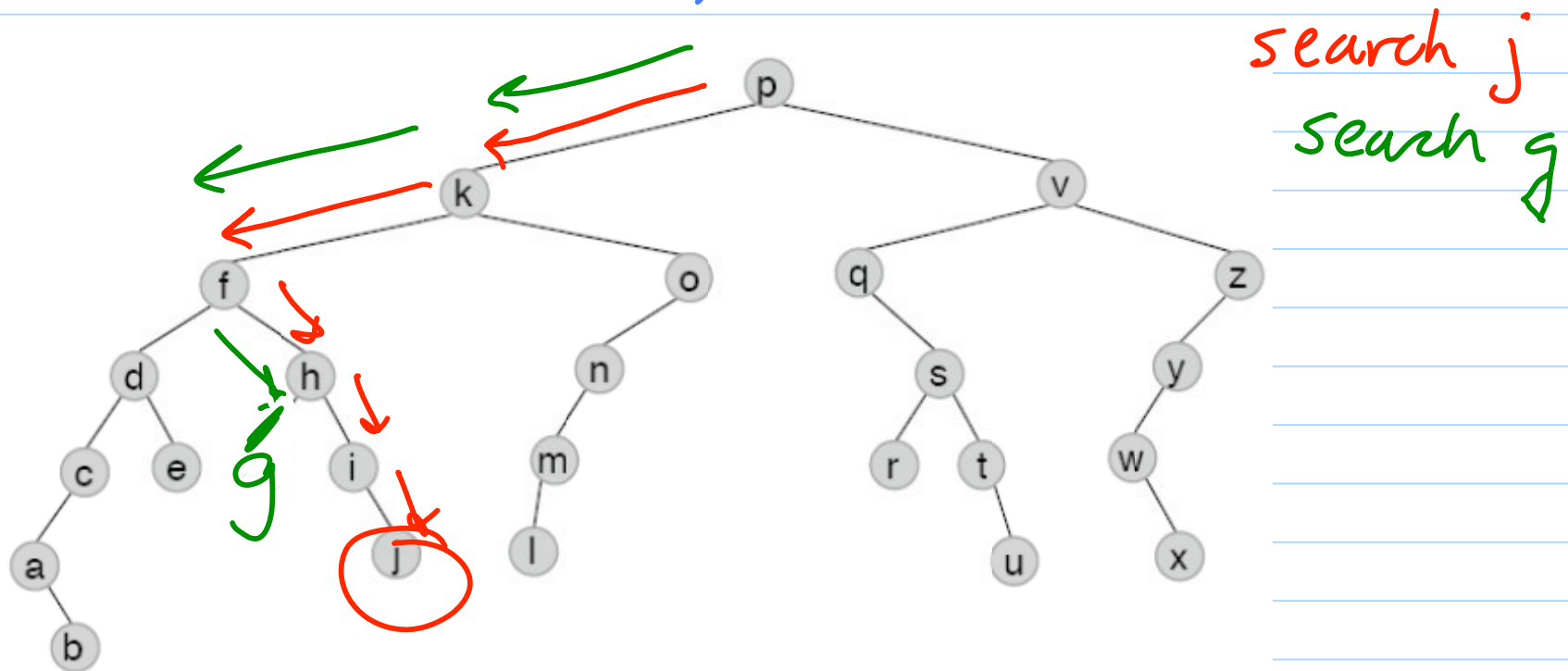
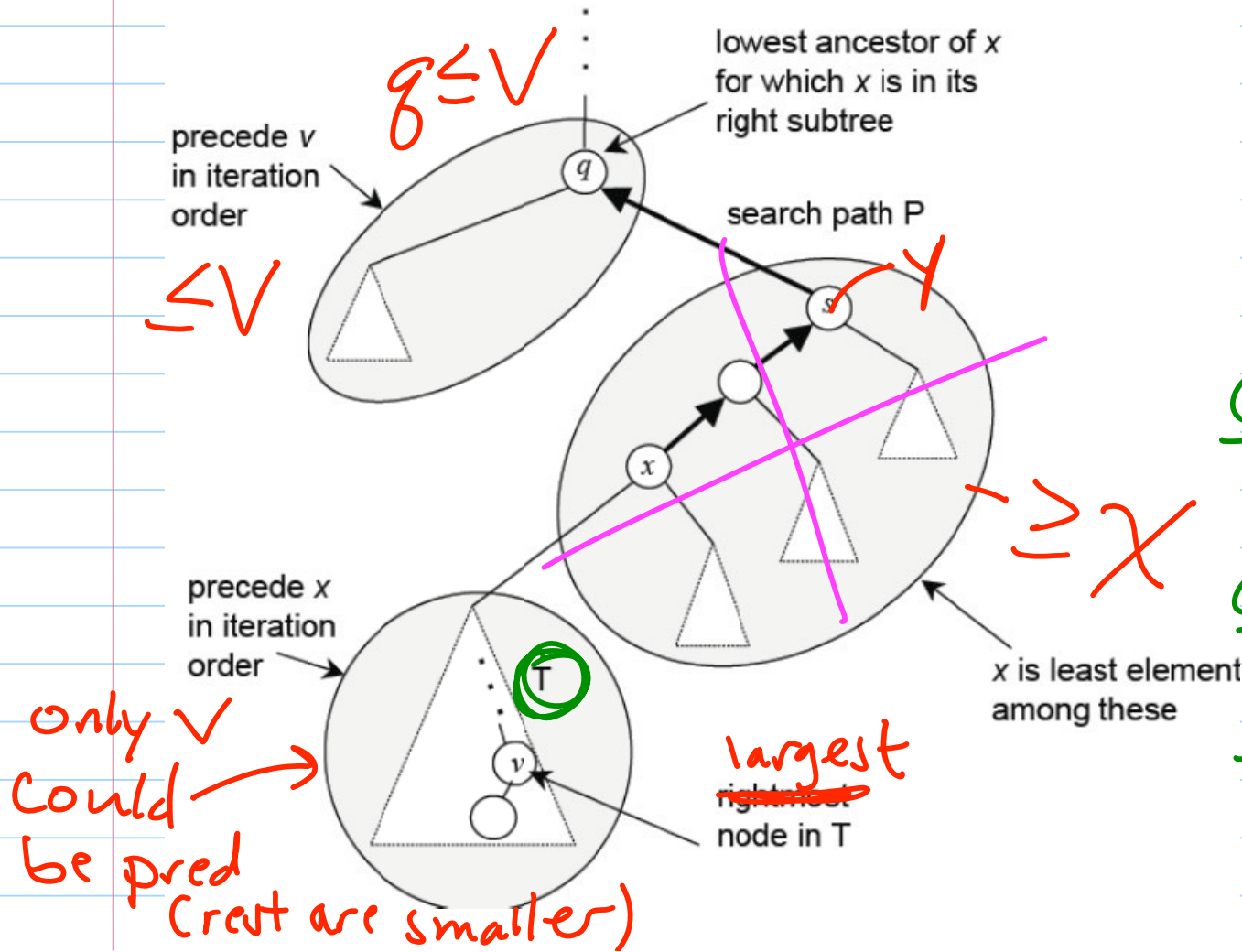


# Review binary search trees



insertion is a search that ends at "null"  
+ place it.

# Finding predecessor



Note

$$g \leq v \leq x \leq s$$

Find pred. of  $x$

Case 1  $T$  exists  
 $v$  is pred

Case 2  $T$  empty  
 $\& g$  exists  
then  $g$  is pred.

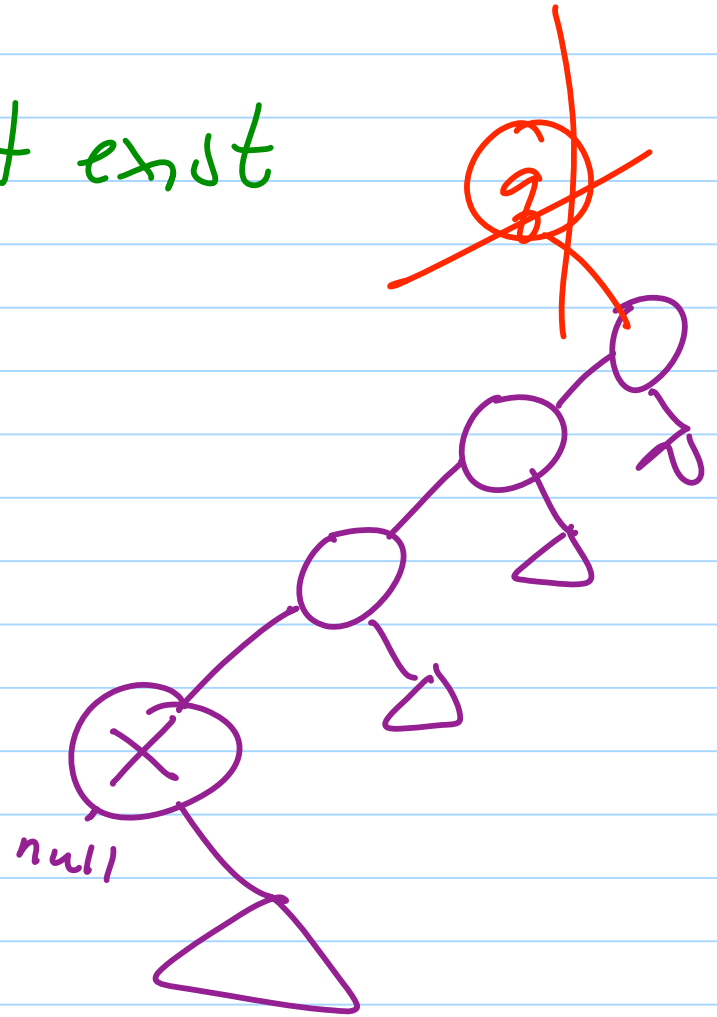
Case 3.

T empty + g doesn't exist

No predecessor

x is first  
in an in order  
traversal

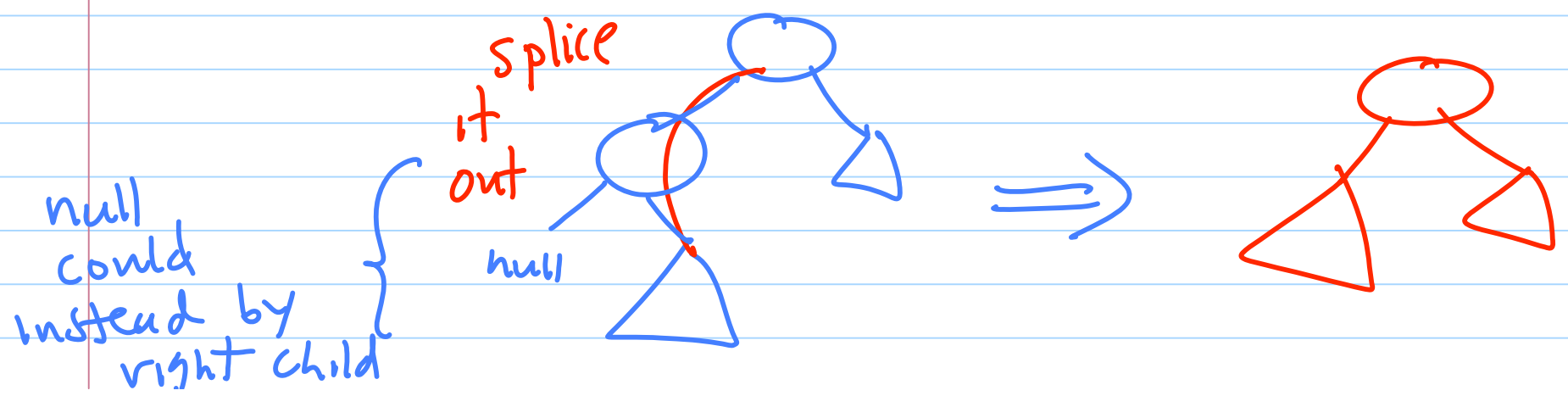
Successor is symmetric



# Delete

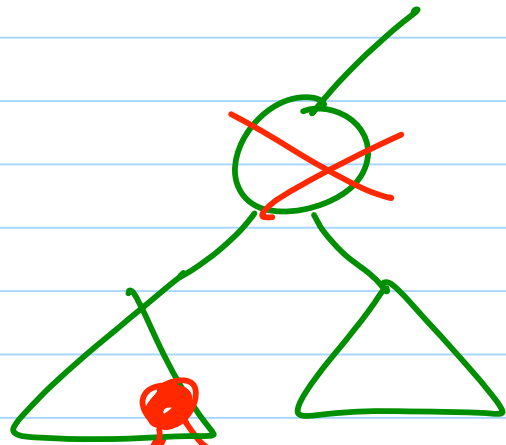
easy case - delete a leaf  
remove it

medium case delete a node with  
one child

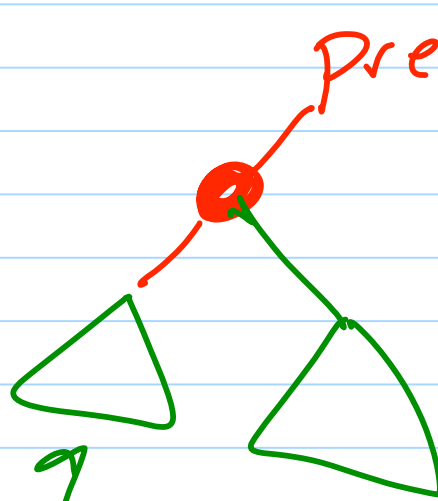


Hardest case delete a node  
with 2 children

could use succ



pred  
is max  
in subtree



pred has 0 or 1 children

remove pred from left subtree