

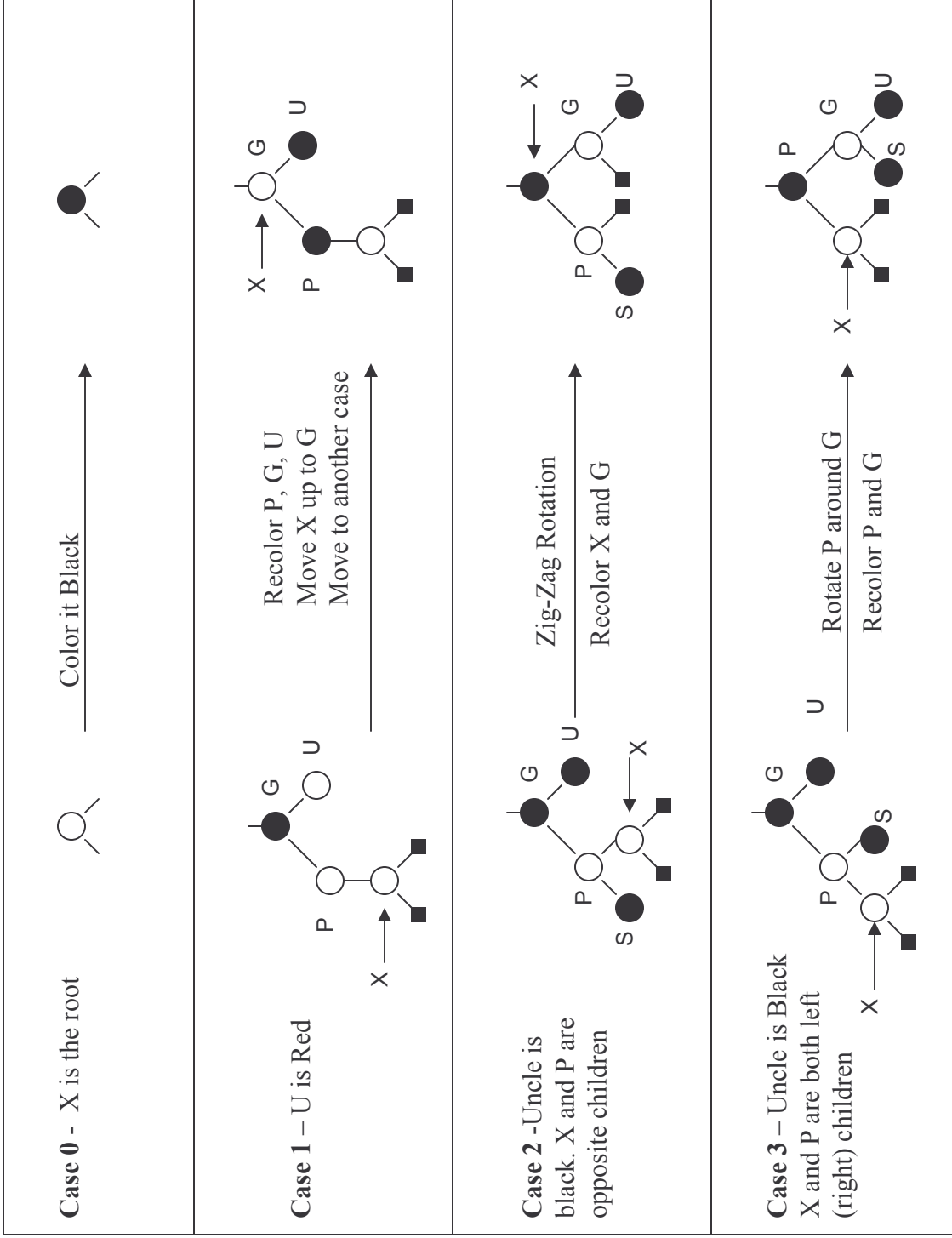
Red-Black Tree Rotations

Red-Black Diagrams

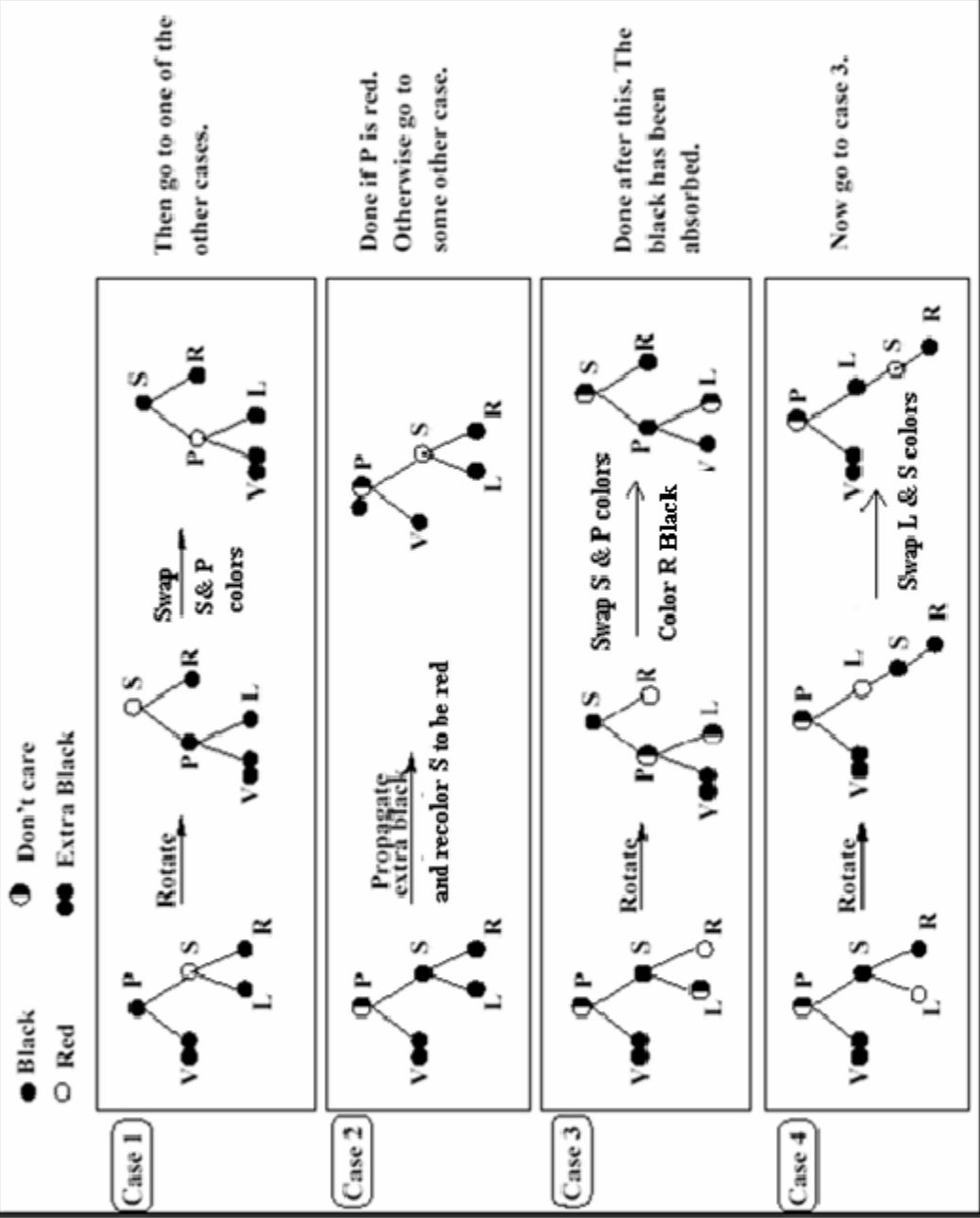
The diagrams which follow show the rotations and recoloring for each “case” for Bottom-Up Insertion, Top-Down Insertion and Bottom-Up Deletion.

Bear in mind that each case has a left-right symmetrical twin which is not shown here.

Bottom-Up Insertion

