Due: **Friday, March 6, 2009** at the beginning of class. Please put your name and Section TA at the top of your homework.

**Problem 1. Quicksort**

Do Weiss problem 7.19. Please follow the algorithm given by the code included in the book for this problem. You should show the results of all steps that involve swapping elements, with enough text so that someone reading your solution can follow what you’re doing. The problem notes that there is a “cutoff” value – this refers to the idea of running insertion sort on subarrays that are as small as the cutoff value. You don’t need to show any steps of insertion sort; simply assume it sorts the values.

**Problem 2. Decision Trees**

Each of the sorting algorithms we discussed in class, with the exception of bucket/radix sort, can be translated into a specific decision tree. In this question, you’ll give the decision tree for three sorting algorithms for a very small sized input. Assume you have an array with exactly three keys: \([a, b, c]\). Assume there are no duplicate keys. For each of the following sorting algorithms, give the full decision tree. Draw your decision tree in the style of slide 27 from the quicksort lecture (with possible orderings in each node, and each branch specifies a comparison). For all of these algorithms, use method as presented in lecture.

(a) selection sort  
(b) insertion sort  
(c) merge sort  

(d) Considering only number of comparison operations, which of these three algorithms is the most efficient for a 3-element array? Explain why in terms of your decision trees.

(e) Considering only number of comparison operations, which of these three algorithms is the least efficient for a 3-element array? Explain why in terms of your decision trees.

**Problem 3. Disjoint Sets**

a) Weiss problem 8.1 (b) and (c) only. You do not need to show all the intermediate results, but, as usual, including at least some of them will help us if it is necessary to award partial credit.

b) Weiss problem 8.2. If there is more than one possible answer, simply choose one of them.

c) Weiss problem 8.4.