CS 202

Section 1

Homework 2

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Question 1:

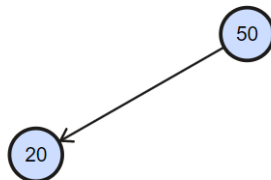**a)** Preorder:

× ∪ A B ∩ \ C D E

Inorder:

A ∪ B × C \ D ∩ E

Postorder:

A B ∪ C D \ E ∩ ×

b) Insert 50, 20, 80, 10, 65, 75, 45, 90, 70, 60, 30, 40, 63 to an empty Binary Search Tree, and then delete 10, 75, 80, 20, 50 in the given order. Show the evolution of the BST after each insertion and deletion operation.
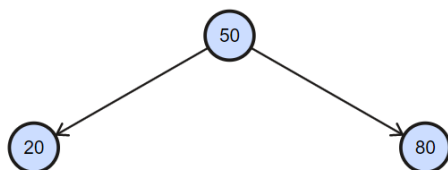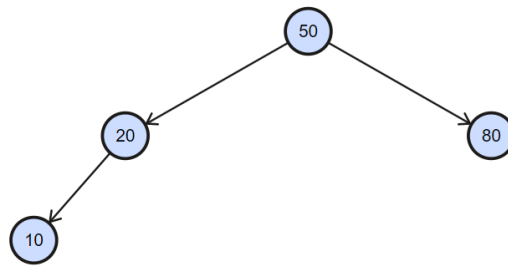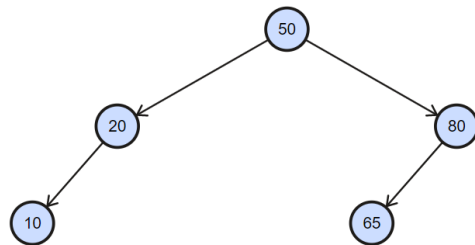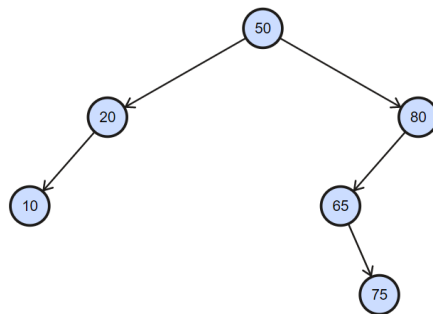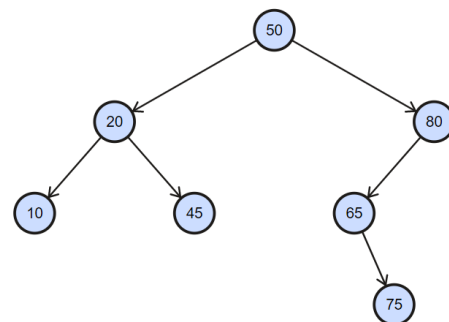
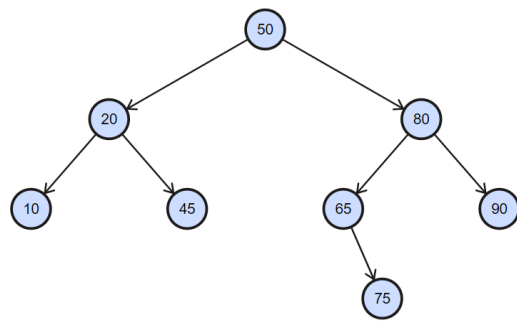Insert 50:
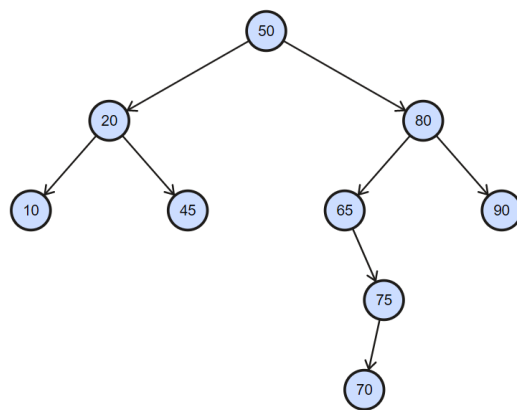

