

CSE 326: Data Structures  
Assignment #3  
October 15, 2008  
due: Thursday, October 23

- Show the result of inserting the following keys into an initially empty binary search tree using Algorithm 6.8: 232, 827, 782, 57, 512, 17, 400, 441, 493, 500. You need only show the final tree.
  - Show the result of deleting the key 232 from the final tree of exercise 1(a), using Algorithm 6.9.
- Explain exactly what is wrong with Algorithm 6.9 when the node  $N$  that contains the key  $K$  satisfies  $\text{LC}(\text{RC}(N)) = \Lambda$ . Fix the problem by replacing the final simultaneous assignment statement by statements that follow the suggestion of exercise 39 on page 214.
- Repeat exercise 1(a), but this time using an AVL tree and Algorithm 7.1. Show the AVL tree after each insertion (including possible rotations) is completed.
  - Show the result of deleting the key 512 from the final tree of exercise 3(a), using the AVL deletion algorithm described on page 228.
- Page 251, exercise 2a. Show the AVL tree after each of the 10 insertions (including possible rotations) has completed.
- Number the nodes of the last tree in Figure 7.2 according to the order in which they are visited in an inorder traversal.
  - Using the numbers from part (5a) as the keys, show the result of doing an AVL-TreeDeleteMin on this AVL tree. Show the tree after each rotation. (For your information, it is not hard to see that executing a DeleteMin on these worst case trees causes  $\Theta(\log n)$  rotations to occur. You might be interested in proving this to yourself.)
- Explain why it is much more convenient for AVLTreeDeleteMin to be written recursively than iteratively.
  - In executing AVLTreeDeleteMin, it is possible that there are rotations at a node  $v$  and some (distant) ancestor  $u$  of  $v$ , but no rotation at any of the nodes on the path between  $u$  and  $v$ . State exactly under what conditions this can happen.
  - Describe at what point you would invoke AVLTreeDeleteMin as a subroutine in the general AVL tree deletion algorithm of page 228, and how you would use the three values it returns.