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Analysis of Algorithms, Fall 2010

Assignment #6
Due: April 22nd

Each of the problems should be solved on a separate sheet of paper to facilitate grading. Please don't wait until the last minute to look at the problems. Please submit your solutions before class on Thursday.

Problem 1 The *partition problem* is, given a sequence of n non-negative integers as input, to find a way to partition this sequence into two disjoint subsequences so that the sums of the integers in each of the two subsequences are equal. More formally, given non-negative integers $s_1, s_2, \ldots, s_n$ that sum to S, find a subset I of $\{1, 2, \ldots, m\}$ such that

$$\Sigma_{i \in I} s_i = \Sigma_{j \notin I} s_j = S/2$$

or determine that there is no such subset. Give a dynamic programming algorithm for the partition problem. Analyze the worst case running time and space requirements of your algorithm as functions of n and S.

Problem 2

IF you have solved Problem 1, solve Problem 6, Chapter 6 of the textbook.

Problem 3 Reduction Problem. Given a set of n points in the plane, find a set of non-intersecting line segments connecting the points which form a closed loop (a polygon).

Describe a linear time reduction from the problem of sorting n numbers to the problem described above.

Problem 4

Prove that problem 1 is NP-Complete. (You can assume that the subset sum problem is NP-Complete. Section 8.8 of the textbook. We did see in class, how to solve this problem using dynamic programming.)