Friday, January 26, 2024

To whom it may concern,

These are my personal notes that I'm sharing for clarity. Please accept my apology for the messiness and unorganized manner. I will put the highlights on the main page. These notes are a collection of counterexample claims. Many iterations have been provided, making the notes extensive. However, they are still useful, and I don't see any efficient reason to clarify them for everybody. Again, my apologies, but I believe the main information should be sufficient for everyone. These notes are for documentation, representing my thoughts on this matter, and I have no problem sharing them with you transparently.

Please let me know if you have any questions or need further information.

Thank you ,

RSLT

Version 13 Notes

THE_COUNTER_EXAMPLE_TO_SUPER_SYMMETRY_EQUATION (13).pdf

Lemma 1. *This result is given here:* `https://www.0bq.com/azf`

$$\zeta(s) = \sum_{n=1}^{N} \frac{1}{n^s} - \frac{N^{1-s}}{1-s} - s\int_{N}^{\infty} \frac{x-\lfloor x \rfloor}{x^{s+1}}.$$

As the integral vanishes after taking the limit $N \to \infty$, we shall further use the notation $o(1)$ for this integral and obtain the following representation, which is the notation of the term, which is convergent to zero.

$$\zeta(s) = \sum_{n=1}^{N} \frac{1}{n^s} - \frac{N^{1-s}}{1-s} + o(1).$$

Uses little-o notation incorrectly and probably meant to refer to O_1, but that doesn't make a difference in context since this value is meant to be zero. For that reason, it can be considered a pass.

Lemma 2.

$$\sum_{n=1}^{\infty} \frac{1}{n^s} = \lim_{k\to\infty} \sum_{n=1}^{k} \frac{1}{n^s} = \lim_{k\to\infty} \sum_{n=1}^{m(k)} \frac{1}{n^s}, \Re(s) \in (0,1).$$

where $\{m(k)|k \geq 1\}$ *is any other subsequence of the sequence of the positive integers.*

Proof. We know that it holds for the series (1) in the domain $Re(s) > 1$ as this series is absolutely convergent on the corresponding domain. Therefore, by the uniqueness theorem, as the domain $Re(s) > 1$ consists of the accumulation points, if the series (1) can be defined on the domain $\Re(s) \in (0,1)$, those limits should be equal on this domain to the same sum, like it is done before in the corresponding article `https://www.0bq.com/arslt` while performing the step from (8) to (9). □

Interesting approach. Probably meant to use the Identity Theorem. However, the Identity Theorem and the uniqueness and analytic continuation are closely related. Also, probably meant to refer to a different equation Abridged Riemann's Last Theorem Article. The Lemma 2 can be considered correct; however, it's on the borderline of mistake. For that reason, it is a pass for the sake of argument.

Lemma 3. *Let s be a non-trivial zero of Riemann zeta-function. Then SSE* $\Longrightarrow \Re(s) = \frac{1}{2}$.

Proof. The proof may be found by the link `https://www.0bq.com/arslt`, the result corresponds to the equation (15). □

This is Contrapositive of the of rewind Poof of Abridged Riemann's Last Theorem Article and that is correct.

Lemma 4. *Let s be a non-trivial zero of Riemann zeta-function. Then SSE* $\Longrightarrow \Re(s) = \frac{1}{3}$.

By the Lemma 1 we obtain the following.

$$\zeta(s) = \sum_{n=1}^{8k^3} \frac{1}{n^s} - \frac{(8k^3)^{1-s}}{1-s} + o(1), \tag{2}$$

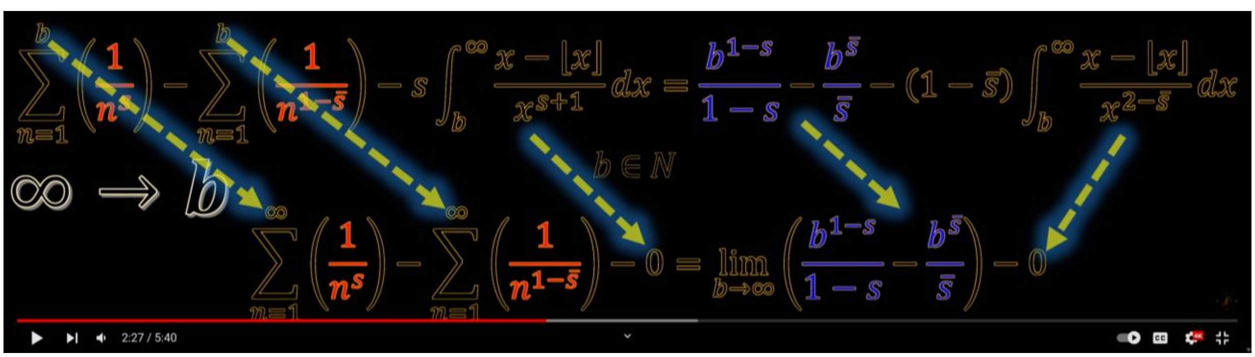
$$\zeta(1-\bar{s}) = \sum_{n=1}^{8k^6} \frac{1}{n^{(1-\bar{s})}} - \frac{(8k^6)^{\bar{s}}}{\bar{s}} + o(1). \tag{3}$$

We note that $\{8k^3|k \geq 1\}$ and $\{8k^6|k \geq 1\}$ are the subsequences of the sequence of positive integers such that $\lim_{k\to\infty} 8k^3 = \lim_{k\to\infty} 8k^6 = \infty$. Therefore, we are able to use Lemma 2. Subtract (3) from (2) and obtain the following with respect to Lemma 2 after taking the limit as $k \to \infty$.

$$\zeta(s) - \zeta(1-\bar{s}) = \sum_{n=1}^{\infty} \frac{1}{n^s} - \sum_{n=1}^{\infty} \frac{1}{n^{(1-\bar{s})}} + \lim_{k\to\infty} \left(\frac{(8k^6)^{\bar{s}}}{\bar{s}} - \frac{(8k^3)^{1-s}}{1-s}\right). \tag{4}$$

Lemm4 is false. It appears that the rest of the paper attempts to justify this assumption theorem. I listed a few and also mentioned the fatal reasons.

