Midterm Exam – 150 points Computational Geometry April 9, 1996

1. **30 points.** Define each of the following terms (using at most 2 sentences each):
   (a) star-shaped polygon,
   (b) Delaunay triangulation,
   (c) line arrangement.

2. **30 points.**
   (a) Draw, as best you can, the convex hull for the set of points
   $$\{(2,1),(0,0),(2,5),(3,2),(4,3),(5,3),(5,1)\}.$$
   (b) Sketch an efficient algorithm to construct the convex hull for a set S of n points in the plane.

   NOTE: For the remainder of this exam you may assume that you have a subroutine for any problem we discussed in class, provided you can correctly characterize its performance bounds.

3. **30 points.** Describe an efficient algorithm for determining if a set S of n points in the plane can be separated from a point p by a line.

4. **30 points.** Given a set S of n points in a rectangle R, describe an efficient algorithm for determining the largest circle C centered inside R that has no point of S inside C's interior.

5. **30 points.** Suppose you are a set S of n line segments in the plane. Sketch an efficient algorithm for finding a line L that intersects the maximum number of segments in S (which, of course, may be much smaller then n).