

CSE780: Analysis of Algorithms – Homework 3

Due: Oct. 24th, 2007 (Wed) in class

(1) [**Lower Bounds**] (10 pts): Exercise 8.1-3 in CLRS

(2) [**Longest Increasing Sequence**] (10 pts): Exercise 15.4-5 in CLRS.

(3) [**Bitonic Tour**] (15 pts): Problem 15-1 in CLRS.

(4) [**Optimal Gas Stops**] 15 pts): June is planning a three thousand mile trip across North America. There are n gas stations along her route and she must decide at which ones to stop. Gas station i is located at mile $D[i]$ along her route and charges price $P[i]$ for a gallon of gas. June's car always gets exactly 25 miles per gallon and she has a ten gallon tank which is initially full. Whenever June stops at a gas station, the station attendants insist upon filling the car's gas tank.

The problem is to determine at which stations June should stop in order to minimize the amount she spends on gas. (June must never run out of gas between stations.)

Describe how to split this problem into subproblems in order to construct a polynomial time dynamic programming algorithm for determining the stations at which June should stop. Analyze the time complexity of your solution. You need not give the actual dynamic programming algorithm in pseudo-code.

(Note: Faster algorithms receive more credit. However, a slow, correct algorithm with correct analysis of its time complexity is always preferable to a faster incorrect one or a correct algorithm with incorrect time complexity analysis.)