
Up to **four** people can work on an exercise together. But each of you should be able to explain the solutions to the TA (Bremser). Write your names **and** the name of your group (time, TA) on the sheets. Staple them together

Assignment 7

Deadline: January 12, 2003

Exercise 1

Show that sorting is linear time transformable to computing the convex hull of n points in the plane. (We assume a model of computation where multiplication is permitted.)

Exercise 2

In Chan's algorithm when we perform Jarvis's march on $CH(P_1), \dots, CH(P_r)$, for each P_i we need to compute q_i which makes the largest angle among points in P_i with $p_{k-1}p_k$. Show that q_i can be computed in $O(\log m)$ time where $|P_i| \leq m$.

(Hint: Show that the tangent between a point and a convex m -gon can be computed in $O(\log m)$ time.)

Exercise 3

Graham's original algorithm sorted points in a different way. It found an internal point q in $CH(P)$ and sorted points of P by angle around q . Use this idea to do the following problem:

Given two disjoint convex polygons P_1 and P_2 , find the convex hull of $P_1 \cup P_2$ in $O(n)$ time where $|P_1| + |P_2| = n$.

(This algorithm can be used to design an $O(n \log n)$ divide and conquer algorithm to compute the convex hull of a set of n points in the plane.)