3) (10 pts) DSN (AVL Trees)
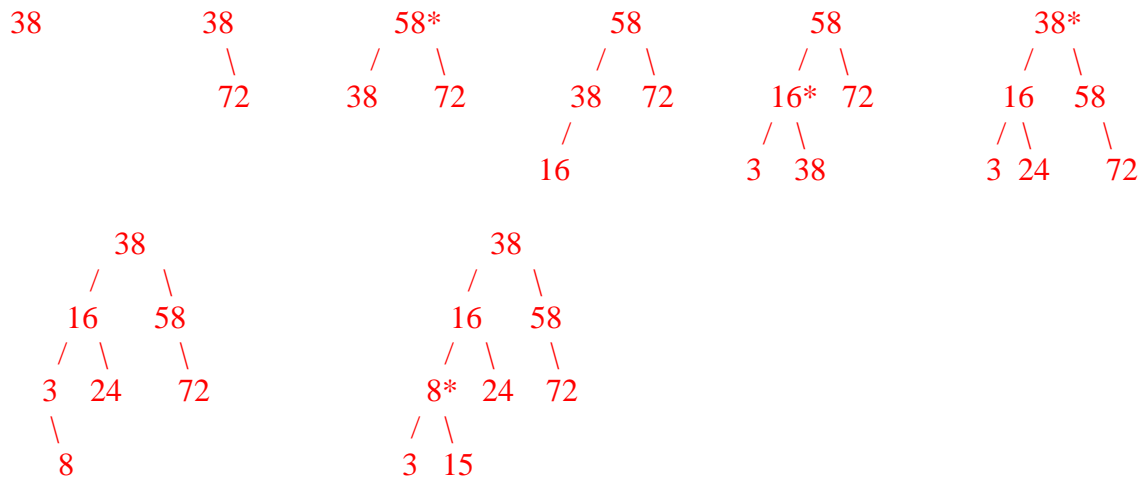
(a) (8 pts) Create an AVL tree by inserting the following values in the order given: 38, 72, 58, 16, 3, 24, 8, and 15. Show the state of the tree after each insertion.

Note: it the solution below, rotations aren't shown, just the final answers after the appropriate rotations. Steps where rotations were necessary are marked with an astericks at the root of the rotation.

```
38          38          58*          58          58            38*
              \         /  \        /  \        /  \          /   \
              72      38    72    38    72    16*   72       16    58
                                    /          / \           / \    \
                                   16          3  38         3  24    72


      38                    38
     /  \                  /  \
   16    58              16    58
  /  \     \            /  \     \
 3   24    72          8*   24   72
       \               / \
        8             3   15
```

Grading: 1 pt for each tree, as long as the insertion on step k was of equal difficulty to the correct insertion, give the point as long as the insertion is correct based on their answer for step k-1.

(b) (2 pts) Draw the state of the tree after the deletion of the node containing the value 16.

There are two possible answers here. One may replace the 16 with either the 15 or 24 and then delete the physical node where the 15 or 24 was stored, respectively. The answer on the left is what occurs when we replace 16 with 15 and the answer on the right is what occurs when we replace 16 with 24: