

Graph Algorithms: Binary tree traversal

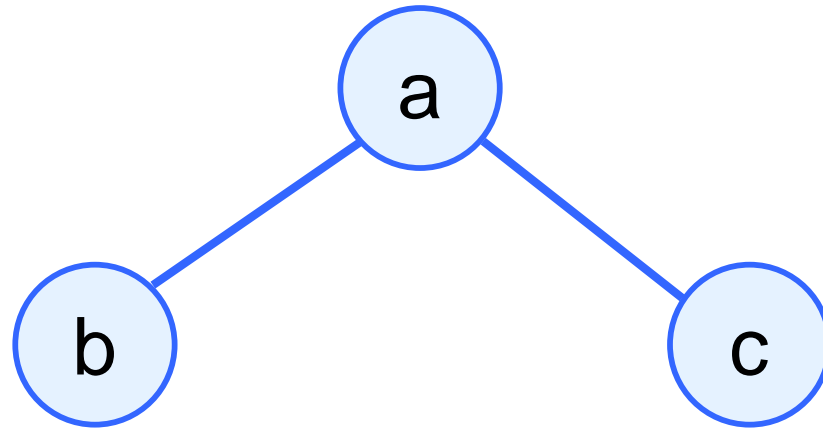
Textbook: Chapter 5.3

Tree traversal

- Traversing a tree means to visit all of the nodes of the tree
- There are several systematic ways to do this, including:
 - Preorder – root *first*
 - Inorder – root *between*
 - Postorder – root *last*

Preorder traversal

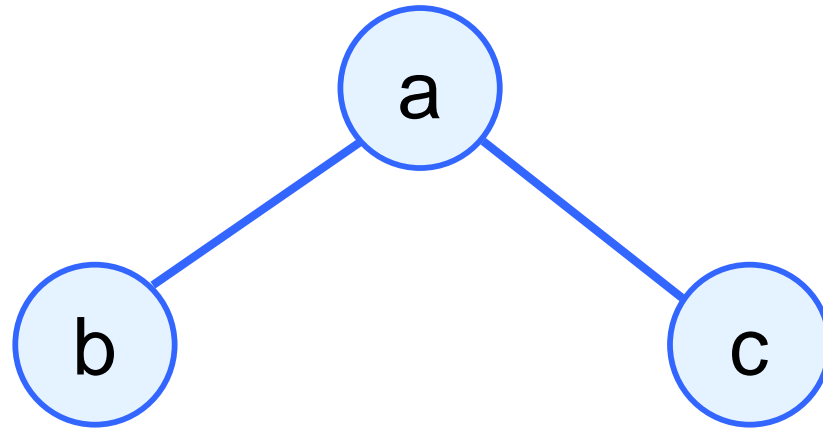
1. Visit the root
2. Traverse the left subtree
3. Traverse the right subtree



Preorder traversal is: a b c

Inorder traversal

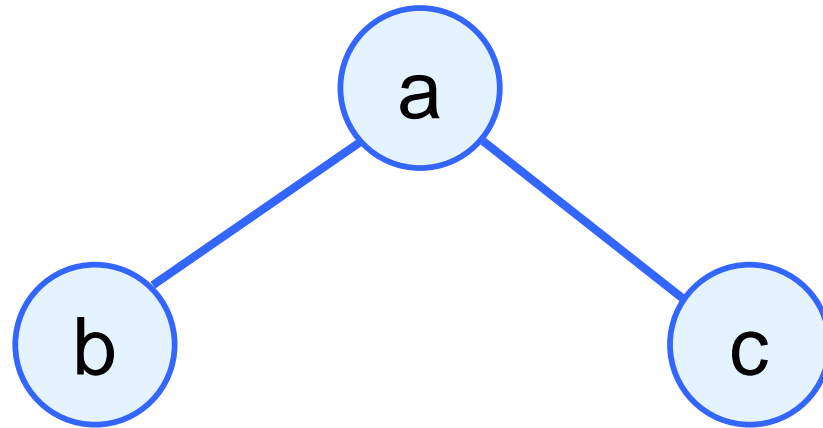
1. Traverse the left subtree
2. Visit the root
3. Traverse the right subtree



