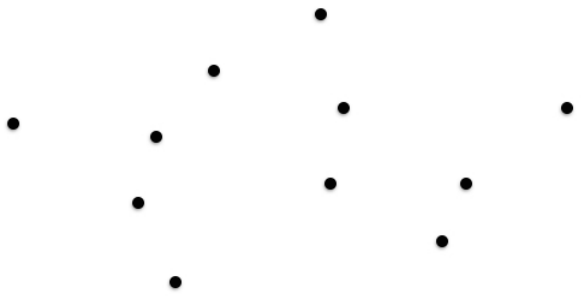
Lecture We will talk about the complexity classes P and NP. You should read about P and NP in CLRS Chapter 34.0–34.2.

Exercises

Graham's scan Illustrate how Graham's scan work on the set of points below. For each step, show which points are on the stack.



Convex hulls of other objects (de Berg et al.) In many situations we need to compute convex hulls of objects other than points.

a) Let S be a set of n line segments in the plane. Give an algorithm to compute the convex hull of S. Analyze the time complexity of your algorithm and argue it is correct.

b) Let P be a non-convex simple polygon given as input as a list of the vertices of P counterclockwise order. Give an algorithm to compute the convex hull of P. Analyze the time complexity of your algorithm and argue it is correct.

Find farthest points Solve CLRS 33.3-3.

Online convex hull CLRS 33.3-5.

Divide-and-Conquer (de Berg. et. al) In this exercise we shall develop an convex hull algorithm based on divide-and-conquer:

(a) Let P_1 and P_2 be two disjoint convex polygons with n vertices in total. Give an $O(n)$ time algorithm that computes the convex hull of $P_1 \cup P_2$.

(b) use the algorithm from part a to develop an $O(n \log n)$ time divide-and-conquer algorithm to compute the convex hull of a set of n points in the plane.

Lower bound for convex hull Solve CLRS 33.3-2.