1. (25 points) Draw the Decision Tree for Insertion Sort on three elements A, B, C (which start in positions indexed by 1, 2, 3 of the array, respectively). Note that Insertion Sort is inefficient so it does some redundant comparisons; some comparisons will not have two children. In those cases just show the child that can actually occur.

2. (75 points) Assume you have a computer, which we call the Model R computer, that can execute two comparisons at the same time, which we call *one round*.
   (a) Give an efficient algorithm to find the largest and smallest of four elements (A, B, C, D) on the Model R computer. Try to minimize the number of rounds.
   (b) Draw the Decision Tree for your algorithm (on the four elements A, B, C, D) on the Model R computer.
   (c) What is the relationship between the number of leaves L and the height H for a Decision Tree that counts rounds on the Model R computer.
   (d) How many leaves are there for an algorithm that sorts N elements (on the Model R computer).
   (e) Derive a lower bound for the number rounds it takes the Model R computer to sort N elements.
   (f) On the midterm exam, we showed that the Model R computer can sort in $\frac{1}{2}N \lg N + O(N)$ rounds, which is an upper bound for sorting. How does your lower bound compare to this upper bound?