CS2351 Data Structures

Homework 6
Due: June 8, 2011 (before class)

1. Consider performing the following sequence of operations in an initially empty BST:

   Insert 5, Insert 1, Insert 8, Insert 9, Insert 7, Insert 10.

   (a) Draw the resulting BST.
   (b) Suppose 5 is now deleted from the BST. Draw the resulting BST.
   (c) Suppose 8 is further deleted. Draw the resulting BST.

2. Consider performing the following sequence of operations in an initially empty AVL tree:

   Insert 5, Insert 1, Insert 8, Insert 9, Insert 7, Insert 10.

   (a) Draw the resulting AVL tree.
   (b) Suppose 9 is now deleted. Draw the resulting AVL tree.
   (c) Suppose 10 is further deleted. Draw the resulting AVL tree.

3. It is known that the root of an AVL tree has balance factor 1, the left child of the root has balance factor 0, and the right child of the root has balance factor -1.

   What is the minimum number of nodes in this AVL tree? Explain your answer with an example.

4. Suppose that we want to apply hashing with chaining, and use the following function $h(x)$ for hashing:

$$h(x) = x^2 \ \% \ 100.$$

   Explain why the above h is not a good hash function.

5. (Bonus: 10%) Suppose we now modify the requirement of the balance factor in an AVL tree, so that it can be -2, -1, 0, 1, or 2. If such a modified AVL tree has n nodes, show that height of the tree is still bounded by $O(\log n)$.