Regarding (2) and (3) as mentioned for Lemma 1, using little-o notation incorrectly in this ARSLT article. The O_1notation is meant to be a placeholder for the Omition sub 1. For O_2, it must be used for (3); it's meant to be O_1 and O_2 , they are not necessarily equal beyond the critical line or for any finite b(N). However, it is appers meant to say that these values are zero, which is consistent with the ARSLT article as depicted below. This is wrong; however, it's not a fatal error and can be corrected using O_1 and O_2.



We note that $\{8k^3|k \geq 1\}$ and $\{8k^6|k \geq 1\}$ are the subsequences of the sequence of positive integers such that $\lim_{k\to\infty} 8k^3 = \lim_{k\to\infty} 8k^6 = \infty$. Therefore, we are able to use Lemma 2. Subtract (3) from (2) and obtain the following with respect to Lemma 2 after taking the limit as $k \to \infty$.

The proposition above it is the first one, and a similar fatal error has been repeated in this paper. Ironically, there is a video on "The Riemann Hypothesis and a New Math Tool (a new Indeterminate form)," particularly talking about this common error.

https://www.youtube.com/watch?v=GuGaNk727LU .

The fatal error is stating that the limit of 8K^3 is equal to the limit of 8K^6 as K goes to infinity. To put it simply, assuming all infinities (∞) are equal because we use the same notation for infinity is very wrong.

Consider the chronological progress table below:

K 8K^3 ≠ 8K^6

2 64 ≠ 512

3 216 ≠5832

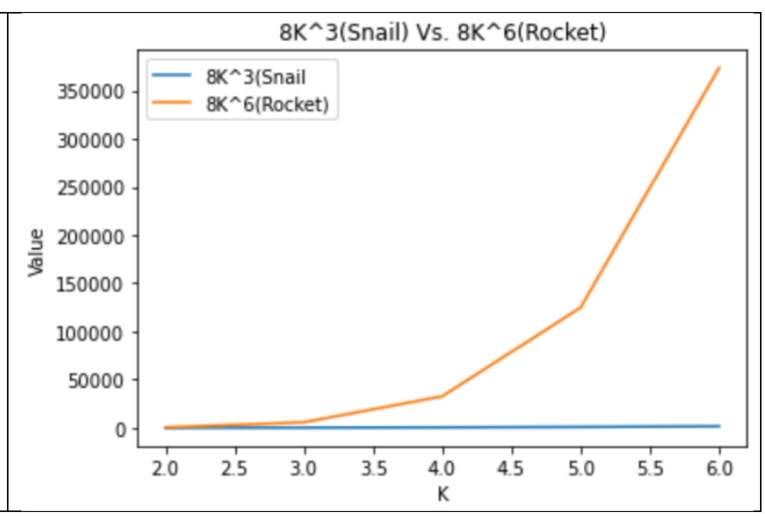
4 512 ≠ 32768

5 1000 ≠ 125000

6 1728 ≠ 373248

…

The assumption that a snail will be able to catch up with the speeding rocket is nonsensical for same reson assuming that all infinities (∞) are equal is false. It appears this false premise spills over from physics, where it has no justification in mathematics.



```
import matplotlib.pyplot as plt
K = list(range(2, 7))
R3 = [8 * k**3 for k in K]
R6 = [8 * k**6 for k in K]
plt.plot(K, R3, label='8K^3(Snail')
plt.plot(K, R6, label='8K^6(Rocket)')
plt.xlabel('K')
plt.ylabel('Value')
plt.title('8K^3(Snail) Vs. 8K^6(Rocket)')
plt.legend()
plt.show()
```

I tried to visualize your fatal error using the analogy of a snail and a rocket: The 'Snail = Rocket' or 'Snail - Rocket = 0' arguments have been repeated in version 13 quite a few times, and for those reasons, your claim is not correct.

In general, this attempt was false from the beginning because the Super Symmetric Equation (SSE) gives the correct answer as expected for all non-trivial zeros. The claim that is false comes from defining a wrong function that has nothing to do with SSE. If you claim two functions are equal, then you are claiming that one function produces zero and the other function gives you a non-zero value. That should be a strong clue that your newly proposed function is false. If the argument was correct, when we plug in 'non-trivial zero', SSE would have failed and produced a non-zero value.

Defining a wrong function and then providing counterexample examples for that wrong function under no circumstances can be considered a logical step. All it shows is that your new function is not equal to the original function, and the claim of equality is false.

Version 12 Notes

https://yutu.be/s3pHA4HTGPE

On July 21st, 2023, the user provided Iteration Version 12 via email. This version starts with a major problem where the author ignores the fact that ζ(s) is the analytic continuation of the series ∑(n=1 to ∞) 1/n's in the critical strip. This should be sufficient to debunk this claim. Please consider see my personal note for more detail. The claim at the beginning of the video is analogous to someone saying that 1+2+3... - 1/12 = 0, which is false for obvious reasons, as someone misinterprets the meaning of equality. -1/12 is the analytic continuation result for the series 1+2+3.... This is an invalid and unsupported operation that does not appear in any paper or argument by anybody, and for the same reason, it never occurs in the videos nor in Riemann's last theorem article.

$$\zeta(1-\bar{s})-\zeta(s) = \lim_{b\to\infty}\left(\sum_{n=1}^{b}\left(\frac{1}{n^{1-\bar{s}}}\right)-\sum_{n=1}^{b}\left(\frac{1}{n^{s}}\right)+ \frac{b^{\bar{s}}}{\bar{s}}- \frac{b^{1-s}}{1-s}\right)$$

The good point is that the numeric counterexample claim has disappeared from this version, which is a step in the right direction. However, the argument for version 10 and earlier is still present, where it remains merely a claim without any proof.

On July 2st 2023 the user provide this iteration version 12 stating . In this version Ignoring the fact ζ(s) = analytic continuation of ∑(n=1 to ∞) 1/n's in above function and in general .

