Problem Set 7

Assigned: April 10
Due: April 17

The grader will be Monish: monish.k.vachhani@gmail.com Since problems 1 and 3 involve drawing trees, you may hand in your solutions in hard copy.

Problem 1

A. Convert the following expression to prefix and to postfix:

\((3+(x/y)) \times ((x^2)-1)\)

B. Draw the corresponding expression tree.

Problem 2

Suppose that \(A\) and \(B\) are each the representation of a set as an ordered array. Since they are sets, you may assume that they do not have any repeated elements. Using the "two-finger" method, write an efficient Java function:

```java
static int[] union(int[] A, int[] B)
```

that returns the union of the two sets in the same representation; that is, the result should be sorted and should not have any repeated elements.

Problem 3

Suppose you start with the heap shown below. Show the final state of the heap after executing the three commands: add(1), add(4), deleteMin().

```
3
   / \
  8   5
 / \   /
15 10 6 9
/   /   /
17 20 12
```

1
Problem 4

You are given an unsorted array $A$ of ints with no repeated elements, and asked to find the $K$th largest elements in descending sorted order. For example if $A$ is the array $[11,6,1,2,15,7,4,8,20]$ and $K = 3$, then the answer should be $[20,15,11]$. Describe how you would modify selection sort and heapsort to solve this problem (two separate answers). What is the worst case running time of your algorithms, as a function of $N = A$.length and $K$?

You may assume that you are describing your algorithm for the benefit of someone who already knows the standard versions of selection sort and heapsort. So you can either (a) write the complete code; (b) write pseudo-code; or (c) describe in English how to modify the standard algorithm; whichever you prefer.

Honors Problem

Solve problem 3 for insertion sort.