Due at the start of class Thurs, Mar 11, 2004.

Problem 1. Design a sorting algorithm for $n$ elements, where the running time is $O(n + k)$ and $k$ is the number of inversions. An inversion is defined as a pair of elements such that $a_i > a_j$ with $i < j$.

Problem 2. Prove that the sum of the degrees of all the vertices is $2|E|$ where $E$ is the edge set of a graph.

Problem 3. Run the following 3 sorting algorithms on the following set of numbers to show the different ways they sort. Give an exact count of the number of element comparisons that were done.

- Bubble Sort
- Insertion sort
- Quick sort

Set to be sorted: [17, 3, 15, 4, 7, 9, 5].

Problem 4. What is the running time of Heapsort on a heap of length $n$ that is already sorted in increasing order? What about decreasing order?

Problem 5. 1. Is an array in sorted increasing order a Min-Heap? Prove or disprove.

2. Show how the element 8 is inserted in the following table that stores a Max-Heap. [10, 7, 6, 5, 2, 4, 3]. Show how this table can be interpreted as a heap and what the table will be after 8 has been inserted.