CSC-361: 2-3 Trees and Left-Leaning Red-Black Trees

Please work in a pair. Only one group members needs to submit; however, make sure all names are listed.

1. Indicate true / false for each statement.

   (a) A valid 2-3 tree with only 2-nodes is a binary search tree.

   (b) The search operation for a 2-3 tree of $n > 0$ nodes is $O(\log n)$.

   (c) The search operation in a 2-3 tree with $n > 0$ keys is guaranteed to visit at most $\lg n$ nodes.

   (d) If you insert keys in increasing order into a left-leaning red-black tree, the tree height is monotonically increasing.

2. Show the 2-3 tree resulting from `add`ing keys: 2, 7, 0, 9, 4, 6, 8, 5, 3, 1 to an initially empty tree.

3. Show the left-leaning red-black tree resulting from `add`ing keys: 2, 7, 0, 9, 4, 6, 8, 5, 3, 1 to an initially empty tree.

4. Draw all structurally distinct 2-3 trees with 6 keys (not nodes).

5. Draw a left-leaning red-black tree with 5 red links and 11 black links.