At first glance, this equation may seem hard to understand. However, the user chose to ignore the fact that ζ(s) represents the analytic continuation of the series ∑(n=1 to ∞) 1/n's. As someone who has seen Riemann's last theorem article, they know that there are two independent proofs for the transcendental zeta function. Moreover, there was a $10K bounty offered if anyone could disprove this function. Nevertheless, the user previously understood that the transcendental zeta function is correct, having verified and accepted its validity.

This is none related not correct answer regarding this comment .

Version 12 is supposedly in response to my comments on YouTube regarding Version 11. However, this response is unrelated and does not provide a correct answer to my comment, where I said, "Again, it makes no sense to assert that the analytic continuation of ∑(n=1 to ∞) 1/n^s and ∑(n=1 to ∞) 1/n^(1-s*) are equal, and yet also claim that ∑(n=1 to ∞) 1/n^s and ∑(n=1 to ∞) 1/n^(1-s*) are different.

There are some claims about the identity theorem that state both functions have to converge, which is not consistent with the sole purpose of the Identity Theorem. The Identity Theorem is the most important and fundamental concept in complex analysis and serves as the foundation for our claim connecting divergence functions to their convergence values. For example, it provides validation for claims like 1+2+3+...=infinity and 1+2+3+...=-1/12. Otherwise, one of these claims would be considered false in the given context. For more details, you can see here: https://www.0bq.com/IdentityTheorem.

The main reason we believe that the diverging Euler product in the critical strip is related to the converging zeros of the zeta function in the critical strip is due to the Identity Theorem.

All other questions and alarms were ignored and not addressed by the author. It's essential for a successful argument that all of their claims are correct. Replacing one or two false arguments with yet another false argument is not helpful.

For example, there is still a claim regarding a curve that has not been validly proven. In this and all prior iterations, I specifically asked for a clear proof for Φ(s) = e^{i α}. However, the author repeatedly claims that |e^{i α}| = 1 is sufficient to conclude that |Φ(s)| = 1, which is extremely false. In this version, the author argues that knowing Φ(1-s) = 1/Φ(s) is enough to make the claim, but this reasoning is logically flawed.

I have emphasized the importance of independently proving both |Φ(s)| = 1 and |e^{i α}| = 1. Merely stating that |e^{i α}| = 1 does not justify the claim that |Φ(s)| = 1 as well. The two statements must be proven independently and cannot be equated without proper justification. Providing evidence for |Φ(s)| = 1 is crucial if the author wants to claim the existence of a curve that makes Φ(s) = e^{i α}, because we know that |e^{i α}| = 1 and thus we must prove |Φ(s)| = 1. Therefore, this version is incorrect same as the previous one.

Despite my numerous requests, the author's responses persistently refer to well-known facts, such as |e^{i α}| = 1 or Φ(1-s) = 1/Φ(s), and mistakenly skip over the crucial need for a valid and substantiated claim. They assume that Lemma 5 somehow proves something about e^{i α} being equal to everything, but this is an erroneous assumption. Essentially, the author has demonstrated that they do not even consider the true meaning and significance of |e^{i α}| = 1.

Furthermore, even if we magically assume Lemma 5 is correct, there are other lemmas that are incorrect, as I have shown in earlier versions. Yet, the author believes that by solving this one lemma, the other issues will be ignored, which is not a valid approach to addressing the problems in the overall argument.

End Version 12 Notes(0bq.com/AAEC)

Version 11 Notes

Below is the @artificialresearching4437, I kindly ask you to take a moment to read and understand why he seems to have no intention of answering questions correctly in the comment above. Firstly, he skips through the comments and jumps to the end, apparently focusing solely on the known fact that |e^{i α}| = 1. I am specifically asking for a clear proof (paste it here) for Φ(s) = e^{i α}. Instead, he states a proof for |e^{i α}| = 1, assuming it will be sufficient to conclude |Φ(s)| = 1, which is logically flawed. I have repeatedly mentioned the importance of proving both |Φ(s)| = 1 and |e^{i α}| = 1 independently. Merely stating that |e^{i α}| = 1 does not justify the claim that |Φ(s)| = 1 as well. Then, despite my numerous requests, his responses persistently refer to the well-known fact |e^{i α}| = 1. If you have a strong math background, please take a moment to read his paper, specifically Lemma 5, where he seems to have no regards that to claim Φ(s) = e^{i α}, he must prove that |e^{i α}| = |Φ(s)|, and the only way to do that is to independently demonstrate that |Φ(s)| = 1. You can find the paper here: 0bq.com/AACE. I never requested nor needed the fact that |e^{i α}| = 1 for this discussion; he keeps proving it because that is the only part he can comprehend. As a hint, I asked him to show the proof of why s^2 = e^{i α}, hoping that he would realize the flaws in his argument. However, he seems completely unaware about the fact thatα if s = 10, s^2 cannot be equal to e^{i α}. He mistakenly believes that Lemma 5 somehow proves something about e^{i α} equal to everything. Essentially, he demonstrated that he doesn't even consider the meaning of |e^{i α}|=1 and merely knows how to use the Pythagorean to prove it. I can assure you that he doesn't take hints at all and remains stubborn in his misunderstanding. Ironically, at the end, he questions my intelligence based on his level of understanding. I'm a proud member of the Mensa and the Intertel, and encountering someone rude like him just makes me sad that I cannot help them. He shows little to no respect for people and, for some reason in his mind, on multiple occasions, he thinks he can use it against others by asking intrusive questions.

