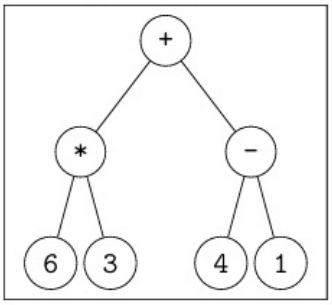
1 Written Questions

Question 1: (20 points)

An important application of binary trees is to represent the structure of an arithmetic computation.

Example Expression Tree: 6 x 3 + (4 - 1)



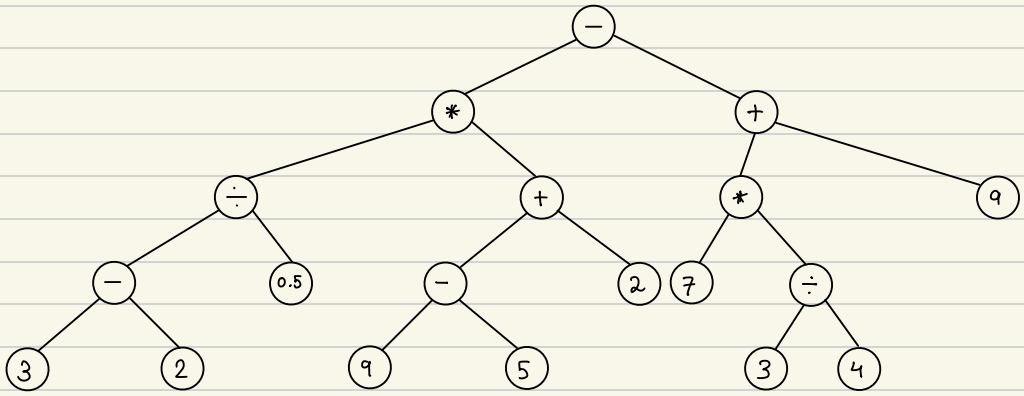
a) Sketch the following binary expression trees:

1. $\frac{3-2}{0.5} \times ((9-5)+2) - (7 \times \frac{3}{4} + 9)$
2. $(\frac{3}{2})^5 \times (N - M \times 2^M) - (7 \times 12 + 9)$

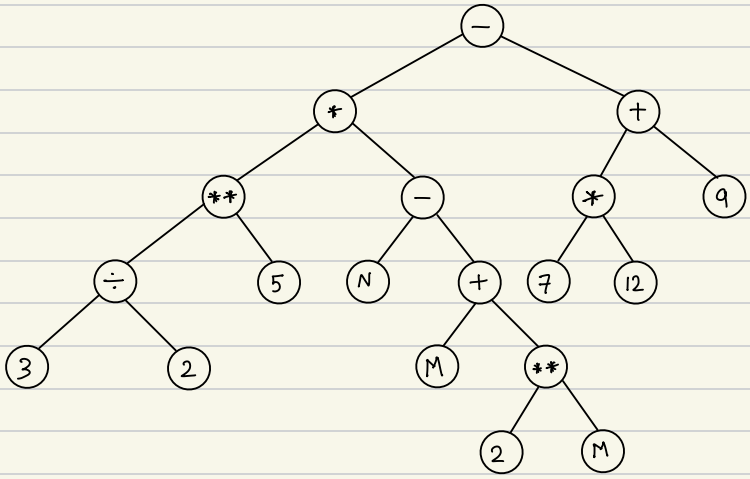
b) Explain how the order of operations are executed in terms of the levels in an arithmetic expression tree.

Hint: Think of the first and last operations executed in an arithmetic expression tree.

(a) 1.



2.



(b) The order of operations is governed by the levels in the tree, with traversing occurring from the bottom up. The operations at the lowest level, closest to the leaf nodes, are evaluated first, while the final operation is always at the root of the tree. This structure ensures that operations with higher precedence or those inside parentheses are evaluated before combining them with other operations at higher levels.