Algorithms (COT 6405): Solutions 9

Problem 1
Suppose that we apply RB-Insert to add a node to a red-black tree, and then immediately call RB-Delete to remove this node. Can the resulting tree differ from the initial tree?

We use the example in Figure 14.4/13.4 (page 269/282) of the textbook to demonstrate that the new tree may differ from the original tree. The example shows the insertion of a node with value 4 into a red-black tree. If we then delete the value 4, we obtain a tree that differs from the initial tree. Note that, in this case, the deletion does not involve color changes or rotations.

Problem 2
Consider a binary search tree, and give an algorithm that prints all nodes whose keys are between two given values.

Inorder-Range-Walk(x, *min*, *max*)
if $x \neq$ NIL
  then if $min \leq key[x]$
      then Inorder-Range-Walk(*left-child*[x], *min*, *max*)
    if $min \leq key[x] \leq max$
      then print $key[x]$
    if $key[x] \leq max$
      then Inorder-Range-Walk(*right-child*[x], *min*, *max*)

The running time is $O(h+k)$, where h is the height of the tree, and k is the number of nodes whose keys are between the two given values.