Inorder traversal is: b a c

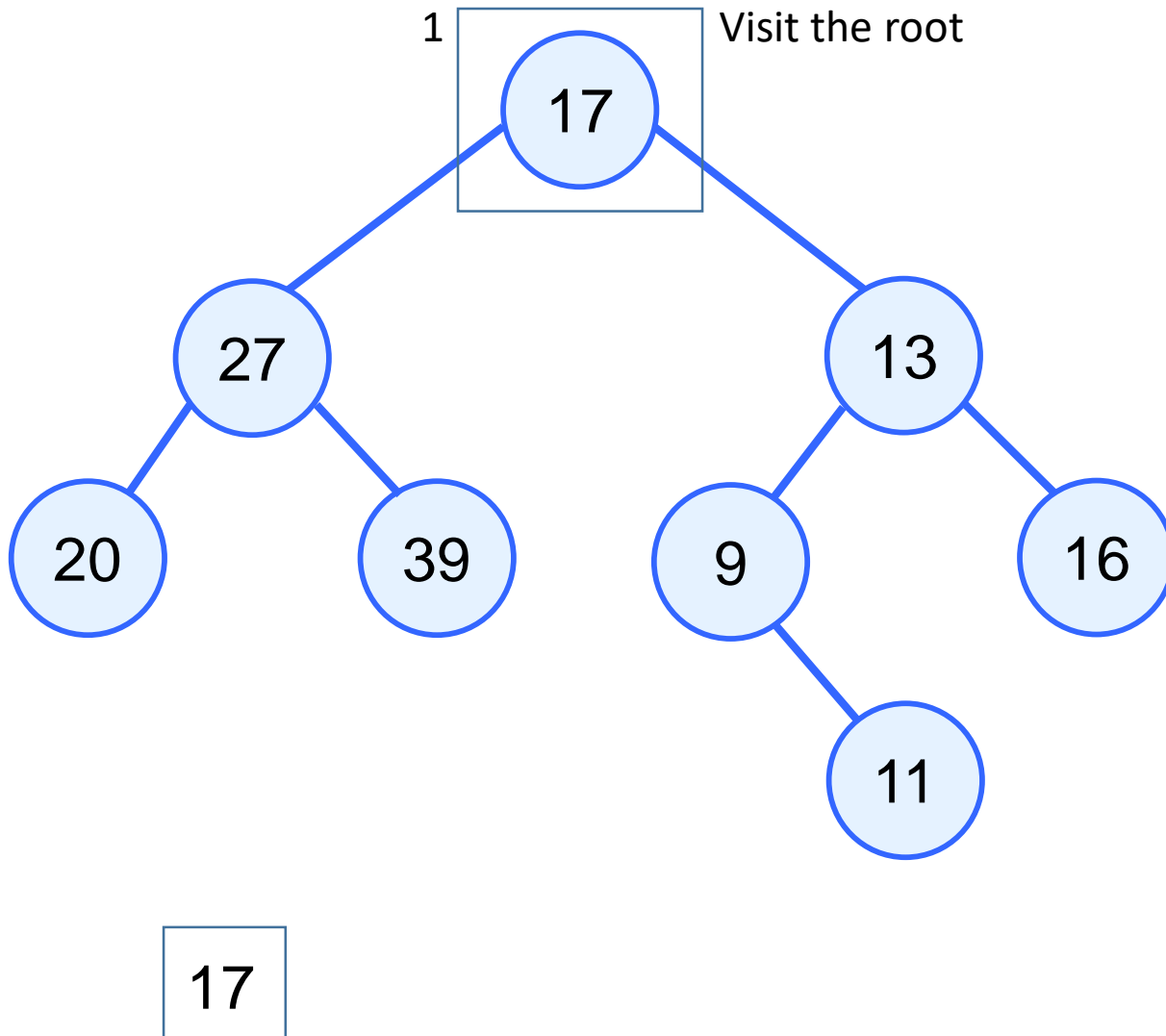
Postorder traversal

1. Traverse the left subtree
