Quadratic Theory of the Riemann Hypothesis and Connection to Operators and Random Matrix Theories.

Tony Gomis, A.M. Gomis, C.M. Gomis, A.L. Gomis, S. Schwarz.

ABSTRACT

In a bold move, the non trivial zeros of the Riemann Zeta functions are considered as complex zeros of a canonical quadratic equation. The Riemann Hypothesis confirmation and its links to operators and Random Matrix Theories are the direct mathematical implications of this bold view.

KEYWORDS: Riemann Zeta function, Riemann Hypothesis, Nontrivial zero, complex zero, spectral analysis, quadratic equation, discriminant, Random Matrix, Quantum chaos, Quasi-crystal, Hermitian operator, Hilbert space Eigenfunction, Eigenvalue,Hilbert-Polya, Connes, Berry and Keating, Casimir, Laplace-Beltrami, Selberg, Number Theory.

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SHORT PROOF

Let s be a nontrivial zero of the Riemann Zeta-function. So is (1-s) by direct application of the Riemann zeta functional equation. ( see E.C. Titchmarsh, “The Theory of the Riemann Zeta-Function “, 2 nd edition, revised by D.R. Heath-Brown, Oxford: Clarendon Press, 1986, page 22, Equation 2.6.4).

...Therefore s and (1-s) may be considered as the unique complex zeros of the
unique canonical quadratic equation $Z^2 - S Z + P = 0$, where $S = s + (1-s)$ or $S = 1$, and
$P = s(1-s)$ and P non null, and Z a complex variable, and under the following mathematical constraints:

1-
The related associated discriminant
$\Delta = S^2 - 4 P$
must be such that
$\Delta < 0$
2-
$Res(s) = S/2$
3-
$Im(s)^2 = (-\Delta ) / 4$

These mathematical constraints impose:

a)

$s(1-s) = [Re(s)]^2 + [Im(s)]^2$,

hence a real and strictly positive number that can be associated with an Eigenvalue $\lambda$ of a positive, differential, Hermitian, self-adjoint operator $\partial ( 1 - \partial )$ defined on some Hilbert spaces,
such that

$\partial ( 1 - \partial ) f = s (1 - s) f = \lambda f$ ,

where f is a Hilbertian Eigenfunction.

See Hilbert-Polya, Aneva, Berry-Keating, Connes, Casimir, and Laplace-Beltrami-Selberg operators .

Therefore the spectral interpretations of the nontrivial Riemann Zeta-zeros are validated.

b)

Real part Re(s) is such that

Re(s) = S/2

or

Re(s) = ½

because

S = 1.

Therefore:
1) the Riemann Hypothesis is true,
2) its original Hilbert-Polya spectral interpretation is valid, and
3) its connection to the Random Matrix Theory goes beyond the special case of the Gaussian Unitary Ensemble (GUE).

#RiemannHypothesis #RiemanHypothesisSolved2014 #GSR.

tonygomis@gmail.com
@tonygomis

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