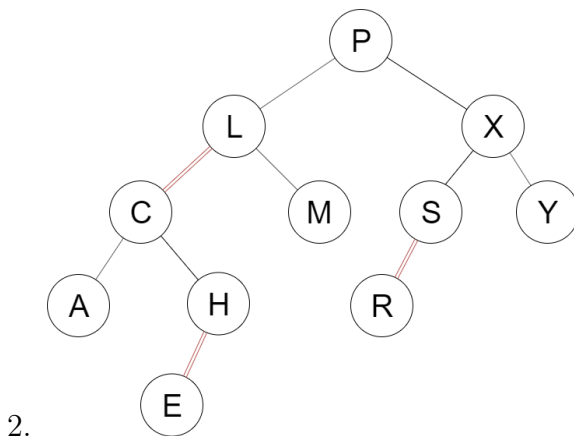
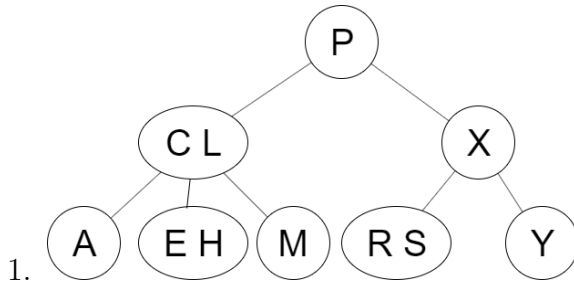


Exercise 1



3. All of these trees have no node with 2 red links and all the red links lean to the left, so the only thing we have to check is the black height of the nodes. The first one has a black height of 1 for the left most null link and a height of 2 for the right most null link. The second one has a height of 2 for the left most null link and a height of 3 for the right most null link. The third one is a simple balanced BST with only 2 nodes, so it is a valid red-black tree. The fourth one has a black height of 2 for every null link, so it is also a valid red-black tree.