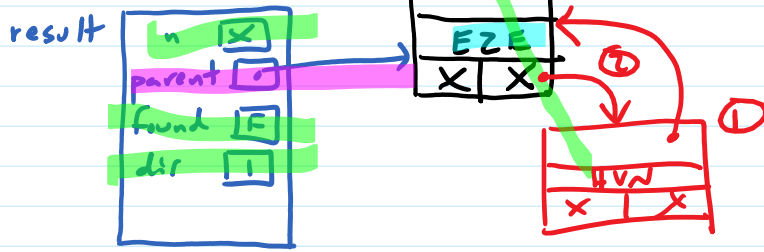


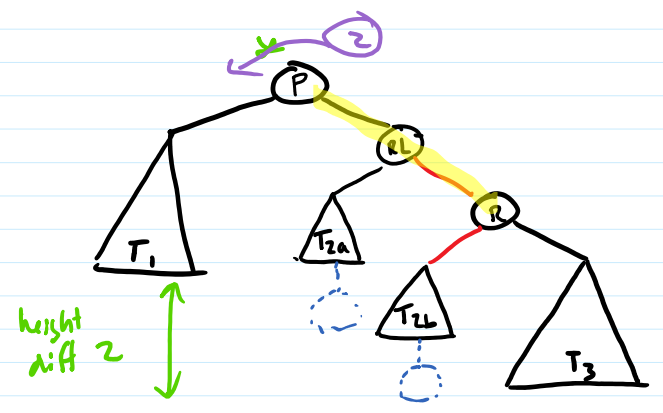
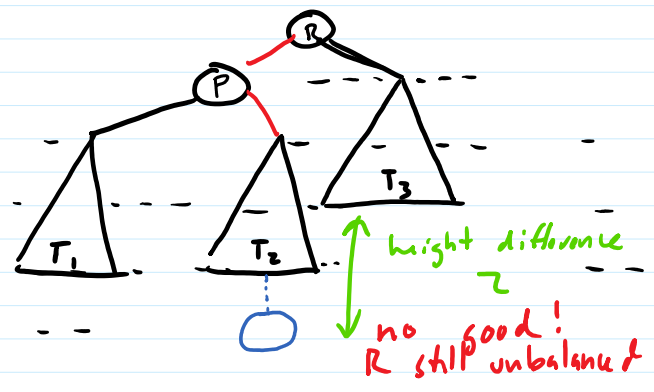
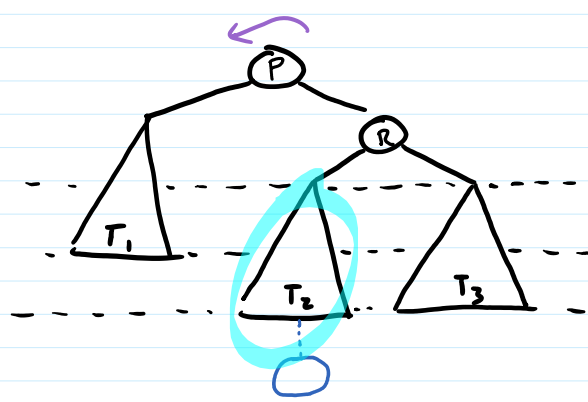
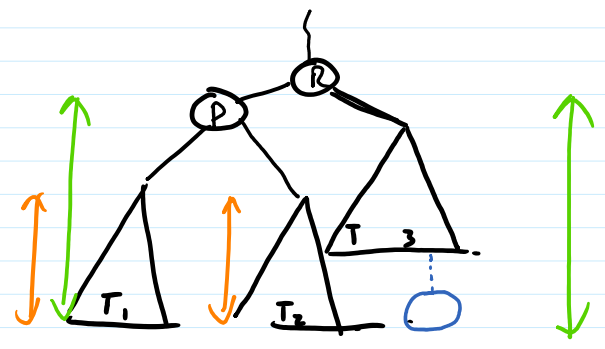
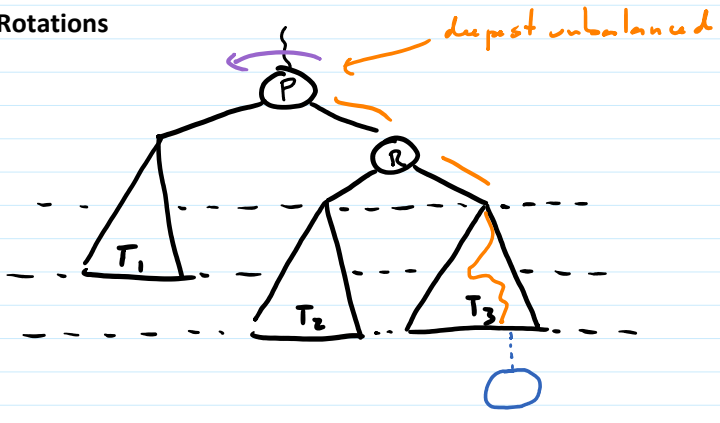
Adding a BST

add (HVN)

