

Math 4550 HW due Feb. 19, 2009

1. Euler's formula says that for any d -polytope P

$$\sum_{i=0}^d (-1)^i f_i = 1.$$

Verify this formula for the specific polytopes \square^d , \triangle^d and \diamond^d .

2. Let K be a closed convex set of \mathbb{R}^d . Prove that K is the intersection of all closed half-spaces which contain it.
3. Let K be an i -dimensional convex set in \mathbb{R}^d with $i < d$. Let A be the affine span of K . Choose a point x NOT in A . The convex hull of K and x is a *cone* of K and is denoted $C_x(K)$. Prove that if F is a face of K , then $C_x(F)$ is a face of $C_x(K)$.