CSE355/AMS345 Homework 2

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The following problems are due by October 1st 9pm.

1. **Diameter (10pts)** Prove that the diameter of a set of points S, defined as the pair of points with largest distance, is realized at two vertices on the convex hull of S. (Hint: prove by induction – of course you may try other approaches)
2. **Degeneracies (20pts)** Consider the following convex hull algorithms and discuss how to handle degeneracies such as three points collinear.
   (a) Incremental construction. (10pts)
   (b) Graham scan (10pts)
3. **Min Supporting Line (20pts)** Design an algorithm to find a line L such that
   - has all the points of a given set to one side;
   - minimizes the max of the perpendicular distances of the points to L.

   (a) Prove that such a line L goes through *two* vertices on the convex hull.
   (b) Show an algorithm of time $O(n \log n)$ to compute for L, where n is the number of points.
4. Design an algorithm to find the convex hull of a polygon in $O(n)$ time. (10pts)

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