HW Assignment 6 (Due date: November 5, Wednesday)

1. [Divide & Conquer, 15 points] Given a set of $n$ points in the two-dimensional plane, design a D&C algorithm that finds all maximal points in $O(n \log n)$. We say a point $(x_1, y_1)$ dominates a point $(x_2, y_2)$ if $x_1 > x_2$ and $y_1 > y_2$. A point is called *maximal* if no other point dominates it.

2. [Greedy, 10 + 5 points] There are $n$ customers that need to be served in a restaurant. The restaurant can service only one customer at a time. For each customer $i$, the service time required is $t_i$. Design a greedy algorithm that finds an ordering of the customers that minimizes the total waiting time of the $n$ customers. Analyze its time complexity and prove its correctness.

For example, if 4 customers with service times $t_1 = 17, t_2 = 20, t_3 = 6, t_4 = 12$ are serviced in this order, the total waiting time will be $0 + 17 + (17 + 20) + (17 + 20 + 6)$. Find an ordering that minimizes the waiting time.

3. [Dijkstra’s SSSP, 10 points] Exercise 24.3-2, page 663.

4. [Dijkstra’s SSSP, 10 points] Exercise 24.3-3, page 663.

5. [SSSP, 15 points] Exercise 24.3-6, page 663.


7. (*) [Dijkstra’s SSSP, 10 points] Exercise 24.3-4, page 663.