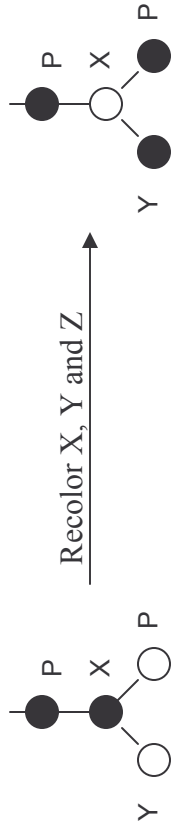


Bottom-Up Deletion

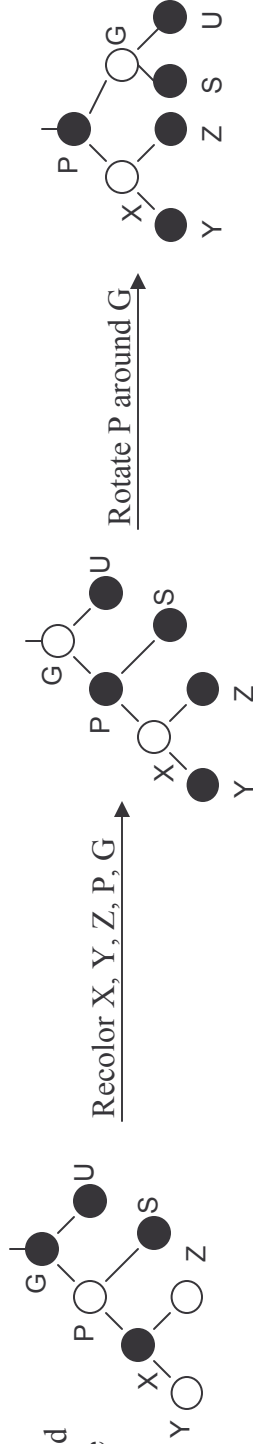


Top Down Insertion

Case 1 – P is Black

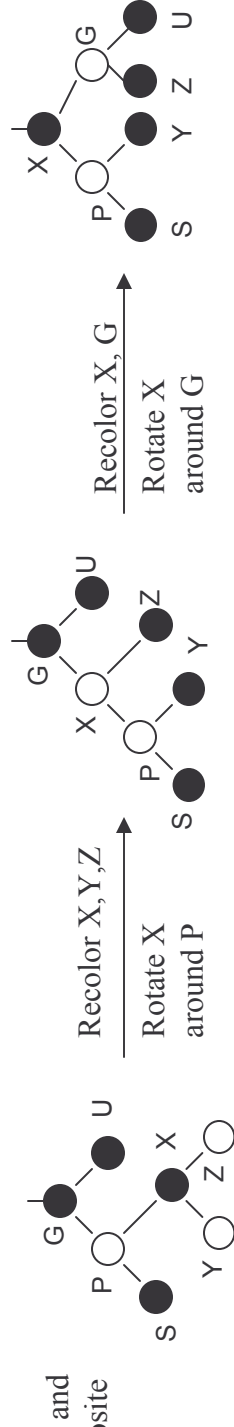


Case 2 – P is red and P and X are both left (right) children



Rotate P around G

Case 3 – P is red and P and X are opposite children



Rotate X around P

Recolor X, G

Rotate X around G