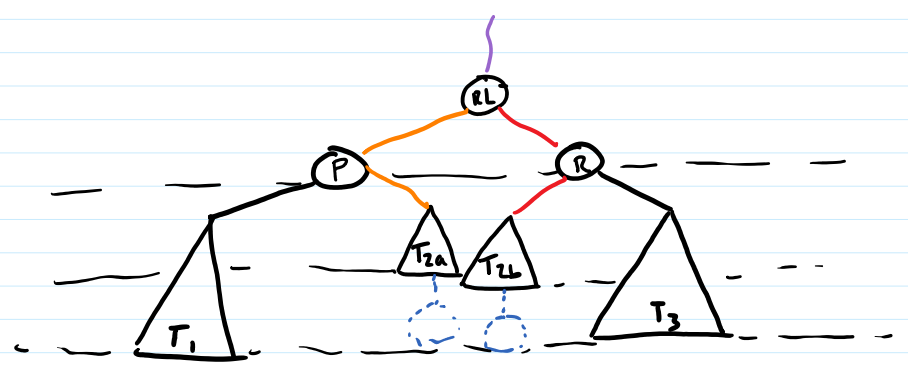


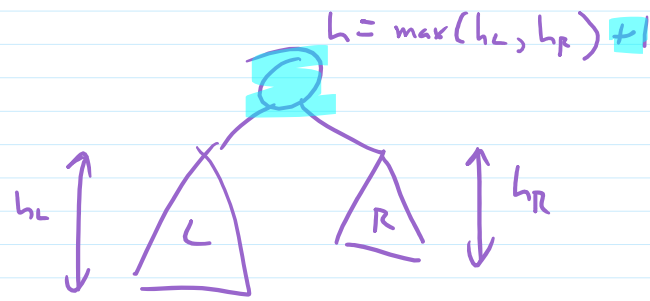
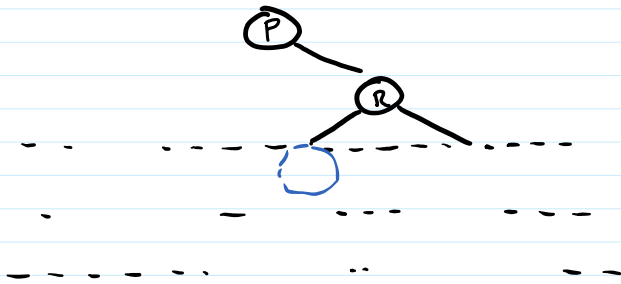
- 1) create new node
- 2) link parent to new code
- 3) link new node back to parent

