PROOF OF SOME CONJECTURES AND RIEMANN HYPOTHESIS

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Abstract. A simple proof confirms Riemann, Generalized Riemann, Collatz, Swinnerton-Dyer conjectures and Fermat's Last Theorem.

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1. An Interesting Way of Aristotelian Logic

A counter-example is a specific situation in which the hypothesis is not valid. In the case of the Riemann Hypothesis, this is when the non-trivial zero of the zeta function does not lie on the critical line. No such counter-example was found, but a search is underway. There should be no counter-examples at all. Dr. Robin [1] proved in the 20th century that there cannot be any finite number of counter-examples. The final numbers are ordinary concrete numbers: 1,2,3,4,5, and so on. My conclusion: the total amount of counter-examples cannot be one, it cannot be two, it cannot be three, and so on. I see these absent cases are increasing without end. Therefore, the final entry is: "There cannot be an infinite number (of cases) of counter-examples." This means that there are no counter-examples against the Riemann Hypothesis at all.

The logic is solid. Hence, it is a proof of Luck. Why? There is a possibility that somebody will find a counter-example. But we are lucky enough that nobody will find a counter-example. Why? Because Luck does exist and must protect the Riemann Hypothesis because of my reasoning for it. Dark Energy is the placeholder for the entity called Luck because nobody knows what it is. More about Luck is found in the Appendix.

The logic does not disprove the existence of prime numbers. Because it is known that the amount of primes is infinite. I reasoned that it cannot be infinite. The mathematical uncertainty happens: infinity is not equal to infinity. This uncertainty is a usual situation in mathematics.

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Because of the generality of this line of thinking, I am applying this logic to other open questions of mathematics, e.g., the Collatz conjecture and the Generalized Riemann Hypothesis.

2. Birch and Swinnerton-Dyer conjecture

The question of the validity of this conjecture is the answer to the question: should the number of counter-examples be finite or infinite if the conjecture is false? If it is infinite, then the conjecture is true.

An elliptic curve definition is

$$\sum_{\nu,\mu} c_{\nu\mu}\, x^{\nu}\, y^{\mu} = 0\,. \tag{1}$$

If an counter-example has $c_{\nu\mu} = k_{\nu\mu}$, then by making transformation of variables $x = q\,\hat{x}$, $y = w\,\hat{y}$, where q and w are any two rational numbers, I come to infinitude of counter-examples. An elliptic curve $y = y(x)$ definition has

$$\sum_{\nu,\mu} \hat{c}_{\nu\mu} \hat{x}^{\nu}\, \hat{y}^{\mu} = 0\,, \tag{2}$$

where $\hat{c}_{\nu\mu} = k_{\nu\mu}\, q^{\nu}\, w^{\mu}$.

3. Fermat's Last Theorem

A counter-example to this conjecture would have

$$a^n + b^n = c^n\,, \tag{3}$$

where integer $n \geq 3$. The a, b, c are rational numbers. Then, any of $(m\,a\ ,m\,b\ ,m\,c)$ triplets is a counter-example, where $m > 0$ is any rational number. So, there should be an infinite number of counter-examples if Fermat's Last Theorem is false. Hence, Fermat's Last Theorem is not false.

4. Collatz conjecture

The Collatz conjecture is one of the most famous unsolved problems in mathematics. The conjecture asks whether repeating two simple arithmetic operations will eventually transform every positive integer n into 1.

It deals with the following operation on an arbitrary positive integer: if the number is even, divide it by two; but if the number is odd, triple it and add one.

Assuming at least one counter-example exists, I come to an infinitude of them. If $n = N$ is a counter-example, then all numbers of form $2^k N$, where $k = 0, 1, 2, 3, \ldots, \infty$, are counter-examples. So, the total number of counter-examples is infinite. But counter-examples were not found.

5. Generalized Riemann Hypothesis

Assuming at least one counter-example exists, I come to an infinitude of them. The generalized Riemann Hypothesis makes the inequality of Dr. Schoenfeld $|\pi(n) - \mathrm{Li}(n)| < (1/(8\pi))\sqrt{n} \ln n$ stronger. [2] It is known that there are infinitely many violations of Schoenfeld's inequality because Dr. Robin has shown an infinitude of counter-examples. Because generalized inequalities are stronger bounds than Dr. Schoenfeld's one, there are infinitely many violations of them. Infinitely many counter-examples of generalized Riemann Hypothesis. But none of them were found.

