慶應義塾大学 21世紀COEプログラム
「統合数理科学：現象解明を通した数学の発展」

Integrative Mathematical Sciences 統合数理科学

Keio University 1858 CALAMVS GLADIO FORTIOR

INTENSIVE LECTURE SERIES in Mathematics, Keio

Speaker: Prof. Jonathan Sondow

Place: Room 14-216, 2nd Floor, Bldg.14
Yagami Campus, Keio University

Lecture 1 15:30 ～ 16:30 November 13, 2006 (Monday)

New formulas for π and other classical constants

Lecture 2 16:45 ～ 17:45 November 13, 2006 (Monday)

A geometric proof that e is irrational and a new measure of its irrationality

Lecture 3 16:00 ～ 17:00 November 14, 2006 (Tuesday)

An elementary reformulation of the Riemann Hypothesis

I begin with new formulas for π, e, Euler's constant γ, the "alternating Euler constant" $\log 4/\pi$, and the Glaisher-Kinkelin constant A. The formulas involve double integrals, infinite products, hypergeometric series, q-logarithms, and binary expansions of integers. They include a generalization of Ramanujan's integral for γ.

Next I present a simple geometric proof that e is irrational. This leads to a new measure of irrationality for e, that is, a lower bound on the distance from e to a given rational number p/q, as a function of q. Using the integrals for γ and $\log 4/\pi$ (analogs of ones for $\zeta(2)$ and $\zeta(3)$ that Beukers used to simplify Apery's famous irrationality proof), I give irrationality criteria and conditional irrationality measures for them.

Finally, I use a new formula for the Riemann zeta function to give an elementary reformulation of the Riemann Hypothesis, and of the conjecture that all zeta zeros are simple.

Along the way, I mention several new conjectures. Some results are joint with J. Guillera, P. Hadjicostas, K. Schalm, S. Zlobin, and W. Zudilin.
See my web page http://home.earthlink.net/~jsondow/ for background reading.
First-year students are welcome.

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