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 $\pi$, Euler's constant $\gamma$, 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 $\gamma$.

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 $\pi$, $e$, Euler's constant $\gamma$, 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 $\gamma$.

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 $\gamma$ and $\log 4/\pi$ (analoges 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.