2. Traverse the right subtree
3. Visit the root

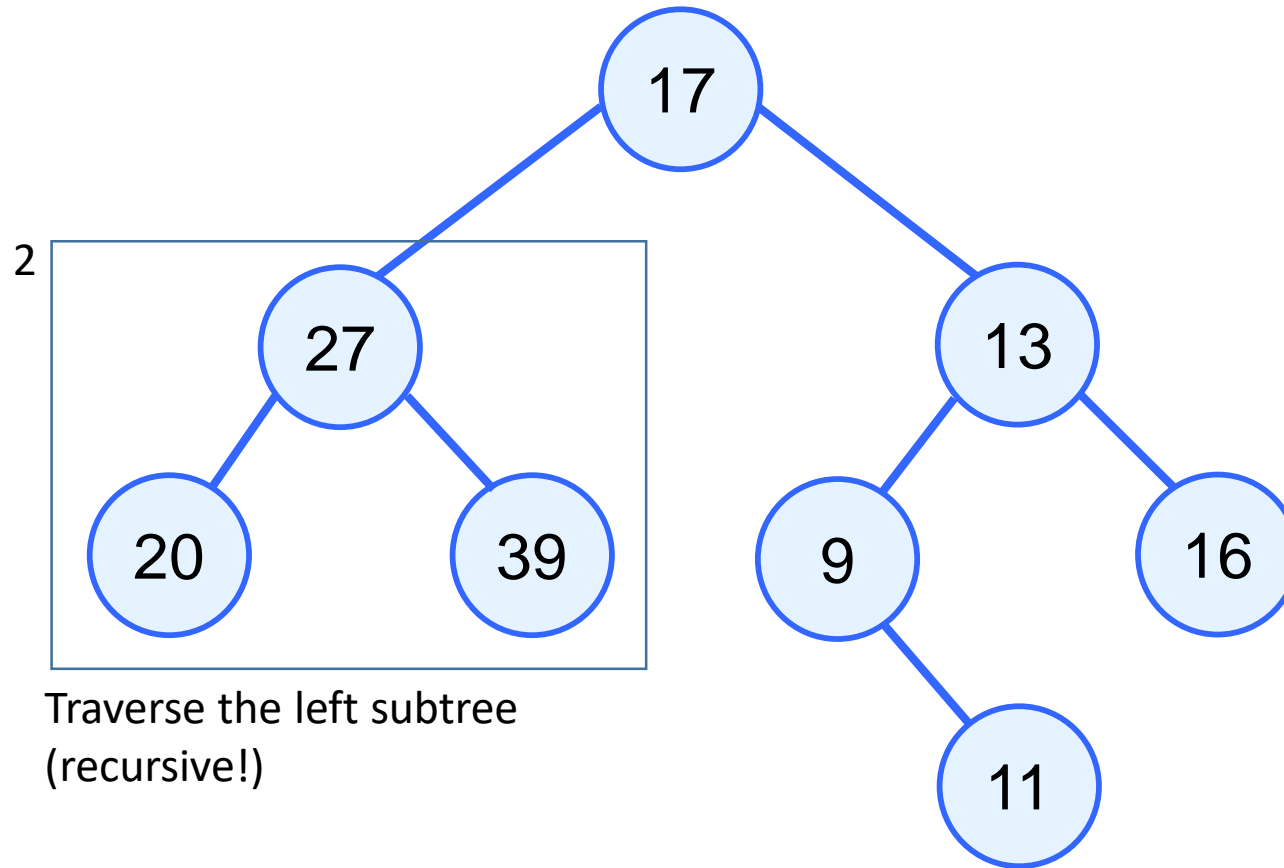


Postorder traversal is: b c a

