Number theory
N16 Colloquium

# *Counting points and doing integrals on Feynman diagrams*

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**Abstract:** Let $G$ be a finite connected graph with $E$ edges. The Kirchhoff polynomial of $P(G)$ is a certain homogeneous polynomial in $E$ variables whose degree is the first Betti number of the graph. These polynomials appeared classically in the study of electrical circuits (e.g., Kirchhoff's laws). They also appear in the evaluation of Feynman integrals. Motivated by computer calculations of D. Kreimer and D.J. Broadhurst associating multiple zeta values to certain Feynman integrals, Kontsevich conjectured that the number of zeros of $P(G)$ over a field with $q$ elements is a polynomial function of $q$. P. Belkale and I disproved this conjecture by relating the schemes $V(P(G))$ to the representation spaces of certain combinatorial objects called matroids. I will discuss this work and subsequent work on the number-theoretical properties of Feynman amplitudes.

Thursday, February 19, 2009, 4:00 pm
Mathematics and Science Center: W303

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