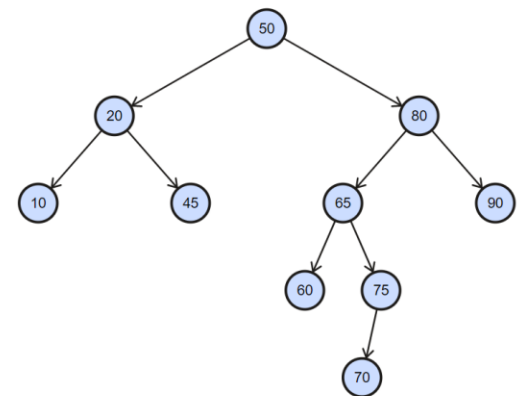Insert 20:

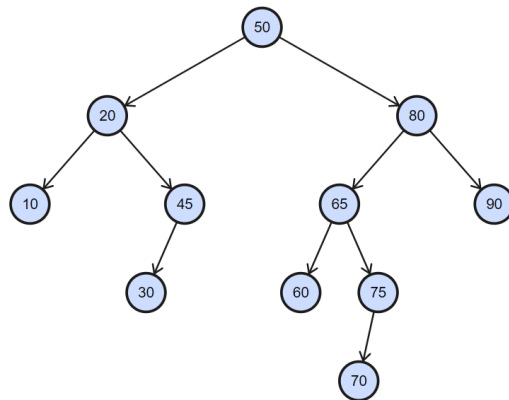
Insert 80:

Insert 10:

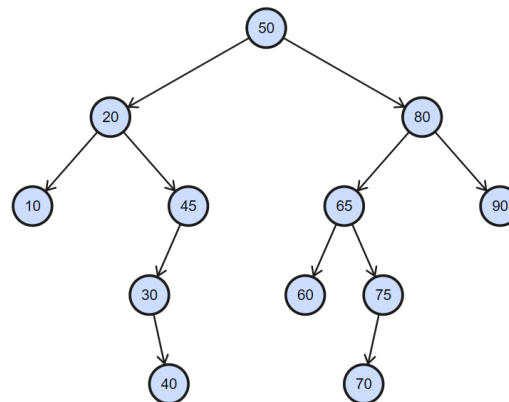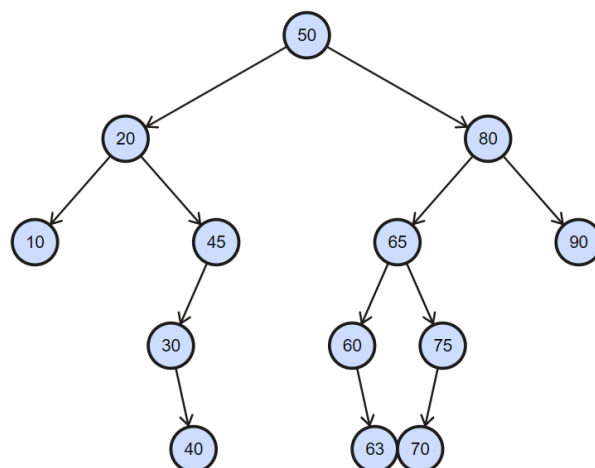Insert 65:

Insert 75:

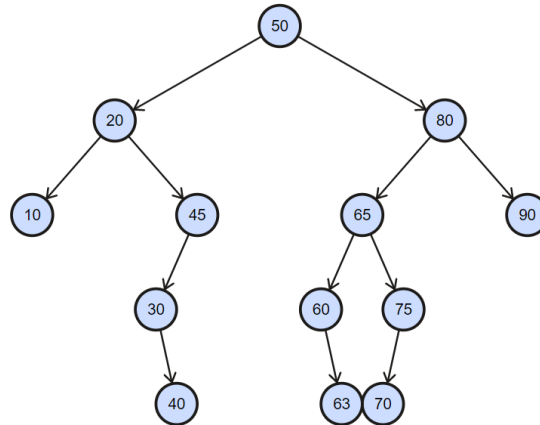Insert 45:

