International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 9 **Issue:** XI **Month of publication:** November 2021

DOI: https://doi.org/10.22214/ijraset.2021.38719

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue XI Nov 2021- Available at www.ijraset.com

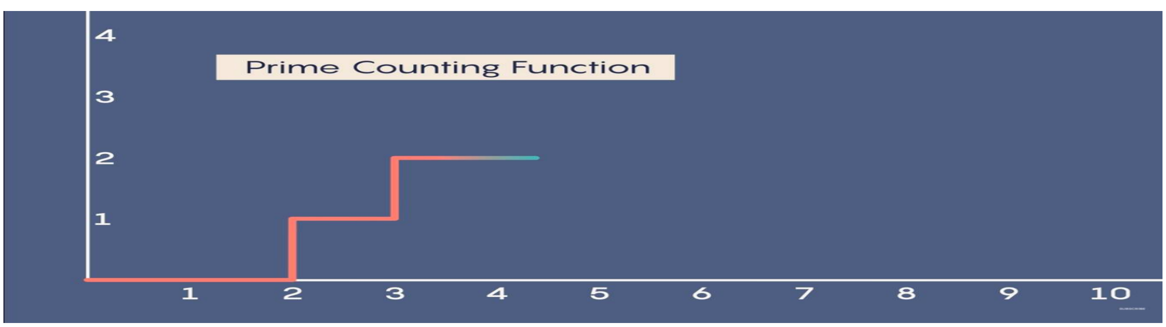
Heuristic Approach towards Demystifying Riemann Hypothesis in Laymans Language and It's Implication on Robotics, Cryptography and Security

Parekh Abhishek J[1], Vasoya Keyuriben C[2] , Rao Nirmeet M[3],Vishwa Bhadiyadara U[4], Limbasiya jay K[5]
[1]*Student, Mechanical Department, SSASIT, Surat*
[2]*Student, E.C. Department, SSASIT, Surat*
[3, 4]*Student, Computer Department, SSASIT, Surat*
[5]*Student, Mechanical Department, SSASIT, Surat*

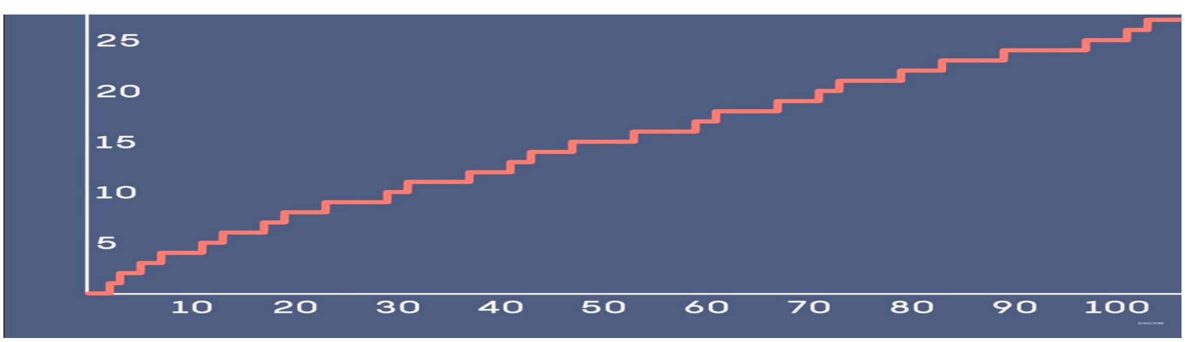
Abstract: The Quest for finding this solution to millennium problem has its own unique history. Perhaps, the most under rated element about this conjecture is that it's jargonising language to understand. The impacts which it lays on laymen's life are immense. Often this conjecture is difficult to understand for majority of technical student also. It lays its foundation among the various branches of engineering such as applied maths, mechanical, E.C., computer and physics. Seeing its potential impacts, a heuristic approach is tried in this paper to demonstrate Riemann hypothesis in simplified form and unique way. Also, the impacts which can be brought by the solution of this problem in foreseen future are discussed.
Keyword: 1. Riemann Hypothesis, 2. E.C., 3. Cryptography, 4. Physics, 5. Robotics, 6. Mechatronics, 7. Quantum mechanics.

I. INTRODUCTION

Rienmann hypothesis is one of the 7 millennium problems defined by Clay University, which are still mystery to the humans since decades. This is as old as modern maths itself. A wide spectrum of theorems in quantum mechanics and cryptography assumes that this conjecture is true. This shows our dependency on this unproven statement. For a long time in history of maths, we have tried to find the exact function locating prime numbers. But till now, we are not able to get hold of it. Many of them have put on immense hard work, for example Carl Friedrich Gauss [1796] solved almost 30, 00,000 numbers to find the pattern in prime numbers. But all in vain.

