Summer 2013 **CMSC 351: Homework 5** Clyde Kruskal

Due at the start of class Friday, June 14, 2013.

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 CLRS.

(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. Assume you execute quicksort using the version of partition from CLRS.

(a) What is the fewest exchanges that the algorithm will execute for an input of size n.

(b) Give an example with $n = 8$.

Problem 3. Write an algorithm `Partition(A,p,r,s)` to partition array A from p to r based on element $A[s]$ ($p \le s \le r$), using exactly $r - p$ comparisons and $r - p + O(1)$ moves. The element $A[s]$ should end up in its proper sorted location after partitioning.

Problem 4. For this problem you may use a calculator for a few calculations.

Consider $\sum_{k=1}^{100} k^{3/2}$.

(a) Use a non-integral method to show that the sum is between 15,000 and 70,000.

(b) Approximate the sum using integrals. Make sure to get an upper and lower bound.