.42690257$$

$$t = 1\,000\,000\,000\,000\,000\,000\,000\,000\,000$$

-10 … 1×10^{27}

$$\sum_{n=1}^{1000} \sum_{m=1}^{1000} \frac{(-1)^{n+m} \ln(n) \ln(m) \ln(m) \cos((\ln n - \ln m)t)}{\sqrt{mn}}$$

$$= -279.438703007$$

$$t = 10\,000\,000\,000\,000\,000\,000\,000\,000\,000$$

-10 … 1×10^{28}

Fortunately, we don't need such a large value and can still obtain zero. Through my continuous attempts, I have found at least 5 counterexamples of non trivial zeros between s=0.5+10 ^ 16i and s=0.5+10 ^ 28i. But between s=0.5+10 ^ 2i and s=0.5+10 ^ 16i, no matter how hard I tried hundreds of times, I couldn't find it. Among all the counterexamples found, the smallest one is the following one

$$\sum_{n=1}^{1000}\sum_{m=1}^{1000}\frac{(-1)^{n+m}\ln(n)\ln(m)\ln(m)\cos((\ln n-\ln m)t)}{\sqrt{mn}}$$

$= -398.401528098$

$t = 15\,786\,867\,949\,799\,975$

-10 1.5787×10^{16}

$$\sum_{n=1}^{1000}\sum_{m=1}^{1000}\frac{(-1)^{n+m}\ln(n)\ln(m)\ln(m)\cos((\ln n-\ln m)t)}{\sqrt{mn}}$$

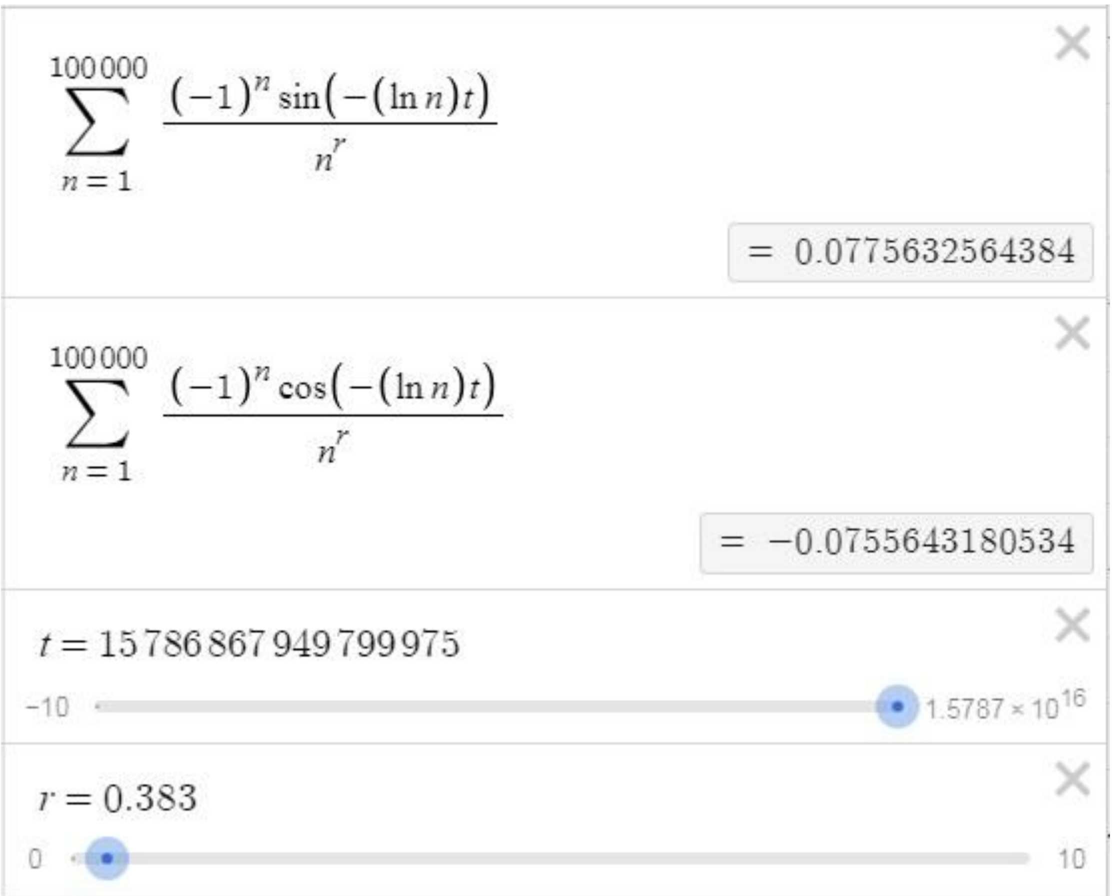
$= 251.697239151$

$t = 15\,786\,867\,949\,799\,974$

-10 1.5787×10^{16}

That is to say, the first counterexample of the Riemann hypothesis is between s=0.5+157868679499974i and s=0.5+157868679499975i

So, we can calculate the exact value of the counterexample, which is s=0.383+15786867949799975i



References

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