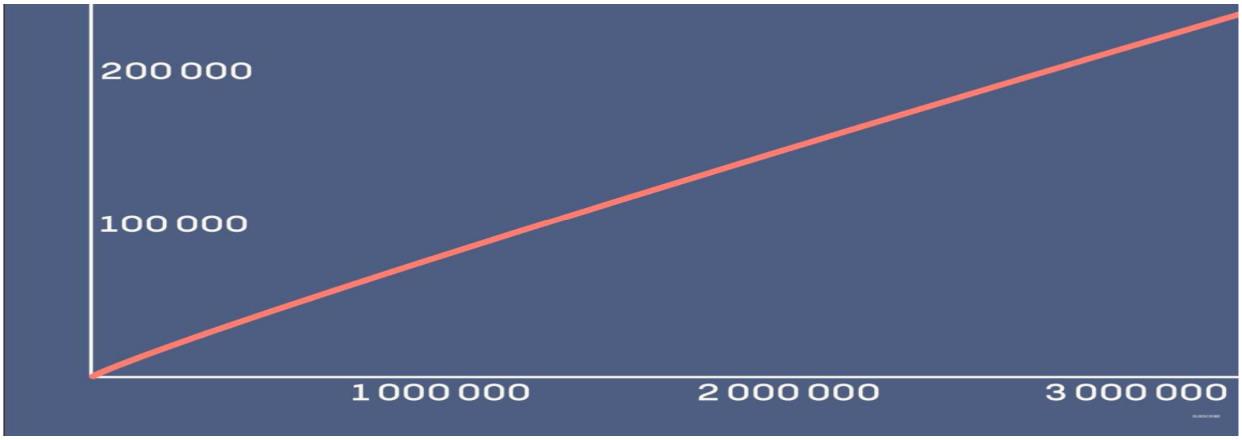


1.] Prime counting function.



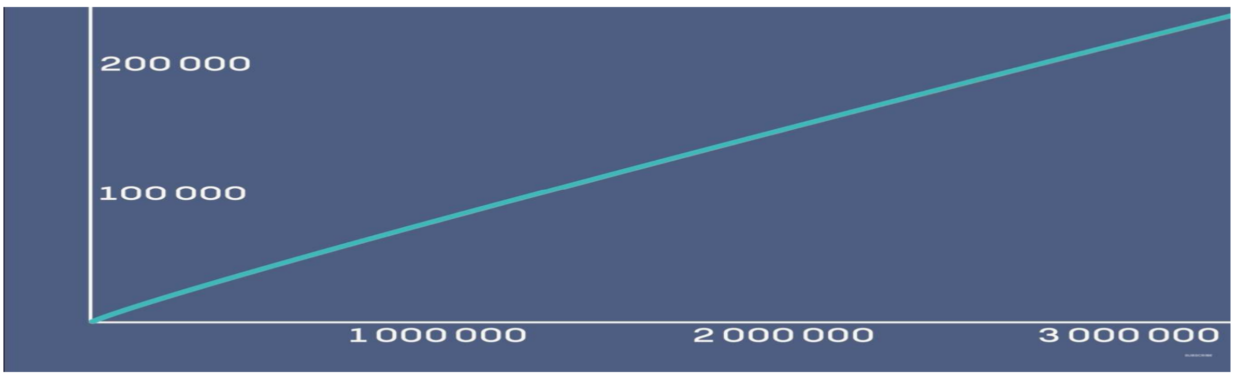
2.] Continuation of Gauss's conjecture.

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue XI Nov 2021- Available at www.ijraset.com



3.] Gauss's conjecture up to 30, 00,000.

On the same time, Gauss was also dealing with logarithmic function. He found a unique similarity between pattern of prime numbers and 1/ Log function. They both showed much similarity in graph and pattern when plotted. However, it was not always the case but when seen a bigger picture, it is evident that both graphs almost coincided each other when scaled on 0 to 30, 00,000 numbers.