@artificialresearching4437 response " My answer to the last comment is being deleted by the author, so I put it here. To put it correctly, I have found such a counter-example, but I argue with the author about the fundamental concepts of mathematics. So, my answer to the last comment is the following:

By the definition of complex number |z|^2 = Re^2(z) + Im^2(z). Therefore let us compute the absolute value of |e^{iα}|^2 = |cos(α) + i sin(α)|^2 = cos^2(α) + sin^2(α) = |Pythagorean theorem| = 1. So asking to prove that is nonsense. To answer your next question we can, actually, put another equation, but it would induce the different curve. Let me give you an example. Suppose that s^2 = e^{i α}. We can find two different curves, which satisfy this equation: s = e^{i α/2} and s = - e^{i α/2}. But only one of these curves satisfies the condition s(0) = 1. That is done with the local inverse concept and the concept of Riemann surface. For more detailed explanation, please, read Lemma 5. I would not state this without the proof of rigorousness. Please, take a closer look

Actually, the point is different because I have taken another interval, as you may see. And moreover, I take another partition of the interval. That is why your argument is not legit. And I can’t understand why do you ignore Lemma 5. What you say is nonsense, since you state that to prove that |\Phi(s)| = 1 along the curve I have to prove it for the entire complex plain. But that is absurd. I don’t believe that you really don’t understand what I’m talking about. Otherwise I simply do not understand, how did you get to Mensa.

@artificialresearching4437   I've noticed a pattern here; every time I ask for proof or explanations, you just run away and come up with nonsense that takes days to decipher. I have seen many times that you completely abandon the previous approach and make new claims. For instance, you first claimed that 0.50000000000000005076299623 - 4.0195820943281097257100068j was the correct value, but when I showed you that it was wrong, you quickly abandoned that claim and presented another value along with a new claim, 0.50000000000000000097910646 + 0.532484207657510071799398j, using the same algorithm.This situation is confusing because both values come from the same algorithm, and if one of them is wrong, it indicates that the algorithm itself is flawed. You need to either demonstrate that both are correct or provide sensible reasons why one is correct and the other one is not.

For once in your life, read the comments below to understand and provide helpful answers. Also, please be polite and respond to each question one by one.

Below is wrong, and I don't know how to explain it, so I hope you invest some time and see your error. When I said, "You exceed machine precision," that means you can no longer trust what it gives you. To put it simply, I'm telling you that the machine may lie to you, and you cannot say, "Let me ask the machine."

```
eps = mp.mpf(1.0) # here we compute the machine error of the library mpmath

while 1 + eps != 1:

    eps /= 2
```

You claim your algorithm found this numeric counterexample:

0.50000000000000005076299623 - 4.0195820943281097257100068j

And then, allegedly with higher precision you claim this :

0.50000000000000000097910646855312333138107183454263813190157613736809730733645805017
35568008340442253516430419555933050441786919935577739798533782493544814318657780129088711671837212807891724880000466057195693472832149689880541555820093995507082759338550296230074536215007862944693072283577055668530375 +
0.532484207657510071799398515748960275214290052099343715595382442375072087036764958071896587831450772986045169801512801313551172262052087158353117033730742744310149739105877730030269049536363751865290412294365521568713864619937275239980107814764548131442785905582378781110973657330084735519607298784997j

Let me clean it up and see what we have:

0.50000000000000005076299623 - 4.01958209432810972571006 8j

0.50000000000000000097910646 +0.53248420765751007179939 8j

What do you see above?

First, you can observe that in the second round, the result is over 50 times closer to the critical line.

Second, you can see that the convergence leads to a completely different point. This is a consequence of exceeding machine precision.

Third, I already mentioned that you exceeded machine precision, and you still decided to ask the machine for information. When machine precision is exceeded, you cannot obtain reliable information from it, including logic.

Fourth, I advised you to use an intermediate theorem to demonstrate that the number you found is actually zero. However, you chose to ignore that advice. It is unclear why you think finding a number close to zero around the critical line for zeta(s) - zeta(1-s*) is a counterexample. Keep in mind that s and 1-s are almost the same, so attempting to calculate zeta function (σ=.5+-10^-17) and zeta(s) - zeta(1-s*) (where σ is close to 1-σ) results in a number like zeta = 0.000000000000000003831... After potentially thousands of iterations, there is nothing significant to find.

Please refrain from making numeric claims unless you have genuinely addressed the above problem.

I have no reason to believe that SSE is incorrect. This is the strongest point of RSLT based on the Uniqueness of Analytic Continuation and Identity theorem. If you have any claim, you need to demonstrate why you believe zeta(s) and zeta(1-s*) are equal, even though you claim they originated from different series. Again, it makes no sense to assert that the analytic continuation of ∑(n=1 to ∞) 1/n^s and ∑(n=1 to ∞) 1/n^(1-s*) are equal, and yet also claim that ∑(n=1 to ∞) 1/n^s and ∑(n=1 to ∞) 1/n^(1-s*) are different.

Also, I strongly advise you to wait and watch the video before making any claims regarding this matter.

So, for you next counter-example claim please address those 4 items .

Regarding your paper up to version 10, it was wrong, and I have no interest in reviewing version 11 before publish my next video. There are several fundamental problems that I have listed in my note, which can be found here: 0bq.com/AACE.

Regarding your last version, I have some concerns that you haven't addressed critical aspects, such as:

Could you kindly provide a clear proof (paste it here) for $\Phi(s) = e^{i \alpha}$? Additionally, could you explain why this proof is not applicable to other functions, for example, $s^2 = e^{i \alpha}$? I have mentioned multiple times that it is necessary to prove both $|\Phi(s)| = 1$ and $|e^{i \alpha}| = 1$ independently. Simply stating that $|e^{i \alpha}| = 1$ does not sufficiently justify the claim that $|\Phi(s)| = 1$ as well. Your arguments appear flawed and confusing when you say $|\Phi(s)| = 1$ because $|e^{i \alpha}| = 1$.

For a correct argument, it is essential to demonstrate rigor in proving both $|\Phi(s)|$ and $|e^{i \alpha}|$ equal to 1 independently. Only then, based on the fact that 1 = 1, one can claim that there exist values α (s) that make $\Phi(s) = e^{i \alpha}$ possible.

I believe you are capable of presenting a more robust analysis. This is an undergraduate problem, and I don't expect you to get stuck on this for so long.

Please address these concerns adequately.

Regarding your arguments in Version, it seems that the Version 10 answers apply to this version as well. However, as you know, I'm still super busy with the last video, and I'll rephrase my answer once I publish the video.