Preorder example



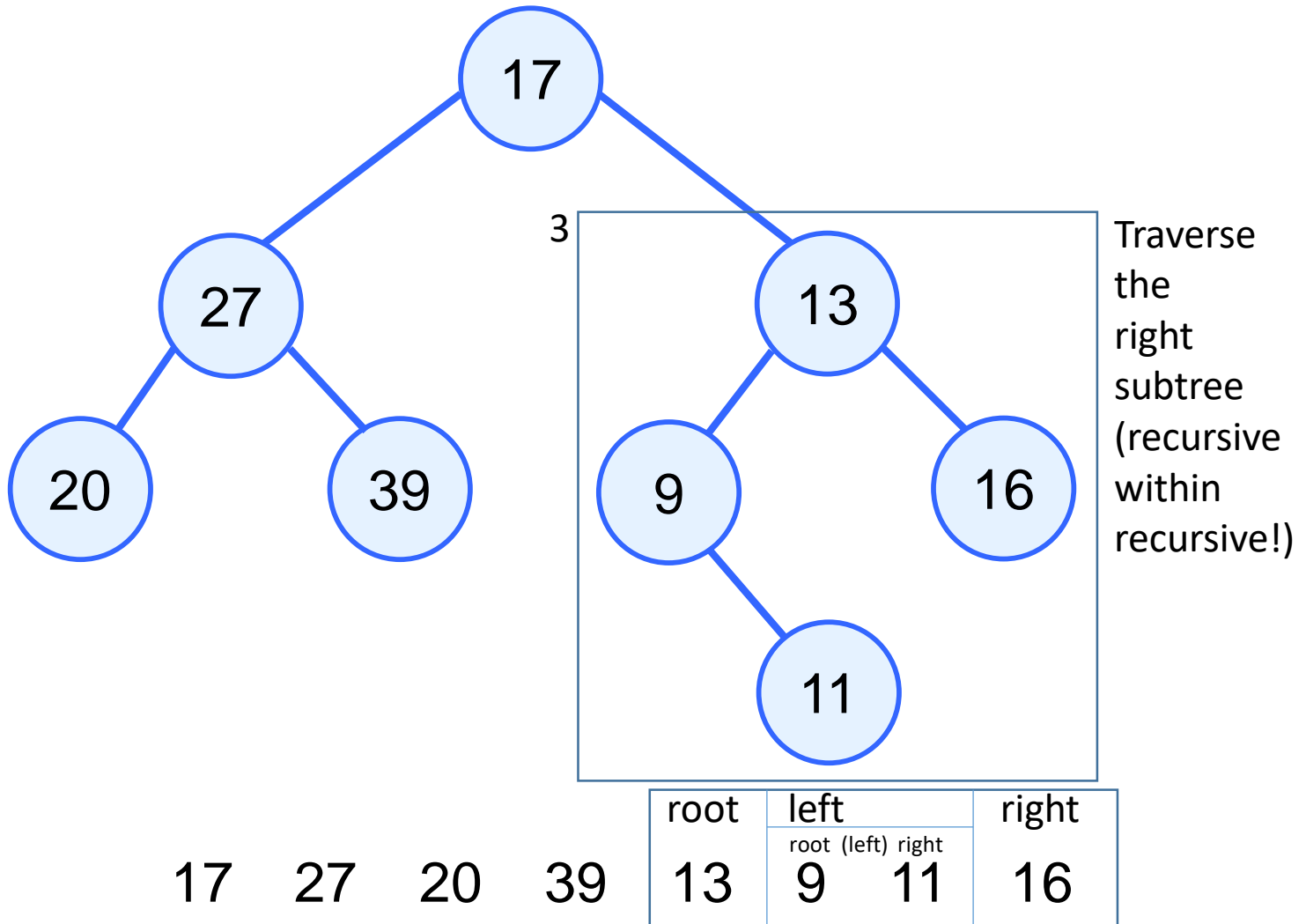
Preorder example



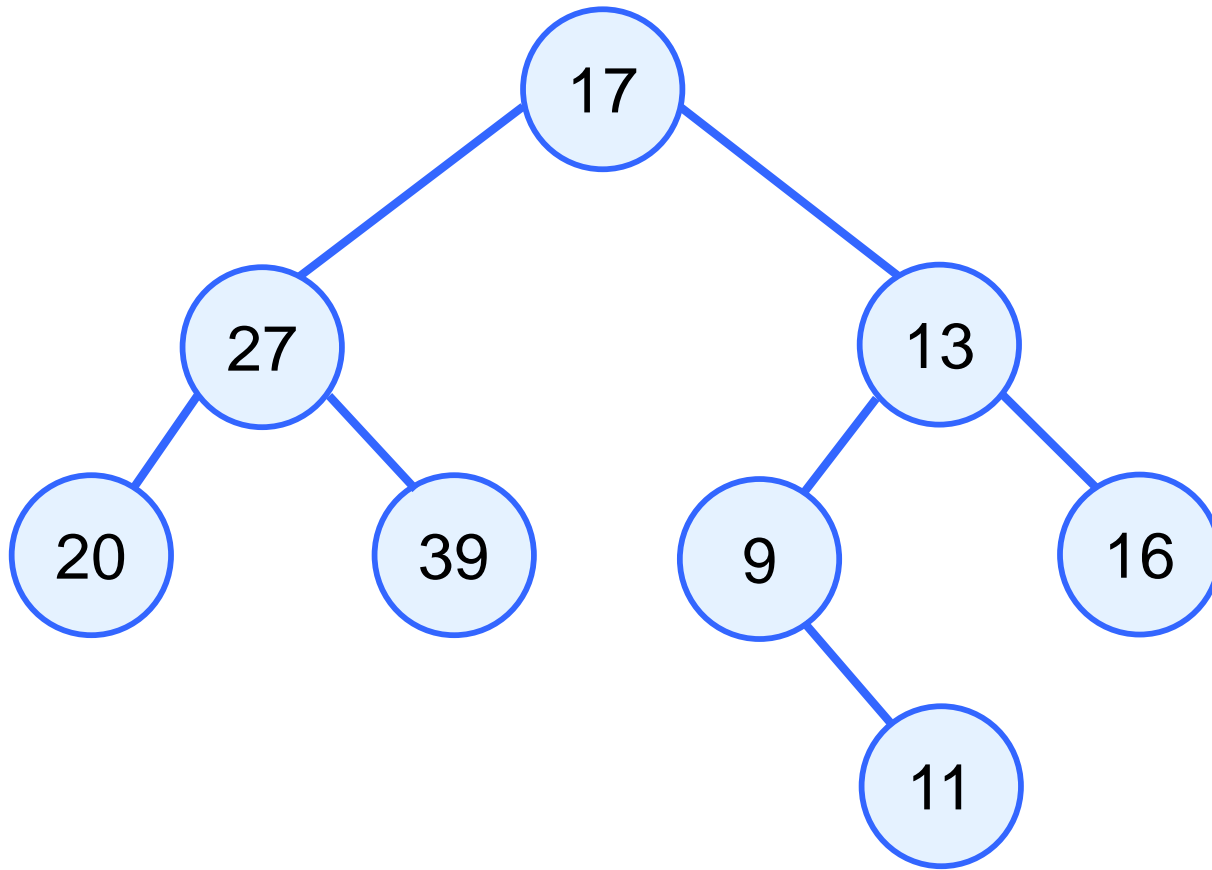
17

