Homework 11

CS 331H

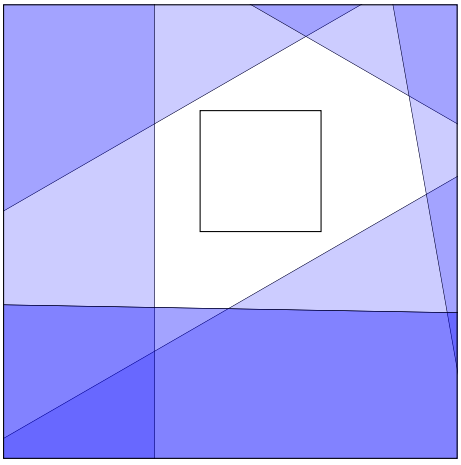
Due Wednesday, April 12

1. Suppose we are given a sequence of n linear inequalities of the form

$$a_i x + b_i y \leq c_i.$$

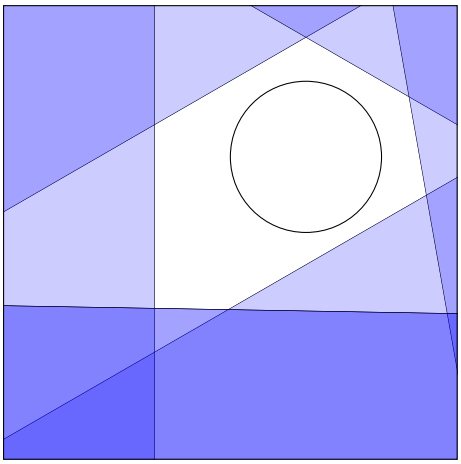
Collectively, these n inequalities describe a convex polygon P in the plane.

(a) Describe a linear program whose solution describes the largest axis-aligned square that lies entirely inside P.
("Axis-aligned" means that the edges are horizontal and vertical.)



(b) Describe a linear program whose solution describes the maximum-*perimeter* axis-aligned *rectangle* that lies entirely inside P.

(c) Describe a linear program whose solution describes the largest circle that lies entirely inside P.



(d) Describe a polynomial-time algorithm to compute two interior-disjoint axis-aligned squares with maximum total perimeter that lie entirely inside P. [Hint: There are exactly two interesting cases to consider; for each case, formulate a corresponding linear program.]