Due: Friday, October 14, beginning of lecture
NOTE change of due date!

NOTE: Each problem set only counts 5% of your mark, but it is important to do your own work (but see below). Similar questions will appear on the first term test which will cover material relating to both assignment 1 and assignment 2. You may consult with others concerning the general approach for solving problems on assignments, but you must write up all solutions entirely on your own. the University's Code of Behavior. You will receive 1/5 points for any question/subquestion for which you say "I do not know how to answer this question". You will receive .5/5 points if you just leave the question blank.

1. (pg.246, Q2 of text) The text discusses the problem finding the number of inversions. In that problem, we are given a sequence of n numbers $a_1, a_2, \ldots, a_n$ which we assume are all distinct, and we define an inversion to be a pair $i < j$ such that $a_i > a_j$. Let's call a pair a *significant inversion* if $i < j$ and $a_i > 2a_j$. Give an $O(n \log n)$ algorithm to count the number of significant inversions between two orderings. [10 points]

2. Suppose you could multiply two 3×3 matrices in q multiplications without using commutativity. How small does q have to be in order to beat the asymptotic complexity of Strassen's matrix multiplication algorithm. Note and hint: you may assume that $n = 3^k$ for some k in your analysis. [10 points]

3. Describe a dynamic programming algorithm for computing the value of an optimal solution for any instance of the two machine weighted interval scheduling problem. In particular,

   (a) Provide a semantic array that will be used as the basis for your algorithm. [5 points]

   (b) Provide a recursively defined computational array that will be used to compute values for the semantic array and briefly justify why your computational array is equivalent to the semantic array. Be careful that your computational array doesn't allow the same interval to be scheduled on both machines. [5 points]

   (c) Indicate how the desired value can be obtained from the semantic/computational array and estimate the time complexity for computing the desired optimal value as a function of $n =$ the number of input intervals. [5 points]