CS 763, Fall 2016 due Tuesday October 4

A. Lubiw

ASSIGNMENT 2

1. For a polygon P and a point q in P, the *visibility polygon* of q in P is the set of points p in P that are *visible* from q—i.e. the line segment pq lies inside P. Give an $O(n)$ time algorithm to find the visibility polygon of a point q in a polygon P, assuming that a triangulation of P is given.

2. Show that any polygon on n vertices has a chord that splits it into two polygons each with at most $\lfloor 2n/3 \rfloor + 2$ vertices. Hint: use a triangulation. Can you guarantee a more even split? Explain.

3. It is an open problem to generate a random simple polygon with n vertices in the $[1..n] \times [1..n]$ grid in polynomial time. Why don't the following work?
   (a) Generate n points in the grid at random. Connect them in random order. If the result is not simple, start over.
   (b) Generate n points in the grid at random. Following the idea of Graham's convex hull algorithm, pick a point X inside their convex hull, sort the points radially around X, and join them in that order to form a polygon.