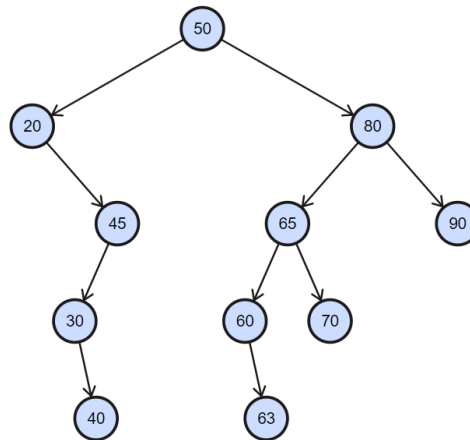Insert 90:

Insert 70:

Insert 60:

Insert 30:

Insert 40:

Insert 63:

After deleting 10:

After deleting 75:

After deleting 80:
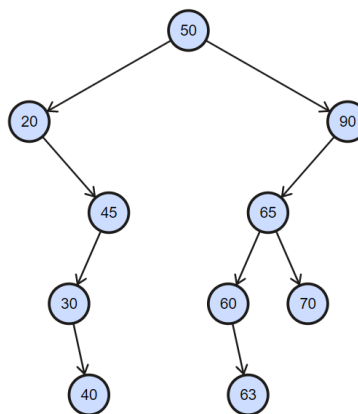
After deleting 20:
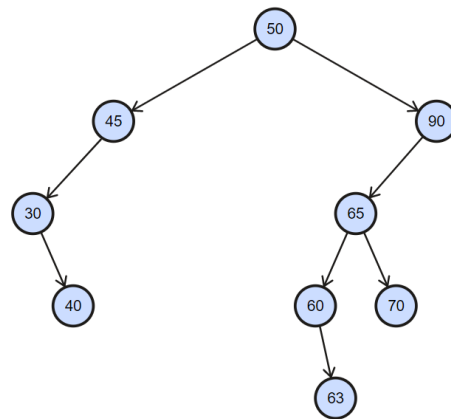
After deleting 50:
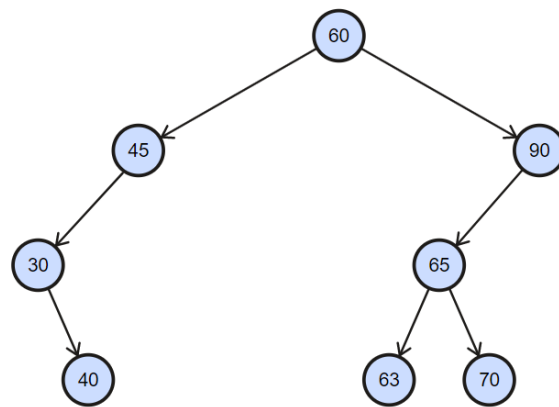
c) A binary search tree has a postorder traversal of 3, 5, 11, 17, 13, 7, 2, 23, 37, 43, 41, 31, 53, 47, 29, 19. Give the corresponding binary search tree. What is its preorder traversal?
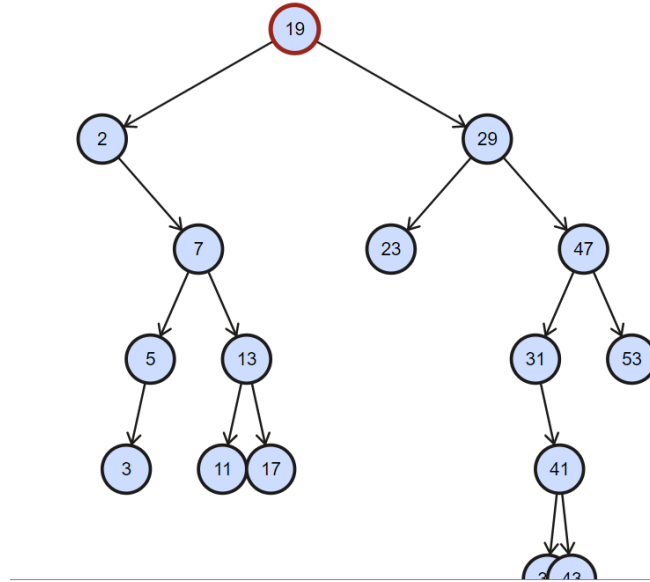
Note that at the bottom, the left one is 37 and right one is 43. Sorry for inconvenience.

