NUMBER THEORY
COLLOQUIUM

From the Circle method to the Circular Law

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Abstract: A starting point of the theory of random matrices is Wigner's semi-circle law obtained in the 1950s, which asserts that (after a proper normalization) the limiting distribution of the spectra of a random hermitian matrix with iid (upper diagonal) entries follows the semi-circle law. The non-hermitian case is the famous Circular Law Conjecture, which asserts that (after a proper normalization) the limiting distribution of the spectra of a random matrix with iid entries is uniform in the unit circle. Despite several important partial results (Ginibre-Mehta, Girko, Bai, Edelman, Gotze-Tykhomirov, Pan-Zhu etc) the conjecture remained open for more than 50 years.

This summer, T. Tao and I confirmed the conjecture in full generality. I am going to give an overview of this proof, which relies on rather surprising connections between various fields: combinatorics, probability, number theory and theoretical computer science. In particular, tools from additive combinatorics and Hardy-Littlewood circle method from analytic number theory play crucial roles.

Thursday, October 2, 2008, 4:00 pm
Mathematics and Science Center: W201

refreshments will be served in the department lounge at 3:30pm

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