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Face Polynomials of Barycentric Subdivisions

Abstract for the Combinatorics Seminar 2010 October 5

The f-polynomial of a finite simplicial complex X is (roughly) the polynomial whose i-th coefficient is the number of i-dimensional simplices of X. Brenti and Welker recently showed that the roots of the f-polynomials of successive barycentric subdivisions of X converge to fixed values depending only on the dimension of X. We take a geometric point of view on this question and show that these numbers are roots of a certain polynomial whose coefficients can be computed explicitely. We observe and prove an interesting symmetry of these roots about the real number -2. This symmetry can be seen via a nice realization of barycentric subdivision as a simple map on formal power series. We then examine how such a symmetry extends to more general types of subdivision. The generalization is formulated in terms of an operator on the (formal) ring on the set of simplices of the complex.

This is joint work with Lucas Sabalka and Aaron Pixton.