

## HW Assignment 6 (Due date: April 14, 9:00am)

1. [Divide & Conquer, 15 points] You are given an infinite array  $A[.]$  of integers in which the first  $n$  elements are in sorted order and the rest of the cells are filled with  $\infty$ . You are **not** given the value of  $n$ . Describe an algorithm that takes  $x$  as input and finds a position in the array containing  $x$ , if such a position exists, in  $O(\lg n)$  time.
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.
6. (\*) [Bellman-Ford's SSSP, 10 points] Exercise 24.1-3, page 654.
7. (\*) [Dijkstra's SSSP, 10 points] Exercise 24.3-4, page 663.