Regarding your numeric counter example

(0.5000000000000005076299623 - 4.019582094328109725710068j)

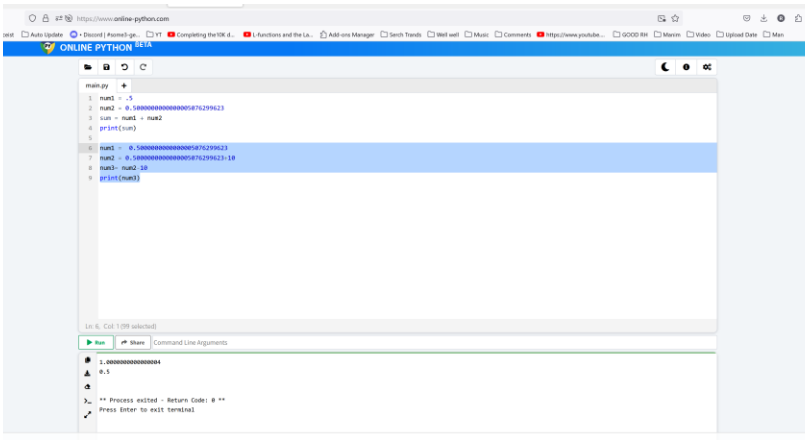
it's obvious that you obtained a false result due to exceeding the machine's precision. When you exceed the machine's precision, the machine starts producing inaccurate results. Simply put, you can't measure the atomic diameter using a ruler, and there isn't a ruler that can accurately do so. Please run the code below and let me know what you observe:

num1 = 0.50000000000000005076299623

num2 = 0.50000000000000005076299623 + 10

num3 = num2 - 10

print(num3)



So, the counterexample is actually incorrect, and it shows that SSE is correct up to the maximum machine precision of your machine. Additionally, please note the followings:

Firstly, this is a computational numeric counterexample where the machine's precision is not taken into account.

Secondly, you need to apply the intermediate value theorem to prove the existence of a zero. A value of 10^-18 is infinitely more significant than zero and cannot be considered as zero.

Also, I'm leaving the code here in case others want to provide a computational counter-example. It serves as a great example of how even verifying a numeric counter-example at this level can require significant effort and consideration.

import numpy as np

from mpmath import mp, findroot, zeta, gamma

from scipy import pi

mp.dps = 25

def Phi(s): # computing Phi

    return 2 ** s * mp.pi ** (s - 1) * mp.sin(mp.pi * s / 2) * mp.gamma(1 - s)

```
def Phi_inv(x):  # finding the inverse to Phi
    def equation(s):
        return Phi(s) - x
    sol = findroot(equation, 0.5 - 1j, solver='mul')
    return sol


x = np.linspace(-pi, pi, 12345)  # Take 12345 points on the interval (-pi, pi)
Phi_inv_values = [Phi_inv(np.exp(1j * xi)) for xi in x]  # compute the values of Phi_inv
max_distance_index = np.argmax(np.abs(np.real(Phi_inv_values) - 1 / 2))  # look for the biggest difference
max_distance_s = Phi_inv_values[max_distance_index]  # computing s
result = zeta(max_distance_s) - zeta(1 - max_distance_s.conjugate())  # check the value of zeta-function difference
print("Zeta diff =", result)
print("s =", max_distance_s)
```

End Version 11 Notes(YouTube/@rslt)

End Version 10 Notes

Lemma 1 and 2 appear to be correct in their statements, but the proofs may have some flaws. There is no need for an additional proof, and you can state the result as a direct consequence of RSLT (not SSE).

Lemma 3. *$\Phi(s)$ and $\Phi(1-s)$ are multiplicative inverses.*

This Lemma 3 appears to be correct.

ζ(s)/ ζ(1-s)* ζ(1-s)/ ζ(s)

Lemma 4 Version 10:

need one lemma, which justifies the counter-example we would find further.

Lemma 4. *Suppose that the function $f : (-L, L) \to \mathbb{C}, 0 < L \leq \pi$ is analytical in some neighbourhood of the real interval and satisfies the following functional equation:*

$$f(t) = -e^{it} f(-t).$$

Then f is identical zero function.

The lemma presented in the provided context lacks coherence. Even if we were to assume its validity, the subsequent claim lacks proper explanation and is introduced as a consistent method without offering any valid proof or referencing relevant sources.

4 Building the counter-example

Lemma 4 introduced us the sufficient condition of our curve to be the curve of counter-examples. However, it is not necessary, which I point to avoid the discussion of "counter-examples" to my statement. For the simplicity we shall study the equation $\Phi(s) = e^{i\alpha}$ for some $\alpha \in \mathbb{R}$. Let us study this equation from the geometric perspective.

Lemma 4 Version 7:

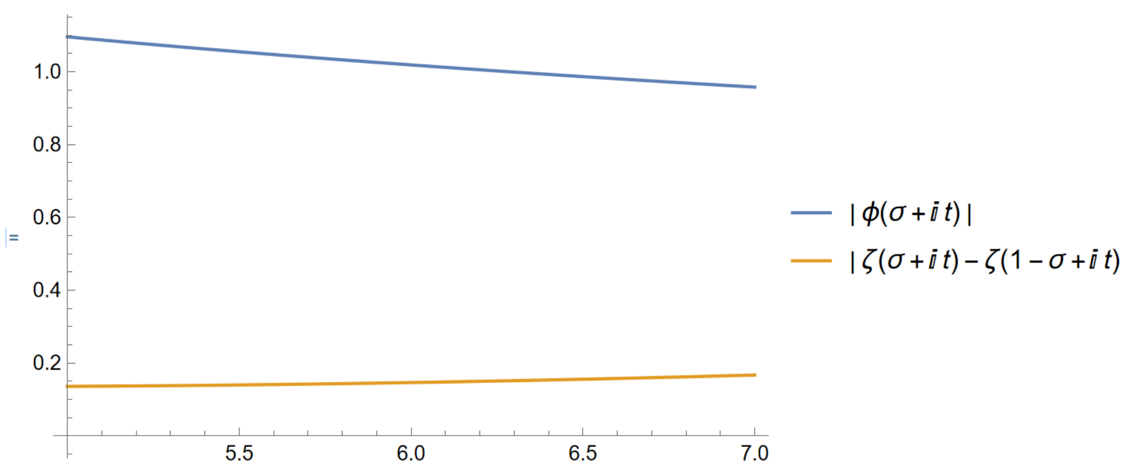
$\sqcup$

Lemma 4. *Let $\epsilon > 0$ be the imaginary part of the closest to the real line point, where $\zeta(s) = 0$ in the critical strip. Then $\zeta(s) - \zeta(1 - \bar{s}) = 0 \iff |\Phi(s)| = 1$ in the domain $\{s | \Re(s) \in (0, 1), \Im(s) \in (-\epsilon, \epsilon)$.*

