HW8

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November 28, 2015

1 Problems

1. A full node is a node with 2 non-null children in a binary tree. Let $F(n)$ be the # of full nodes in a binary tree with n nodes, $L(n)$ be the # of leaves in that tree. Show that the equation below holds for any $n > 0$.

$$F(n) = L(n) - 1$$

2. Show the result of inserting 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 into an initially empty AVL tree.

3. (a) construct a expression tree for the expression below.

$$x = (a + (b * c)) - ((d/e) + f) * g \tag{1}$$

   (b) convert Eq.(1) to a Postfix Expression(*reverse Polish notation*)

   (c) convert Eq.(1) to a Prefix Expression

2 Solution Sketch

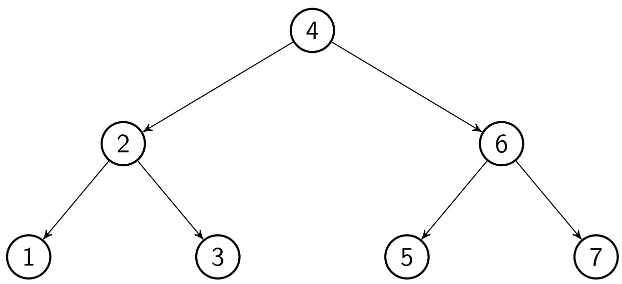
1. We know that the # of edges in a tree with n nodes is $n - 1$, there are two edges from every full node to its children, 0 for leaves, 1 otherwise. therefore,

$$2 \cdot F(n) + 1 \cdot (n - F(n) - L(n)) + 0 \cdot L(n) = n - 1$$

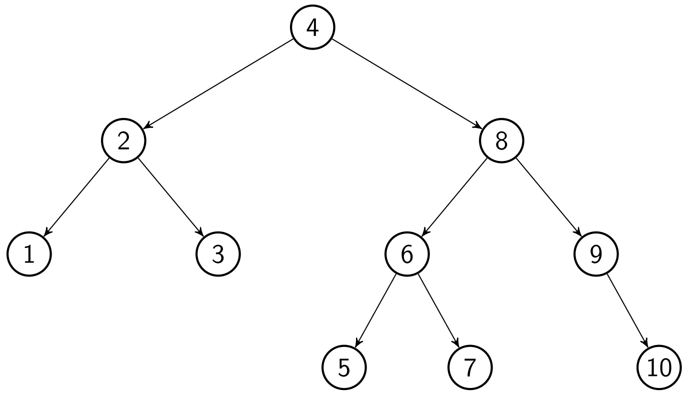
therefore,

$$F(n) = L(n) - 1$$

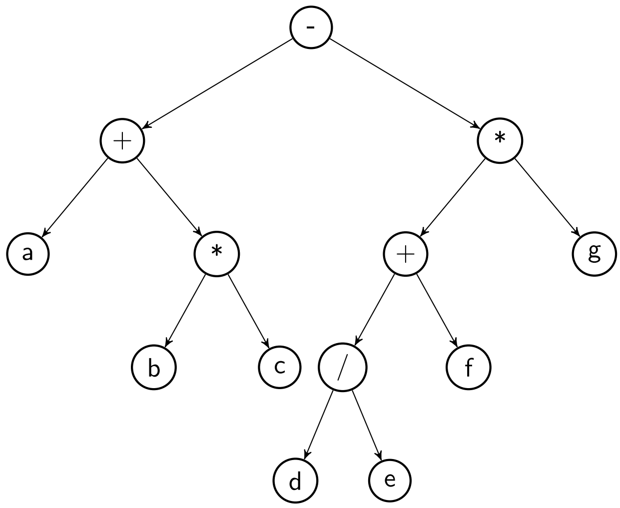
2. The insertion of 1, 2, 3..., 7 makes a perfect balanced AVL tree,



then we insert 8, 9, 10,



3. (a) Just construct the expression tree.



(b) Use the tree above, traverse the tree in post order.

$$abc * +de/f + g * -$$

(c) Use the tree above, traverse the tree in pre order.

$$- + a * bc * +/defg$$