

**Computer Science 673****Fall 2016****Homework 11: Geometric Algorithms (Short!)****Due Friday, November 18th**

1. Exercise 33.1-6 Right horizontal ray (4 points)

Given a point  $p_0 = (x_0, y_0)$ , the *right horizontal ray* from  $p_0$  is the set of points  $\{p_i = (x_i, y_i) : x_i \geq x_0 \text{ and } y_i = y_0\}$ , that is, it is the set of points due right of  $p_0$  along with  $p_0$  itself. Show how to determine whether a given right horizontal ray from  $p_0$  intersects a line segment  $\overline{p_1 p_2}$  in  $O(1)$  time by reducing the problem to that of determining whether two line segments intersect.

2. Exercise 33.1-7 Is a point inside a simple (convex or concave) polygon? (4 points)

One way to determine whether a point  $p_0$  is in the interior of a simple, but not necessarily convex, polygon  $P$  is to look at any ray from  $p_0$  and check that the ray intersects the boundary of  $P$  an odd number of times but that  $p_0$  itself is not on the boundary of  $P$ . Show how to compute in  $\Theta(n)$  time whether a point  $p_0$  is in the interior of an  $n$ -vertex polygon  $P$ .