$t \in (5, 7)$

$\sigma = .9$

Numeric Counterexample



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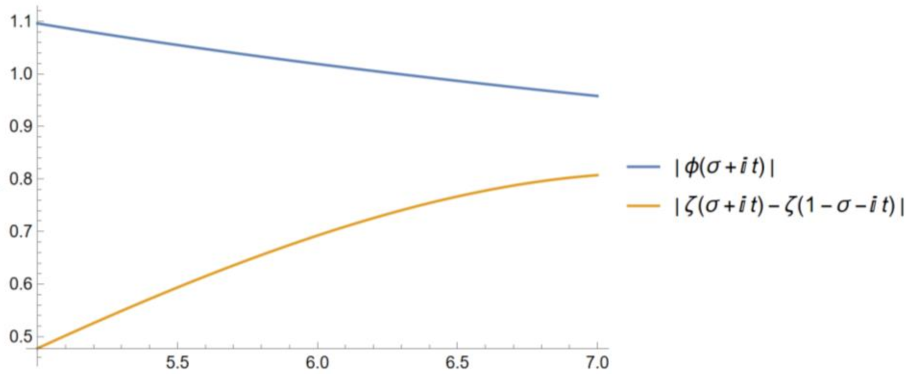


Let me explain what the numerical counterexample for Lemma 4 means. You can see a descending blue line that starts above 1 and ends below it. At the same time, you can see an orange line above zero, which proves that at some point ϕ(s) equals one while ζ(s) - ζ(1-s*) is not zero. Therefore, Lemma 4 is false, and all the subsequent lemmas that are based on it are also false.

We cannot assume that ε is zero simply because it is very close to zero. As you stated, ε > 0 meaning that ε ≠ 0, so we need to be consistent and acknowledge that ε can be zero or nonzero.

According to your definition for the zeros of zeta functions, either |ζ(s+ε)-ζ(1-s+ε)| > 0 or |ζ(s+ε)-ζ(1-s-ε)|≠0 and |Φ(s+ε)| ≠1. Additionally, Φ'(s) is not equal to Φ'(s+ε). For example, consider the derivative of |x| at zero, which is undefined (according to mathematicians). At -ε, it is -1, and at ε, it is 1.

Lemma 4. *Let $\epsilon > 0$ be the imaginary part of the closest to the real line point, where $\zeta(s) = 0$ in the critical strip. Then $\zeta(s) - \zeta(1-\bar{s}) = 0 \iff |\Phi(s)| = 1$ in the domain $\{s|\Re(s) \in (0,1), \Im(s) \in (-\epsilon, \epsilon), \Phi^4(s) - 1 \neq 0\}$.*

New version of lemma 4 is False:

$$\Phi(s)^4 - 1 \neq 0 \;\Leftrightarrow\; \Phi(s)^4 \neq 1 \;\Leftarrow \Phi(s) \;\neq \pm 1 \;\Leftarrow |\Phi(s)| \;\neq 1.$$

$$\Phi(s)^4 - 1 = 0 \;\Leftrightarrow\; \Phi(s)^4 = 1 \;\Rightarrow \Phi(s) \;= \pm 1 \;\Rightarrow |\Phi(s)| \;= 1.$$

$\Phi(s) \in \mathbb{C}$. |Φ(s)| cannot be and not equal to 1 simultaneously.

The response below is not acceptable, and no further communication on this matter is recommended.
"|Φ(s)| = 1 does not imply Φ^4(s) = 1, so this is correctly defined. If you remember some basics of geometry from the middle school, you know that cos^2(x) + sin^2(x) = 1 and hence Φ(s) = e^{i α} is well-defined and it does not necessarily satisfy this polynomial equation."

The absolute value of 1 does not mean that the 4-th power would be one. Please, try cos(\pi/16) + i sin(\pi /16). The square of the absolute value here is cos^2(\pi/16) + sin^2(\pi/16) = 1, but due to the deMoivre's formula the fourth power is the following:

cos(π/4) + i sin(π/4) = \sqrt(2)/2 + i \sqrt(2)/2 \neq 1. You may find all of the needed information here:

https://en.m.wikipedia.org/wiki/De_Moivre%27s_formula

Above shows that proves $1/2 + 1/2 = 1$. In other words, it shows that $|\Phi(s)| = 1$ does not imply $\Phi(s) = 1$ and has no relevance to this topic. Lemma 4 is false.

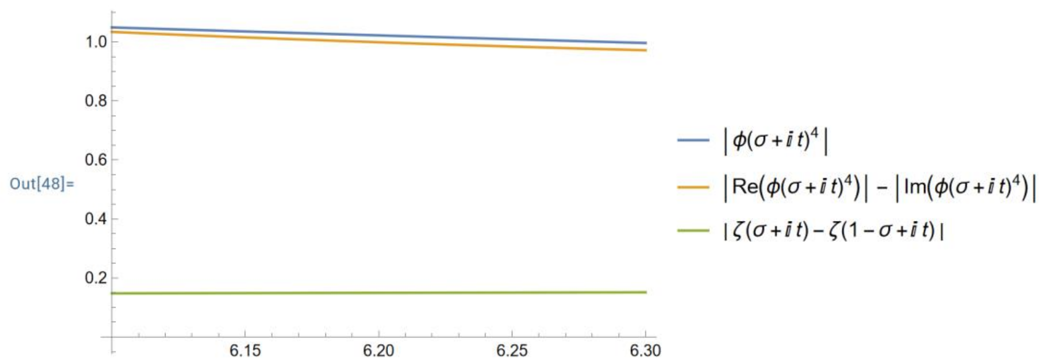
Note that $|\Phi(s)^4| = |\Phi(s)| = 1$

Below is numerical counterexample that lemma 4 doesn't hold.

