Due at the start of class Thursday, November 11, 2010.

**Problem 1.** Consider an array of size eight with the numbers 50, 70, 10, 20, 60, 40, 80, 30. Assume you execute quicksort using the version of partition from CLR.

(a) What is the array after the first partition. How many comparisons did you use? How many exchanges?

(b) Show the left side after the next partition. How many comparisons did you use? How many exchanges?

(c) Show the right side after the next partition on that side. How many comparisons did you use? How many exchanges?

(d) What is the total number of comparisons in the entire algorithm? What is the total number of exchanges in the entire algorithm?

**Problem 2.** We are going to derive the average number of *exchanges* in quicksort similarly to the way we derived the the average number of comparisons in class. Use the partition algorithm from CLRS. You are allowed to make reasonable simplifying assumptions.

(a) Assume that at every call to the partition routine the pivot ends up exactly in the middle.

   (i) Write a recurrence for the number of exchanges quicksort uses.

   (ii) Solve the recurrence.

(b) Assume that at every call to the partition routine the pivot ends up at exactly the one quarter point.

   (i) Write a recurrence for the number of exchanges quicksort uses.

   (ii) Solve the recurrence.

(c) Assume that at every call to the partition routine the pivot is a random element.

   (i) Write a recurrence for the number of exchanges quicksort uses.

   (ii) Solve the recurrence.

(d) What did you learn?