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Coefficients and Roots of Ehrhart Polynomials

Abstract for the Combinatorics Seminar 2010 June 10

[This will be a two-part talk constituting Mr. Reff's admission-to-candidacy exam. The examining committee is Laura Anderson, Marcin Mazur, and Thomas Zaslavsky (chair). All interested parties are invited. Maybe there will be a party.]

I will present a 2005 paper of Beck, de Loera, Develin, Pfeifle, and Stanley, ”Coefficients and roots of Ehrhart polynomials”, in Integer Points in Polyhedra – Geometry, Number Theory, Algebra, Optimization, Contemporary Mathematics, vol. 374.

Given an integral, convex, d-dimensional polytope P, one can associate an enumerator which counts the number of integral points in the n-fold dilation of P. The pioneering work of Eugène Ehrhart showed that this enumerator is actually a polynomial of degree d in n, which is now known as the Ehrhart polynomial. Since the coefficients of the Ehrhart polynomial capture information about P, such as the normalized volume and surface area, it is useful to explore bounds for these coefficients. Once bounds for the coefficients are found, the distribution of the roots can be predicted.

In the first part of this talk I will discuss new bounds for the coefficients obtained via rational generating functions.

In the second part I will use known bounds on the coefficients to construct a bound on the norm of the roots which depends only on d. Then I will construct an interval, depending only on d, where all the real roots lie.