t ∈ (6.1, 6.3)

$\sigma = .9$

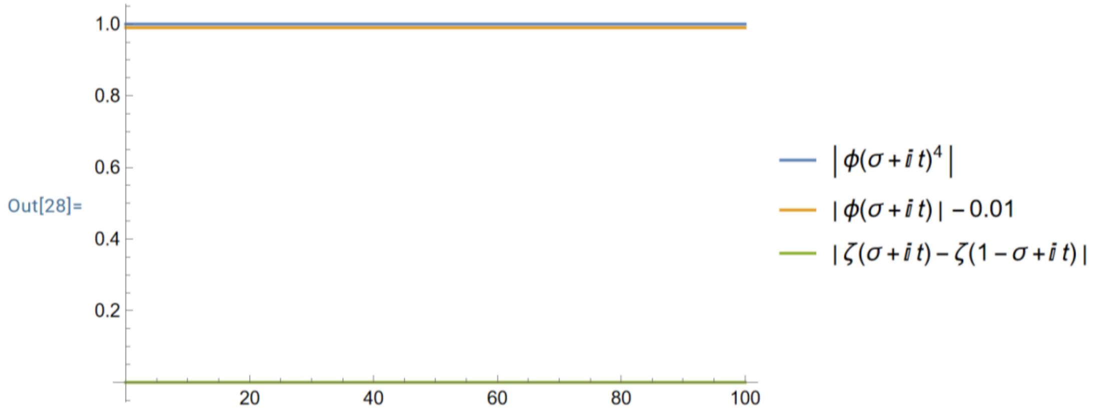
$\Phi(s)^4 - 1 \neq 0$ and $|\Phi(s)^4| = 1$



Here is the computational proof I have. I intentionally subtracted 0.01, and I will not respond to any variation of the proof. It will not lead us anywhere, and it is not an efficient use of our time. However, please keep in mind that we have no obligation to read or review your paper. At this point, I am only looking for a numerical counterexample.

t ∈ (0, 100)

$\sigma = .5$



Lemma 5 Version 10:

Lemma 5. *The equation* $\Phi(s) = e^{i\alpha}, \alpha \in U \subset \mathbb{R}$ *defines at least one analytical curve on the complex plain* $s(\alpha)$, *where* U *is some real symmetric interval, containing* 0.

It appears that the author acknowledges that Lemma 4, Version 7 was incorrect. However, instead of addressing the issue appropriately, the author replaces it with an absurd lemma that has no connection to the rest of the paper. The author ignores the fact that there is no proof that |\Phi(s)| = 1, which is required for any claim that \Phi(s) = e^{i\alpha}, since e^{i\alpha} = 1. Simply because |\Phi(s)| is not equal to one, there is no possibility for equality. Once again, without any valid reason, the author claims that attempting to prove the existence of the curve will somehow demonstrate that |\Phi(s)| = 1.

Furthermore, the author has failed to address prior comments that are applicable to this version. It remains unclear why the author believes that if \Phi(s) = e^{i\alpha}, then \Phi(s) e^{-i\alpha} - 1 = 0, which is a variation of the original function, can provide any useful and reasonable argument.

Lemma 5 Version 7:

Lemma 5. *The equation $\Phi(s) = e^{i\alpha}, \alpha \in \mathbb{R}$ defines at least one analytical curve on the complex plain $s(\alpha)$.*

Proof. Let us rewrite this equation in the following form:

$$F(\alpha, s) := e^{-i\alpha}\Phi(s) - 1 = 0.$$

Take the derivative of F with respect to s:

$$\tfrac{d}{ds}F(\alpha, s) = e^{-i\alpha}\Phi^{'}(s).$$

Since $\Phi(s)$ is a non-constant analytical function, the zeroes of $\Phi^{'}(s)$ would be a set of izolated points. Therefore in the neighbourhood of any point on the complex plain we can find a point, where $\Phi^{'}(s) \neq 0$. Hence by the Implicit Function Theorem we obtain the statement of the lemma. □

The next thing we would like to show is that the real component of this curve is non-constant.

$$\frac{d}{ds} e^{-i\alpha}\Phi(s) - 1 = 0 \quad \Rightarrow \quad e^{-i\alpha}\Phi'(s) = 0$$

Assuming $\Phi'(s) \neq 0$ that means $e^{-i\alpha}=0$.

You cannot use any s you want; you must use the condition $|\Phi(s)|=1$. If you use a different s because $\Phi'(s)=0$, let's say s1, there is no reason to assume that $|\Phi(s1)|=1$.

If you want to say that we are studying the critical strip regardless of $|\Phi(s)|=1$, then you have no reason to say in Lemma 6 that the curve $s(\alpha)$ must be on the critical line.

You as you are not using it correctly The Implicit Function Theorem and neighborhoods. For example, please consider the function F(x,y) = x^2 + y^2 - 1. And let me know why you think that it's satisfied at the points (0, ±1) because it's satisfied in the neighborhood?

Let F(x,y)=x^2+y^2-1 and the implicit function theorem is not satisfied at the points (0,±1)

Lemma 6. *Let* $s(\alpha) = l(\alpha) + it(\alpha)$ *be a curve, defined by the equation* $\Phi(s) = e^{i\alpha}, \alpha \in (-\pi, \pi)$ *such that* $s(0) = \frac{1}{2}$. *Then* $l(\alpha) \neq const.$

Lemma 6 states that l(α) cannot be constant, including the value of 1/2. This leaves us with two possibilities:

1. The lemma is referring to a path that has no direct connection to ζ(s) = ζ(1-s). If this is the case, then the relevance of the lemma is unclear.
2. The lemma is implying that ζ(s) & ζ(1-s) cannot be equal on any straight line including the critical line. As far we know all non-trivial zeros of the zeta function lie on the critical line and ζ(s) = ζ(1-s) in that line.