6. Continuum hypothesis

In mathematics, specifically set theory, the continuum hypothesis (abbreviated CH) is a hypothesis about the possible sizes of infinite sets. It states that there is no set whose cardinality is strictly between that of the integers and the real numbers. (en.wikipedia.org: Continuum Hypothesis). If there is a set, which is a counter-example to that claim, then there are infinitely many counter-examples made by multiplication of this set's members with an arbitrary integer.

7. Appendix

A general, who has subsequently lost ten battles, is over ten times more likely to lose a coming battle than a general, who has never lost a battle. This fact does not depend on the skills of generals (because my consideration does not mention a single word about abilities and skills), only on the bad luck of the first general, and luck of the second.

The "five sigma rule" used to discover the Higgs Boson is the reliance on luck. Why? It is accepted the existence of this particle because the probability of a mistake is less than the five sigma rule value.

There is a possibility of time-machine causality violation, making the reality unreal. But we are lucky enough that nobody has built a time machine. Therefore, nobody has convinced Nature that it does not exist in reality. If something (Dark Energy, Dark Matter, Black Holes, interplay of fundamental constants, Quantum Mechanics, World Peace Treaty) is necessary for reality, it exists due to luck. If something harmful (wars, death, sickness) is destroying existence, it is because of bad luck.

The Einstein Equations, in their original form, were

$$G_{\nu\mu}(ds^2) = 8\pi\, T_{\nu\mu} + X_{\nu\mu}\,,$$

where a correction term $X_{\nu\mu} \equiv 0$; the ds^2 is spacetime geometry, i.e., metric.

In the Large Hadron Collider before the proton-antiproton collision were the matter tensor $T^A_{\nu\mu}$. The corresponding spacetime is ds^A. But after the collision, much another matter was created, along with annihilation-photons: $T^B_{\nu\mu}$, with the solution of Einstein Equations: ds^B. The $ds^A \neq ds^B$. So, at the moment of proton-antiproton collision, there is an unknown kind of matter: $T^C_{\nu\mu}$. Because the matter is unknown, it is a mix of known matter and the non-vanishing correction term $X_{\nu\mu}$ acting as a transition $T^A_{\nu\mu} \to T^B_{\nu\mu}$.

Dark Matter is a transition between the imprint of matter and subsequent radiation on spacetime during the matter-antimatter annihilation or during the impact of protons in the Large Hadron Collider. And the Sun cannot miraculously disappear. Why? The vacuum and Sun spacetime solutions are incompatible without a transition term in the Einstein Equations: Dark Matter. Dark Matter is mathematical, not Physical. Dark Matter makes the Einstein Equations consistent. Dark Energy is luck because luck if it exists, has to have a place to be.

Consider the quantum entanglement of two particles. We are lucky enough that even though Nature forbids faster-than-light communication, the measurement of one particle's spin coincides with another particle's measurement. In this way, Albert Einstein's Theory of Relativity does not become incomplete or wrong.

Consider the Fermi paradox: "absence of recordable life in cosmos, while the abiogenesis has to happen." Romantic people look at night sky star systems and think that the sky is full of life because the chance for Earth to get alive was the same as the chance for any suitable planet to bloom with living organisms. It is a romantic delusion. The Earth is alive, and Mars is dead only because people are born on Earth. Consider ten suitable for life planets. The Earth and Mars are among them. The current time is 4 000 000 000 BC. If it is given that there will be one single living planet in this group of planets with a probability of 30 %, then the probability that the Earth gets alive is exactly this 30 %. Because humans can live only there, where they are born. But Mars has not this advantage; hence, the probability of Mars getting life is (1/10)*30 %=3 %. The difference between 3 % and 30 % is explained by Luck. This solves the Fermi paradox.

References

[1] Guy Robin, “Grandes valeurs de la fonction somme des diviseurs et hypothése de Riemann.” J. Math. pures appl, 63(2): 187–213 (1984).

[2] Lowell Schoenfeld, “Sharper bounds for the Chebyshev functions $\theta(x)$ and $\psi(x)$. II”, Mathematics of Computation, 30 (134): 337–360 (1976). https://doi.org/10.2307/2005976