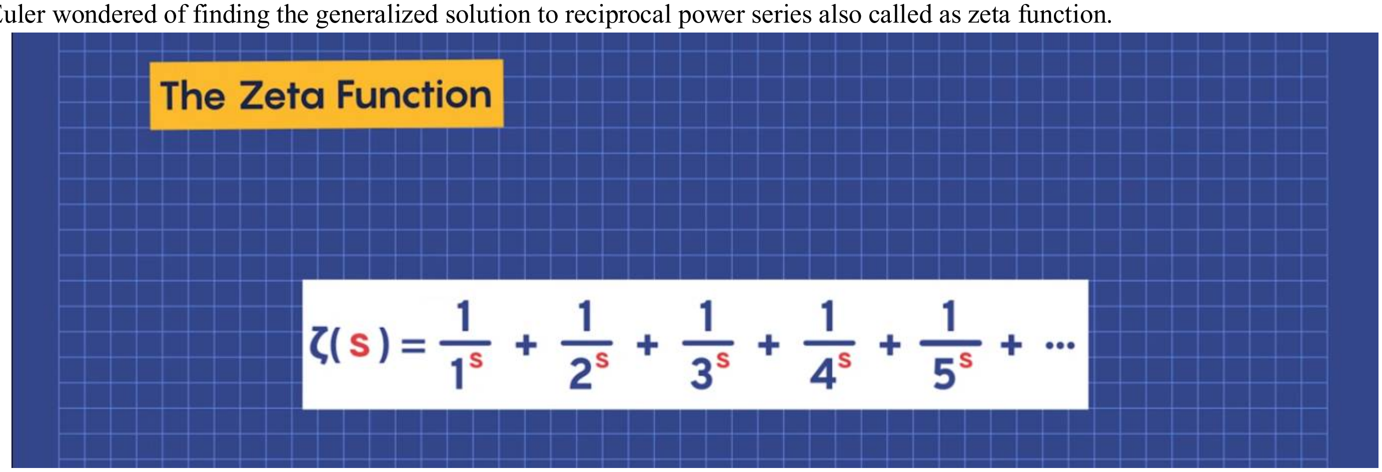


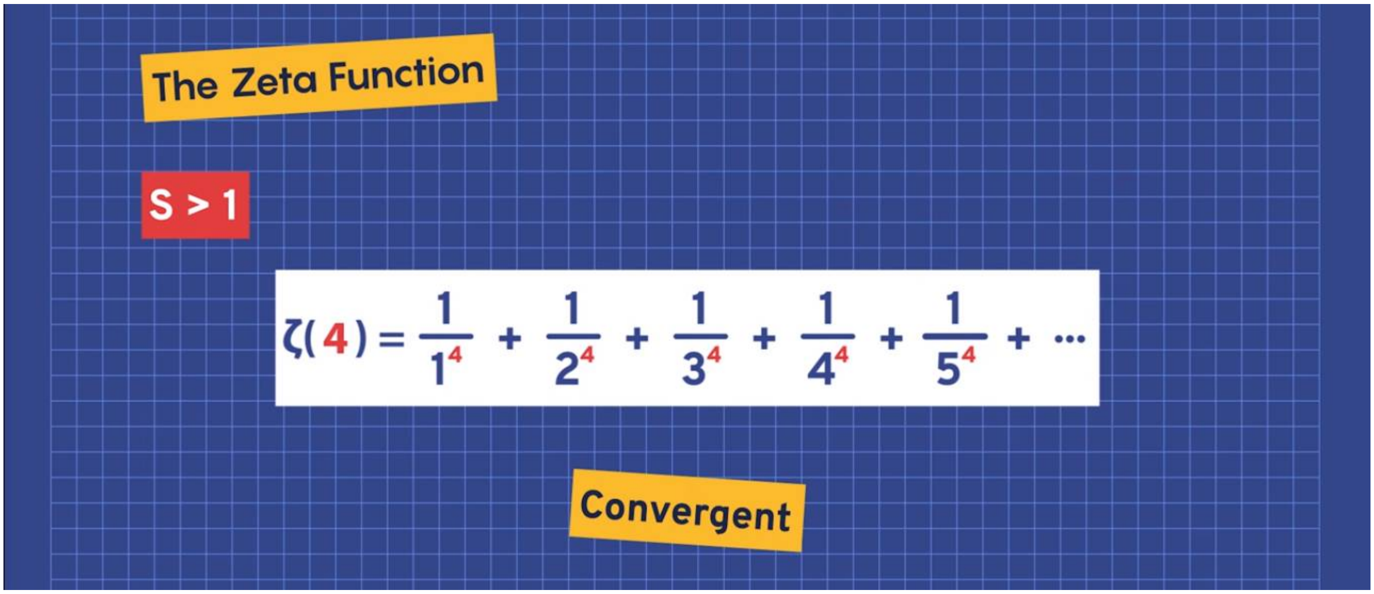
4.] 1/log for 0 to 30, 00,000.

II. LEONHARD EULER [1707]

In the of Euler, engineers and science enthusiasts were working on infinite series and sequences. It was very majestic at that time to prove that the sum of an infinite series may be a finite number. For instance the sum of 1 + 1/2 + 1/4 + 1/8 ...... thus the idea of limits evolved. If the series posed a finite ending than series was termed as convergent series. On contrast to this, the series possessing infinite answer was termed divergent series.

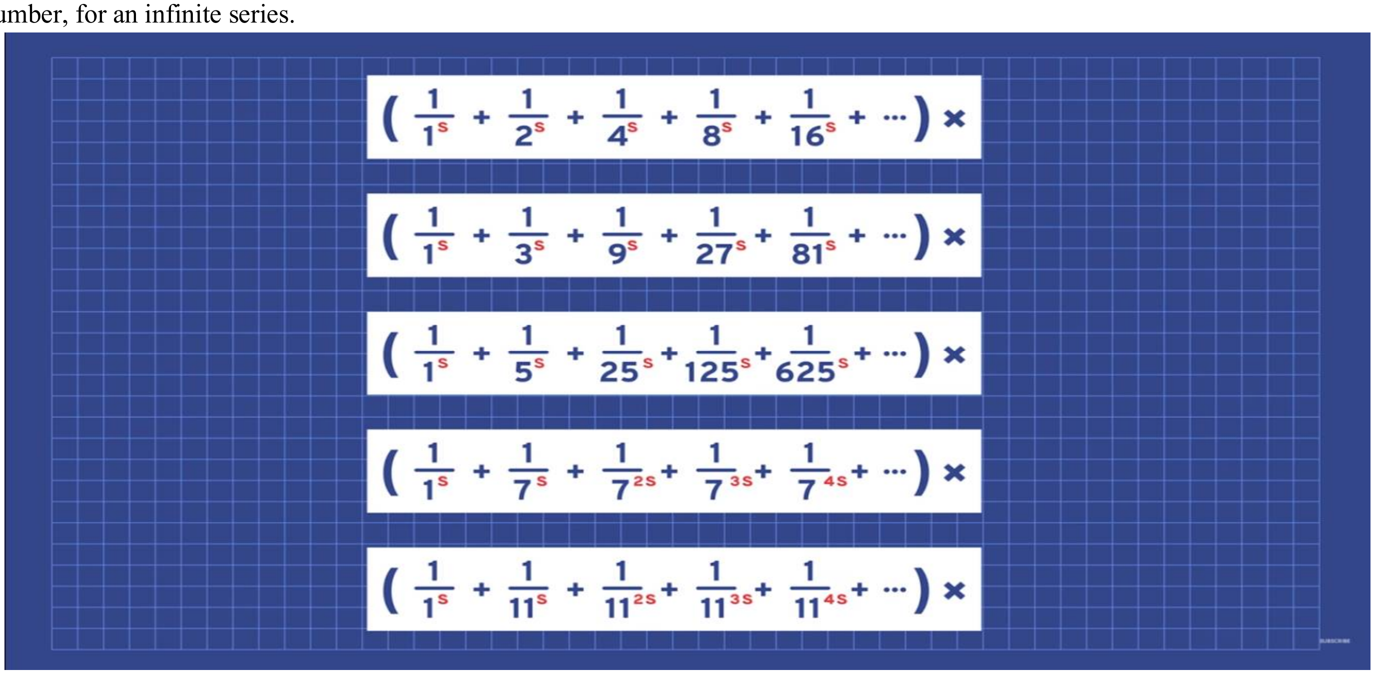
Euler wondered of finding the generalized solution to reciprocal power series also called as zeta function.





5.] Zeta function.

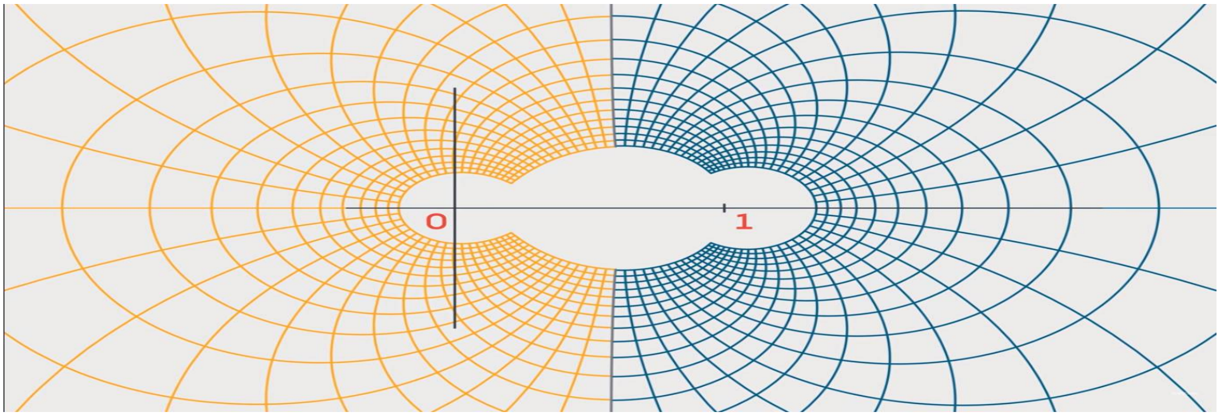
When he completed his research, he deduced an interesting thing that zeta function can denoted as product, one for each prime number, for an infinite series.