Rotations

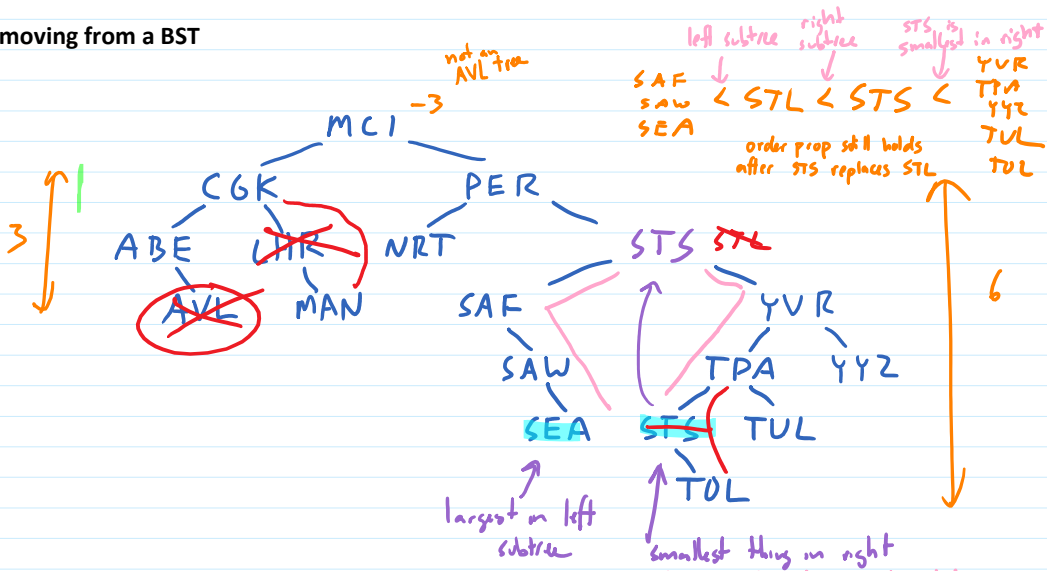


balanced
and no change in height

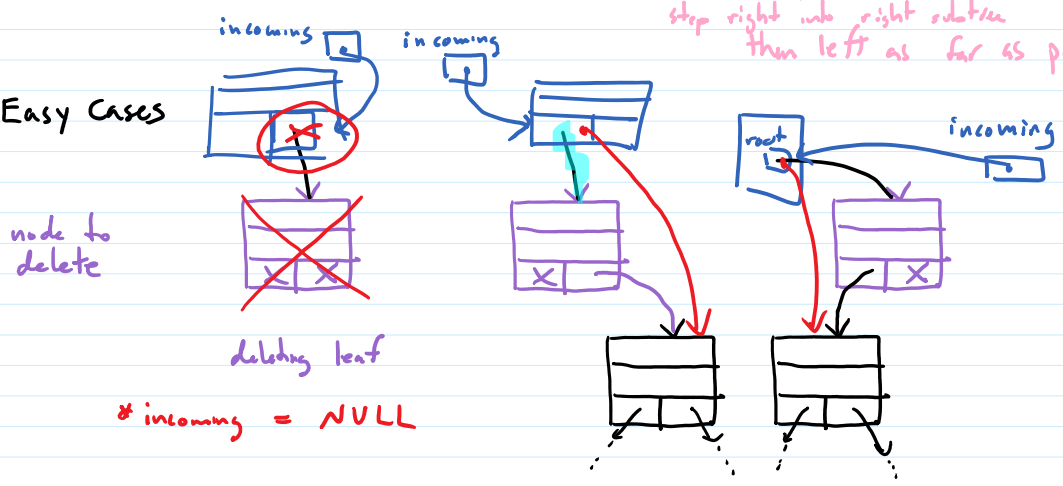




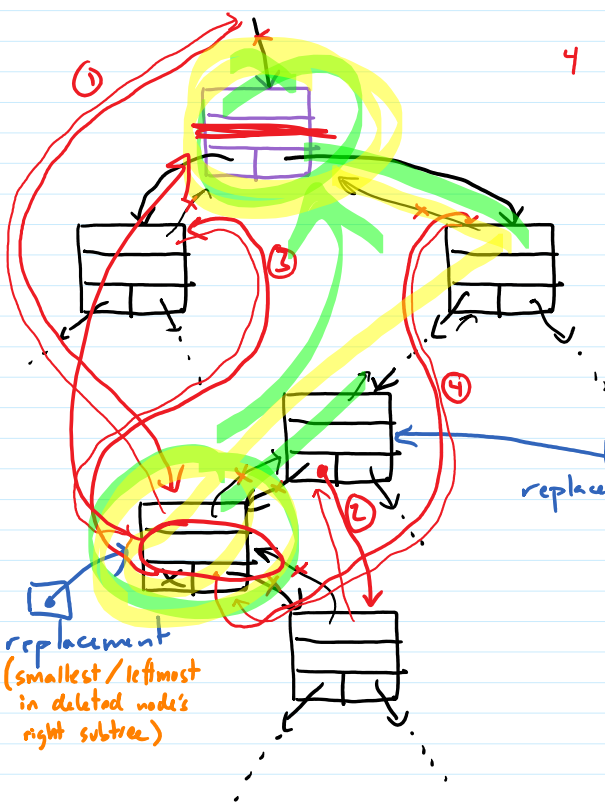
Removing from a BST



Easy Cases



Harder case

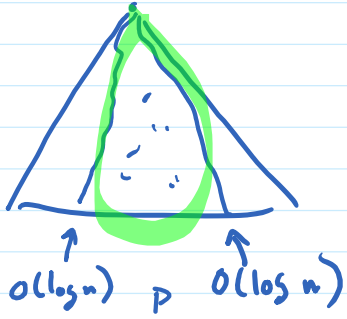


4 sets of ptrs to change

- 1) parent of deleted to replacement
- 2) parent of replacement to right child of replacement
- 3/4) left/right children of deleted as left/right children of replacement

(think about special cases of this)

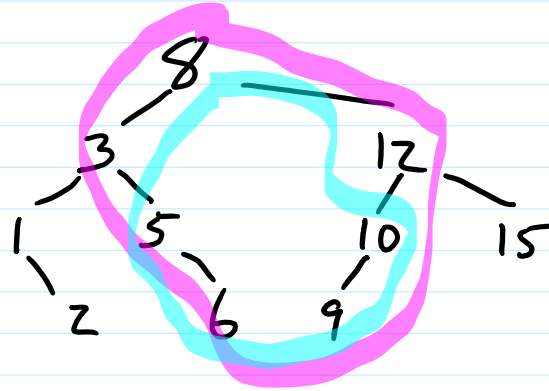
Range



$O(\log n)$ p $O(\log n)$

$O(\log n + p)$

2d-tree $O(\sqrt{n} + p)$



range 3-12

