

WILLIAM BENTER DISTINGUISHED LECTURE SERIES

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Deformations to the Complex Plane, Novel Asymptotic Techniques, and the Large t-Asymptotics of the Riemann Zeta Function

by

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Abstract



Registration

The Unified Transform (also known as the Fokas method) is a powerful new method for solving boundary value problems for linear and for integrable nonlinear PDEs. For linear PDEs, the relevant transform is based on appropriate deformations of certain integrals from the real line to the complex plane. After briefly reviewing this transform, it will be shown that combining this idea with novel asymptotic techniques has recently led to unexpected and exciting results regarding the large t -asymptotics of the celebrated Riemann zeta function. In particular the following two results will be discussed. First, a simple formula will be presented for the difference of the functions defining the error terms in two historic problems: in Atkinson's formula and in the formula for the Dirichlet divisor problem. It will be shown that this difference equals $\pi/2$ plus a function which is simply related to the square of the Riemann zeta function. This result implies a simple formula for the function defining the error term in the Dirichlet divisor problem. Second, a remarkable integral identity satisfied by the Riemann zeta function will be presented, which is obtained via contour deformation in the complex plane from an earlier identity derived by the speaker. Making crucial use of a novel asymptotic technique useful for the evaluation of integrals involving the Hankel contour introduced recently by the speaker and Lenells, the asymptotic analysis of this integral equation gives rise to unexpected identities satisfied, for large t , by the Riemann zeta function and by related sums.

Date : Tuesday, 9 June 2026

Time : 9:30 am

Venue : LT-18 Mr & Mrs Chan Hon Pun Lecture Theatre,
Yeung Kin Man Academic Building, CityUHK

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