Therefore, we can conclude that Lemma 6 is either irrelevant or incorrect in SSE context.

There is no requirement for the path or analytical curve of α to be constant unless you show in lemma 5.

According to Lemma 5 $e^{i\alpha}\Phi(\mathrm{s}) = 1$ and Lemma 3 $\Phi(\mathrm{s})\,\Phi(1-\mathrm{s}) = 1$ thus $e^{i\alpha} = \Phi(1-\mathrm{s})$

Also α=$-i\ ln\ (\Phi(\mathrm{s}))$

Because Φ(s) is none constant analytical function therefore Φ(1-s) is non-constant function.

$$it^{'}(\alpha)\Phi^{'}(\tfrac{1}{2} + it(\alpha)) = ie^{\imath\alpha},$$

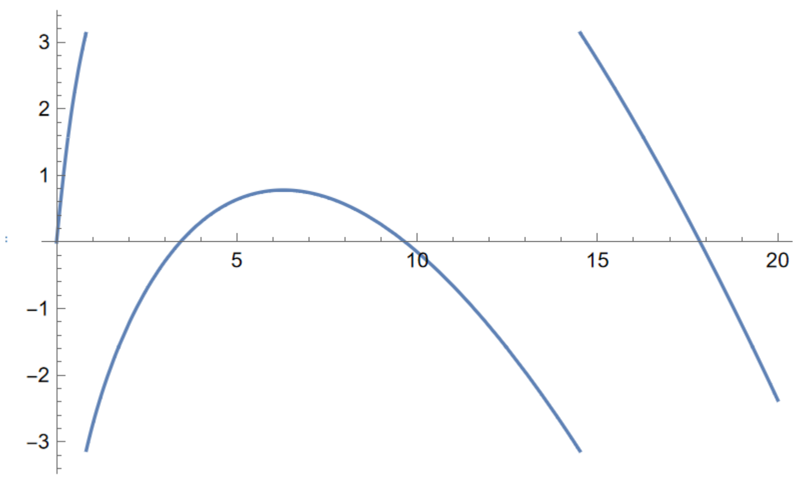
$$it^{'}(\alpha)\Phi^{'}(\tfrac{1}{2} + it(\alpha)) = i\Phi(\tfrac{1}{2} + it(\alpha)),$$
$$t^{'}(\alpha)\Phi^{'}(\tfrac{1}{2} + it(\alpha)) = \Phi(\tfrac{1}{2} + it(\alpha)).$$

Let's define g(s)=f(u) then we have g(s)-f(u) =0 take divertive d/du give us s'g'(s)-f'(u)=0 because RHS is zero that means s'g'(s)-f'(u) is even and odd and there are no contractions.

Take $t(\alpha)$ to be an odd parameterization of the imaginary part of the curve, since $e^{-i\alpha}$ is conjugated to $e^{i\alpha}$ and it preserves conjugation by the Schwarz Reflection Principle. Then by the Schwarz reflection principle $\Im[\Phi(\frac{1}{2}+it(\alpha))]$ is an odd function. But the derivative of this function with respect to $it(\alpha)$, i.e. $\Im[\Phi^{'}(\frac{1}{2}+it(\alpha))]$ should be even as the derivative of an odd function. Therefore $t^{'}(\alpha)\Phi^{'}(\frac{1}{2}+it(\alpha))$ is an even function as the product of two even functions since $t^{'}(\alpha)$ is even as the derivative of an odd function. This means that $\Im[\Phi(\frac{1}{2}+it(\alpha))]$ is even and odd at the same time, which is only possible for the constant zero function. But $\Im[\Phi(\frac{1}{2}+it(\alpha)))] = \sin\alpha \neq 0$ constantly by the construction, hence we obtain a contradiction. This means that $l(\alpha) \neq const$. $\square$

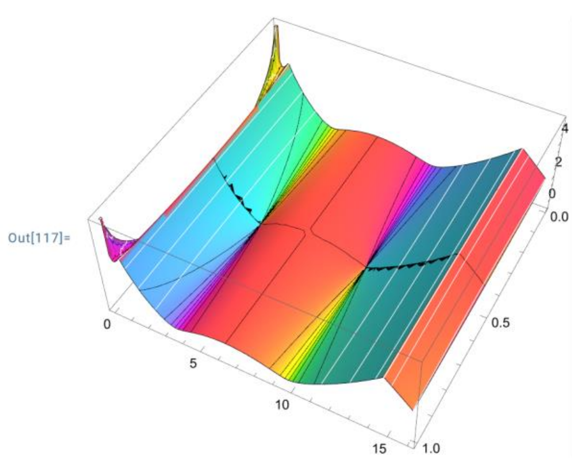
Lemma 7. *Let* $s(\alpha)$ *be a curve from the Lemma 6. Then* $s'(\alpha) \neq 0$ *and* $\Phi'(s(\alpha)) \neq 0$ *for all* $\alpha \in (-\pi, \pi)$.

α is not a continuous function, and you cannot take derivative of s (α) with respect to α. Also, you cannot use any chain rule to differentiate s (α) implicitly. I plotted α(s) =-I log(Φ(s)) on critical line. As stated in Lemma 7 α ∈ (−π, π) which that means every time you reach α=π it must jump to – π and vice versa.



Furthermore, you have specified that α belongs to an open interval, excluding the points π and -π. This implies that α is not continuous at those points, which means that α'(s) or s'(α) does not exist at π and -π.

Contour shows that there is no Analytical path for α




```
In[123]:= ep = .01;
          Z = N[ZetaZero[1]];

In[125]:= Alfa[s_] := -I Log[si[s]];
          AbsArg[Alfa[Z + .1 + I ep]]
          AbsArg[Alfa[Z - .1 - I ep]]

Out[126]= {2.83476, 3.11297}

Out[127]= {2.81855, -3.11286}
```