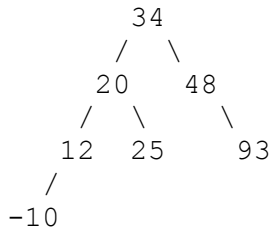


3) (10 pts) ALG (AVL Trees)

List the ranges of all the integer values that would cause a **double** rotation to occur if inserted into the following AVL tree (as opposed to a single rotation or no rotation at all). (For example: “-10 through -5 and any value greater than 93.”) You may assume we do not allow the insertion of duplicate values into the tree. **Note: A double rotation can alternately be described as a restructuring where, out of the three nodes that need to move structurally, the new root node was previously two levels below the node that needs to be restructured.** These cases are also called the C-A-B and A-C-B cases.

**Solution:**

All values from -9 through 11
 All values from 49 through 92

Grading:

First, give +5 for **each** of the two ranges above. (Note: We can accept “-10 through 12” and “48 through 93,” since the problem specifies that duplicates would not be inserted.)

If a range is given but incomplete by more than an off by one error, award 2 out of 5 points. (Something like -3 to 7.)

If a range is given with an off by one error, take off 1 pt per off by one error on an essentially correct range out of the 5 pts.

If a range is given in addition to correct ranges, subtract 2 pts for an extraneous range being given, capping any score at zero.

So, if no valid ranges are given, then automatically 0 of 10. If one valid range is given in full and two invalid ranges are given, this would be $5 - 2 - 2 = 1$ point. If just one valid range is given, that would be 5 points, If one valid range is given with one off by one error, that's 4 points, etc.