Preorder traversal:

19, 2, 7, 5, 3, 13, 11, 17, 29, 23, 47, 31, 41, 37, 43, 53

Question 3:

Num of Nodes vs Height

Num of Nodes vs Height

Num of Nodes vs Height

Report

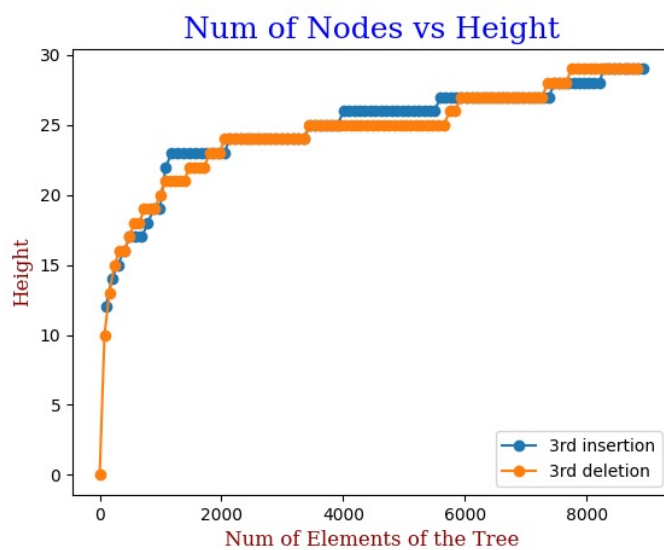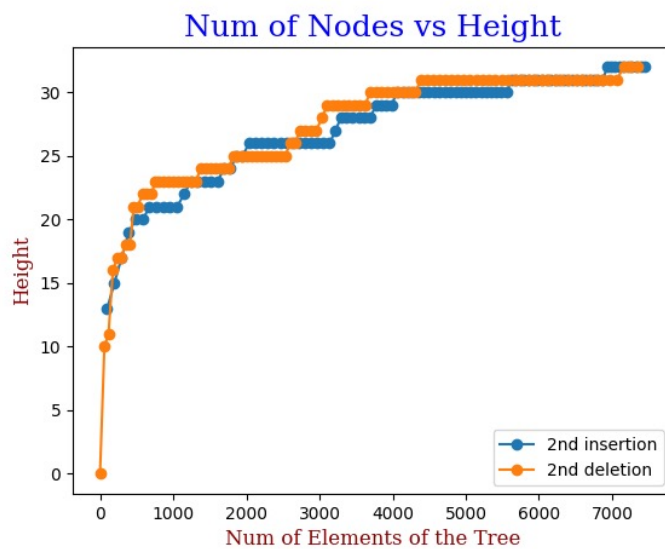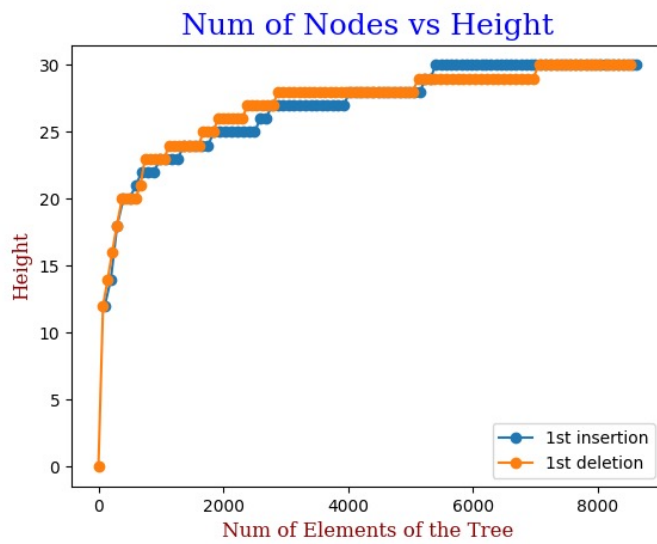Theoretically, we expect that random insertion and deletion of the items into and from the binary search tree gives us $O(\log n)$ for average case. As we did our little experiment with random numbers, we expect experimental results are near to the average case. Indeed, from experimental results and their graphs, the change of height of the tree is quick near small values; whereas, very slow near large values and also deletion and insertion graphs are very similar although we shuffle the values before deleting them. Therefore, experimental and theoratical results are perfectly match. (Note that I use 3 different seeds for 3 graphs. Therefore, it's randomness are more certain that the fact that their graphics all the same strengthens our hypothesis for average case complexity)