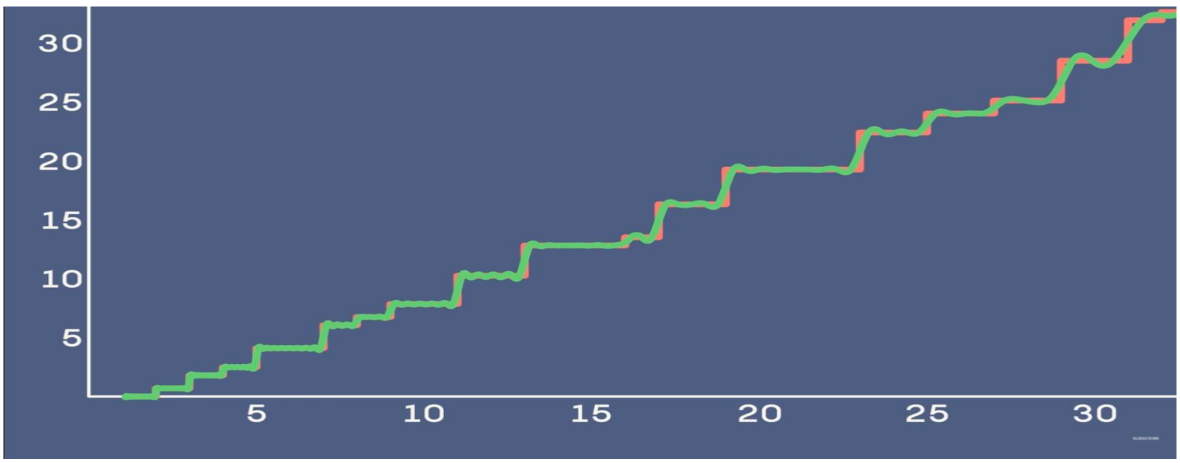
6.] Zeta functions in form of infinite series.

III.BERNARD RIEMANN'S HYPOTHESIS.

Almost after 100 years from Euler, Riemann saw an intimate connection between zeta function and prime numbers. He was pioneer of complex analysis in maths. Perhaps this was his strongest point as he applied complex numbers to zeta function. He wondered what would happen to zeta function if they are allowed to take complex numbers as inputs. And the results he got were groundbreaking. Originally zeta function had only real part. So to cover imaginary part he made anew function called Riemann zeta function. This was based on analytical continuation method. The results were historic as he found that there trivial zeros only on critical line S= ½. Not a single zero was deviated from that line and thus this was them made conjecture and hypotheses. After the advent of modern computers, when results of higher numbers were plotted for Riemann zeta function and prime numbers, the graph magically coincided.



7.] Riemann zeta function.



8.] Riemann zeta function plotted on prime numbers...

IV. IMPACT ON ROBOTICS & CRYPTOGRAPHY

After the discovery of Riemann hypothesis, it is tilled now not cracked as single zero outside critical line. Thus we blindly assume this and thus its name is hypothesis. No proof till now has been made for this. In quantum computing, many theorems are based on assumption of this zeta function to b true and all the calculations are done accordingly. In robotics, Laplace transforms are used widely. If in near future, the zeta function is proved false, than whole robotics branch must be re designed to work for. More over real threat is of security. Bath financial and defence security of nations depends on strong cryptography and passwords. A huge derivation for cryptography methods is based on prime numbers as they are the most random things. But if the pattern to prime numbers is reviled by Riemann hypothesis, it would be a cake walk for hackers to crack passwords and whole online financial transactions around the globe have to be shut down.

V. CONCLUSION

It can be concluded that the mystery of hundreds of years which is still unsolved can be solved in near future when heuristic approach is made. Also threats of assumptions on hypothesis and conjectures can lead to devastating effects also can be predicted from this paper.