The wave function ψ of the Riemann Zeta function *$\zeta(0.5+it)$:*
Applying the Hamiltonian to the wave function interpretation of Zeta to prove RH

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Abstract

The wave graph of Zeta ζ(0.5+it) can be interpreted as a wave function. From this interpretation, the curves represent the probability location of atoms and the nontrivial zeros represent zero probability. It's possible that the atoms represented by wave function curves of ζ(0.5+it) of Zeta are doing the repulsion based on GUE and not the nontrivial zeros. Within the context of Schrodinger equation, the Hamiltonian Operator can be applied to the Parity wave function interpretation of Zeta to yield energy values associated to the Zeta function. Because the Parity wave function is Hermitian it can cause this Zeta-Schrodinger equation to have real energy values.

The Riemann Zeta function is based on the following functional equation

$$\zeta(s) = 2^s \pi^{s-1} \sin\left(\frac{\pi s}{2}\right) \Gamma(1-s)\, \zeta(1-s). \quad \textbf{(1)}$$

Using the input of 0.5+it the Riemann Zeta function generates a wave graph that intersects the critical line at nontrivial zero(root) locations.

The following is the wave graph of Zeta function as ζ(0.5+it) showing it's real and imaginary part waves both intersecting at the nontrivial zero locations. The Riemann Hypothesis states that all the nontrivial zeros lie on the critical line equal to ½ R part.

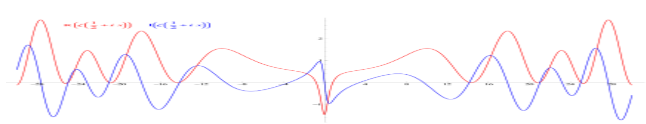


Fig. 1

One approach to proving Riemann Hypothesis is to map the nontrivial zeros of Zeta to a Quantum mechanical operator. However, attempting to map the nontrivial zeros to eigenvalues have fail short. This research takes a radically different approach in linking that Zeta function to Quantum mechanics. In which it focuses on the wave graph of ζ(0.5+it) and not just on the nontrivial zeros. The advantage of this approach is that it explains the source of repulsion within Montgomery Pair correlation conjecture. The curves in the wave function graph of Zeta correspond to atoms. It is those atoms that are repelling based on GUE(Random Matrix) and not the nontrivial zeros. The nontrivial zeros are Zero probability of the Zeta-wave function. The wave function graph of Zeta ζ(0.5+it) is interpreted as adjacent wave functions linked in a chain on the critical line.

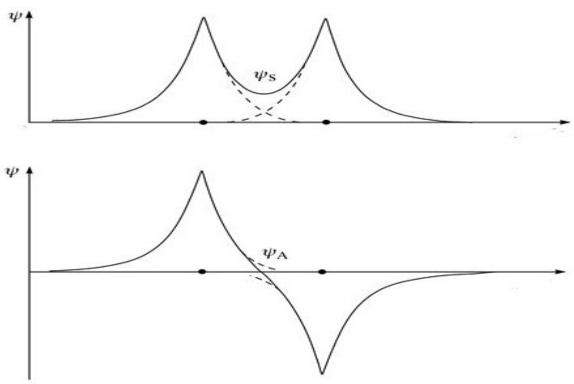


Fig. 2

The following graph is a wave function interpretation of the Zeta function were the dots highlight the locations of the atoms on the critical line with respect to their wave functions.

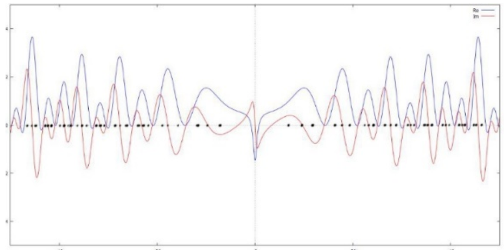


Fig 3

<u>Explaining the repulsion in GUE (Random Matrix)</u>

Regardless if the wave function interpretation of Zeta leads to a Proof of RH or a significant step towards proving RH the breakthrough is explaining the source of repulsion in the Montgomery Pair correlation conjecture. The wave function interpretation of ζ(0.5+it) identifies the wave curves of Zeta as probabilistic density locations of atoms. It is these atoms that repel each and don't want to get too close together.

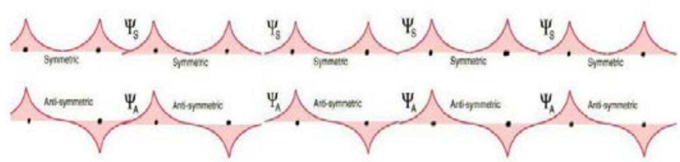


Fig. 4

The following expression is a mathematical correlation between the Parity Operator wave function to the Zeta function.

Even Zeta R(ζ(0.5+it) =R(ζ((0.5-it))
is equivalent to
Even Parity Pψ(x)=+1ψ(-x) **(2)**

And

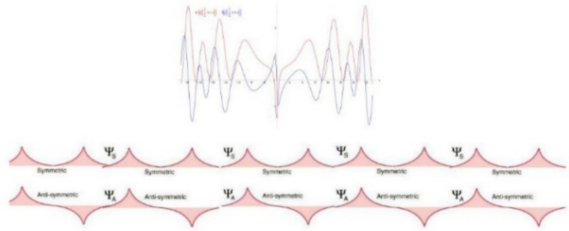
Odd Zeta I(ζ(0.5+it) = I(-ζ((0.5-it)))
is equivalent to
Odd Parity Pψ (x) = -1ψ (-x) **(3)**

A breakthrough towards determining the Riemann Operator

An exciting benefit of the wave function interpretation of Zeta ζ(0.5+it) is that on a conceptual level it can be incorporated in the Schrodinger equation.

$$\underbrace{\left[\frac{-\hbar^2}{2m}\frac{\partial^2}{\partial x^2} + V(x)\right]}_{\text{Hamiltonian operator}} \underbrace{\psi(x)}_{\text{Wave function}} = \underbrace{E}_{\text{Energy}}\psi(x)$$

Based on Schrodinger equation you can apply a simple Hamiltonian to the wave function interpretation of Zeta to yield energy values associated to the Zeta function and its nontrivial zeros. The PSI wave function would have to mirror the Zeta function as in the following graph



You can either have the PSI wave function that mirrors the wave function graph of ζ(0.5+it) or have a Hamiltonian operator structured like a L-function to make the PSI wave graph that mirrors the wave graph of ζ(0.5+it) of the Zeta function.

The Euler Product formula for the Parity Hermitian L-function Operator

If a PSI wave function can mirror the wave graph of Zeta as ζ(0.5+it) then it’s possible it can mirror all other values of Zeta including values greater than 1 over the reals. In doing so the PSI wave function can have it’s own Euler Product.

$$\sum_n \frac{1}{n^s} = \prod_p \frac{1}{1-\frac{1}{p^s}}$$

References

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