# CSCI5010 Exercise List 4

**Problem 1 (Polygon Intersection).** Let $P_1$ and $P_2$ be two convex polygons. The vertices of each polygon are given to you in clockwise order in an array. Let $n$ be the total number of vertices of $P_1$ and $P_2$. Suppose that each edge of $P_1$ shares at most one common point with an edge of $P_2$. Describe an algorithm to compute the intersection points of the edges of $P_1$ and $P_2$ in $O(n)$ time.

**Problem 2 (Polygon Intersection, Again).** Consider the setup in Problem 1 again. The intersection of $P_1$ and $P_2$ is a convex polygon, which we denote as $P$. Describe an algorithm to output the vertices of $P$ in clockwise order. Your algorithm must use $O(n)$ time.

**Problem 3 (Point in Polygon)** Let $P$ be a convex polygon of $n$ vertices, which are given to you in clockwise order in an array. Given an arbitrary point $q$, describe an algorithm to decide whether $q$ is inside or outside $P$ in $O(\log n)$ time.

**Problem 4 (Convexity Detection).** Let $P$ be a polygon of $n$ vertices, which are given to you in clockwise order in an array. $P$ is not necessarily convex. Describe an algorithm to decide whether $P$ is convex in $O(n)$ time.