

CS 506 sample midterm questions:

1. *For a set of objects in 2 dimensions, which of the following examples are degenerate?*
 - (a) 3 points on a line.
 - (b) 3 points all in a box, (ie, all satisfying $0 < x < 1, 0 < y < 1$).
 - (c) 3 points lying on a circle.
 - (d) 3 points lying inside a circle of radius 1.
 - (e) 2 lines that are parallel.
 - (f) a point and a line that intersect.
 - (g) a set of line segments, none of which intersect.
 - (h) a set of line segments whose left endpoints all are the same point.
2. *Given a polygon P with n sides and a point c inside that polygon, show how to compute the region that is inside P and visible to c in polynomial time.*
3. *Define an efficient algorithm for determining the area of a simple polygon containing n vertices. What is the running time of your algorithm?*
4. *Diameter and width: Define the diameter of a set of points to be the largest distance between any two points in the set.*
 - (a) *Prove that the diameter of a set is achieved by two vertices of the convex hull of the set.*
 - (b) *A line of support to a set is a line L that touches the hull and has all points on or to one side of L . Prove that the diameter of a set is the same as the maximum distance between parallel lines of support for the set.*
 - (c) *Two points a and b are called antipodal if they admit parallel lines of support: there are parallel lines of support through a and b . Develop an algorithm for enumerating (listing) all antipodal pairs of a set of points in two dimensions.*
 - (d) *Define the width as the minimum distance between parallel lines of support. Develop an algorithm for computing the width of a set of points in two dimensions.*