CPS815/CP8201 - Assignment 2

Let $P = \{p_1, \ldots, p_n\}$ be a set of n points on a unit circle in the real plane $\mathbb{R}^2$. Let $S = \{L_1, \ldots, L_m\}$ be a set of m line segments with endpoints in P, for example see Figure 1.

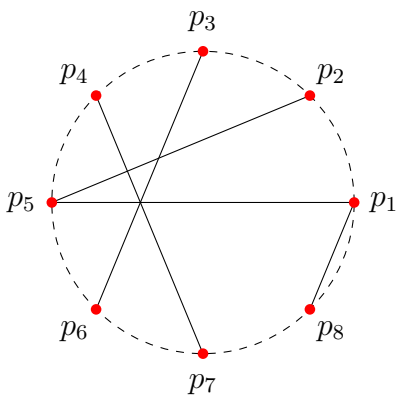

Figure 1

1. (40 marks) Two segment are called disjoint if they do not intersect. For example segments (p_1, p_8) and (p_3, p_6) in Figure 1 are disjoint but (p_1, p_5) and (p_2, p_5) are not since they intersect at p_5. Write an algorithm to find the size of the largest subset $T \subseteq S$ such that every pair of segments in T are disjoint.

2. (30 marks) Two segments cross if they intersect but not at their endpoints. For example the segments (p_3, p_6) and (p_4, p_7) cross but the segments (p_1, p_5) and (p_2, p_5) do not. Write an algorithm to find the size of the largest subset $T \subseteq S$ such every pair in T crosses.

3. (30 marks) Write an algorithm to output the largest subset T in Question 1.

To get full credit, all of your algorithms should run in at most $O(mn)$ operations.