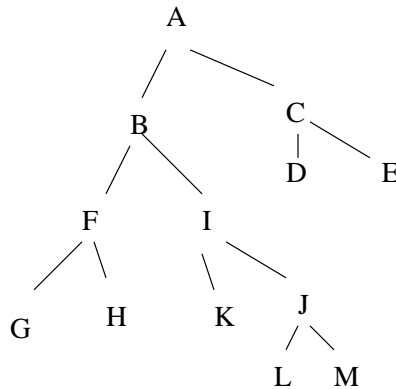# Homework 3 (Cpt S 223)

Due Date: October 8, 2012

Total points: 42

1. (3 points)

   Give the expression tree for ((a+(b-c))*(d-e))+(f*(h-i)).

2. (10 points)

   For the tree shown above, answer the following:

   a) Height of the tree = ?

   b) Depth of node J = ?

   c) Height of node J = ?

   d) Redraw the tree by the First-child, Next-Sibling method.

   e) Give the post-order, pre-order and in-order traversals of the tree.

3. (5 points)

It is possible to reconstruct (meaning, draw) the tree given only the tree's pre-order and in-order traversals. To illustrate this, draw the tree by reconstructing it from the following traversals:

Pre-order traversal: a, f, e, d, g, b, c

In-order traversal: e, f, g, d, b, a, c

4. (7 points)

a) Draw the BSTs that result from the following two different insertion sequences of the same set of elements:

a) Insertion sequence: 8 7 1 6 2 3 5 4

b) Insertion sequence: 5 7 3 2 8 6 4 1

For both cases, start with an empty tree. Just showing the final tree in your answer is sufficient. Alternatively, if you want to show the BST after every insertion, that is fine too.

b) Briefly state what is so markedly different between the shapes of the two resulting BSTs.

5. (5 points)

Starting with an empty tree T_0, show the set of BSTs $T_0 \Rightarrow T_1 \Rightarrow T_2 \Rightarrow \ldots \Rightarrow T_6$ resulting from performing the following sequence of operations (in that order):

Insert(5), Insert(10), Insert(2), Insert(7), Insert(6), Remove(5).

6. (12 points)

a) Starting with an empty tree T_0, show the set of AVL trees $T_0 \Rightarrow T_1 \Rightarrow T_2 \Rightarrow \ldots$ resulting from performing the following sequence of operations (in that order):

Insert(7), Insert(5), Insert(2), Insert(4), Insert(3), Insert(1)

If at any step you need to rebalance the tree using rotation, then clearly identify: i) the node that has the imbalance (i.e., violation), and ii) the corresponding rotation "case" that applies there (i.e., case 1 or 2 or 3 or 4).

b) Answer the same question as in part (a) but with this insertion sequence instead: Insert(2), Insert(1), Insert(4), Insert(5), Insert(9), Insert(3), Insert(6), Insert(7)