CS255, Spring 2014, SJSU
Homework 3

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Due: Mar 10, 2014

Problem 1

Exercise 8.2-2, page 196 from textbook.

Problem 2

Show how to sort integers in the range 1 to n^d in $\Theta(dn)$.

Problem 3

Exercise 15.1-3, page 370 from textbook.

Problem 4

Exercise 15.4-1, page 396 from textbook.

Problem 5

Exercise 15.4-2, page 396 from textbook.

Problem 6

Recall the maximum subarray problem. In a previous lecture, we saw a $\Theta(n \lg n)$ divide and conquer algorithm to solve this problem. Specify a $\Theta(n)$ dynamic programming algorithm for this problem using pseudocode and argue that it is correct.

Problem 7

A thief breaks into a store to steal objects. The store has n objects, each with a certain value of v_i dollars and a certain weight of w_i pounds. The thief has a backpack which can only hold a maximum weight of M pounds. He is interested in making as much profit as possible, and would like to know which objects he should steal and put in his backpack. In the next set of questions you're asked to design an algorithm to help the thief maximize his profit. You may assume that object weights are integers.

(a) Show that this problem has optimal substructure. [Hint: it is helpful to consider a particular object and think about its relation to an optimal solution: either it belongs to an optimal solution or it does not.]

(b) Specify a dynamic programming algorithm to solve the problem. What's the running time of your algorithm? Justify your answer.