Fall 2012 **CMSC 351: Homework 8** Clyde Kruskal

Due Friday, November 16, 2012.

Problem 1.

(a) Assume you use Selection Sort to find the median of 11 elements. Exactly how many comparisons do you use?

(b) Assume you use Mergesort to find the median of 11 elements. Exactly how many comparisons do you use?

Problem 2. It turns out that you can find the Median of 11 elements with 18 comparisons. You can use this information to develop a (worst case) linear time Selection algorithm based on columns of size 11, rather than the columns of size 5 that we used in class.

(a) Using columns of size 11 exactly how far from either end of the array is the median of medians guaranteed to be. Just give the high order term. (Recall that with columns of size 5 we got $\frac{3n}{10}$.)

(b) Write down the recurrence for a Selection algorithm based on columns with 11 elements each. (You can ignore floors and ceilings, as we did in class.) You do not have to give the algorithm, but state where each of the terms in your recurrence comes from. (For example, you might say that the $n-1$ term comes from partition.)

(c) Solve the recurrence, and give the high order term exactly.

Problem 3. Assume you have two sorted lists A, B each of size n. You would like to find the nth smallest element of all $2n$ elements. Give an algorithm that uses $\Theta(\log n)$ comparisons to do this. As usual, try to minimize the number of comparisons, and give the high order term exactly.