CS 473: Algorithms, Fall 2010
HBS 3

Problem 1. [Recurrences]
Solve the following recurrences.

- $T(n) = 5T(n/4) + n$ and $T(n) = 1$ for $1 \leq n < 4$.
- $T(n) = 2T(n/2) + nlogn$
- $T(n) = 2T(n/2) + 3T(n/3) + n^2$

Problem 2. [Tree Traversal]
Let T be a rooted binary tree on n nodes. The nodes have unique labels from 1 to n.

- Given the preorder and postorder node sequences for T, give a recursive algorithm to reconstruct a tree that satisfies the preorder and postorder sequences. Is this reconstruction unique?
- Given the preorder and inorder node sequences for T, give a recursive algorithm to reconstruct a tree that satisfies the preorder and inorder sequences. Is this reconstruction unique?

Problem 3. [Divide and Conquer]
Let $p = (x, y)$ and $p' = (x', y')$ be two points in the Euclidean plane given by their coordinates. We say that p dominates p' if and only if $x > x'$ *and* $y > y'$. Given a set of n points $P = \{p_1, \ldots, p_n\}$, a point $p_i \in P$ is undominated in P if there is no other point $p_j \in P$ such that p_j dominates p_i. Describe an algorithm that given P outputs all the undominated points in P; see figure. Your algorithm should run in time asymptotically faster than $O(n^2)$

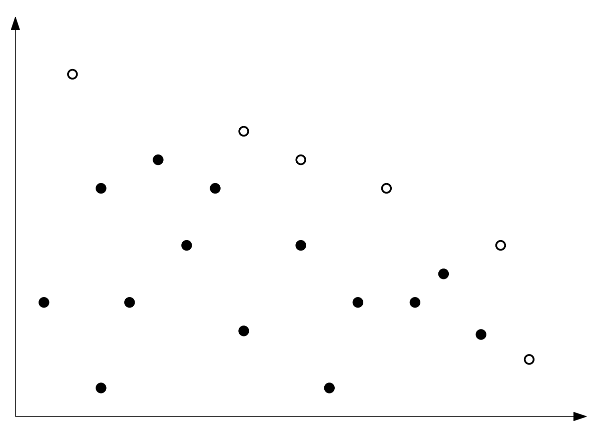

Figure 1: The undominated points are shown as unfilled circles.