root	left	right
27	20	39

Preorder example



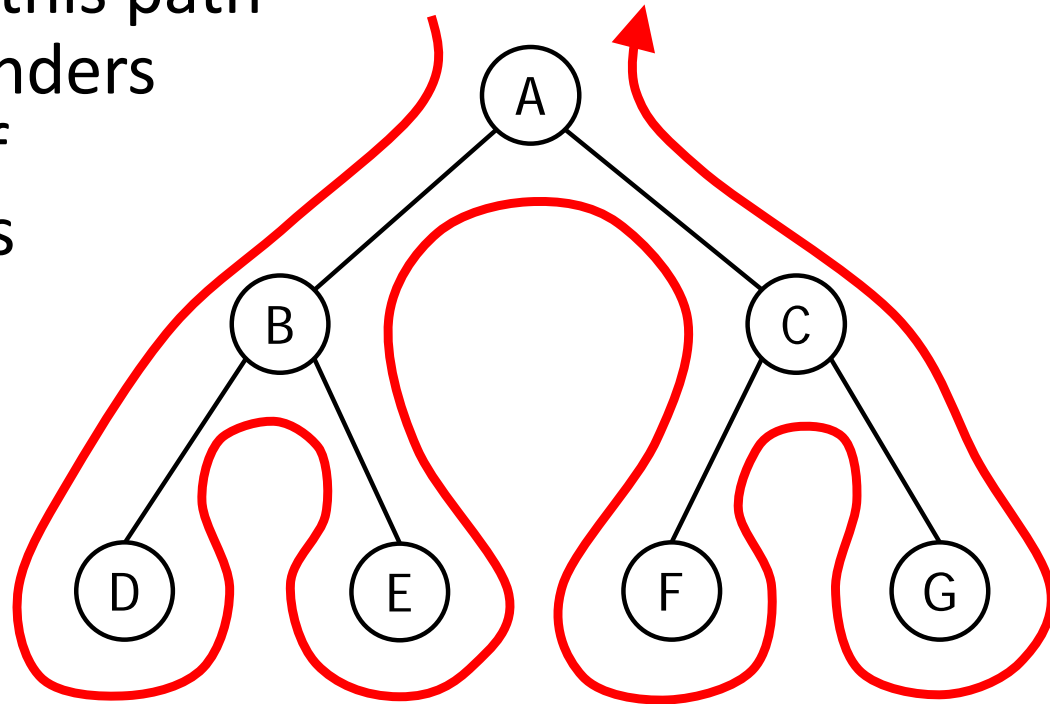
Preorder example



17 27 20 39 13 9 11 16

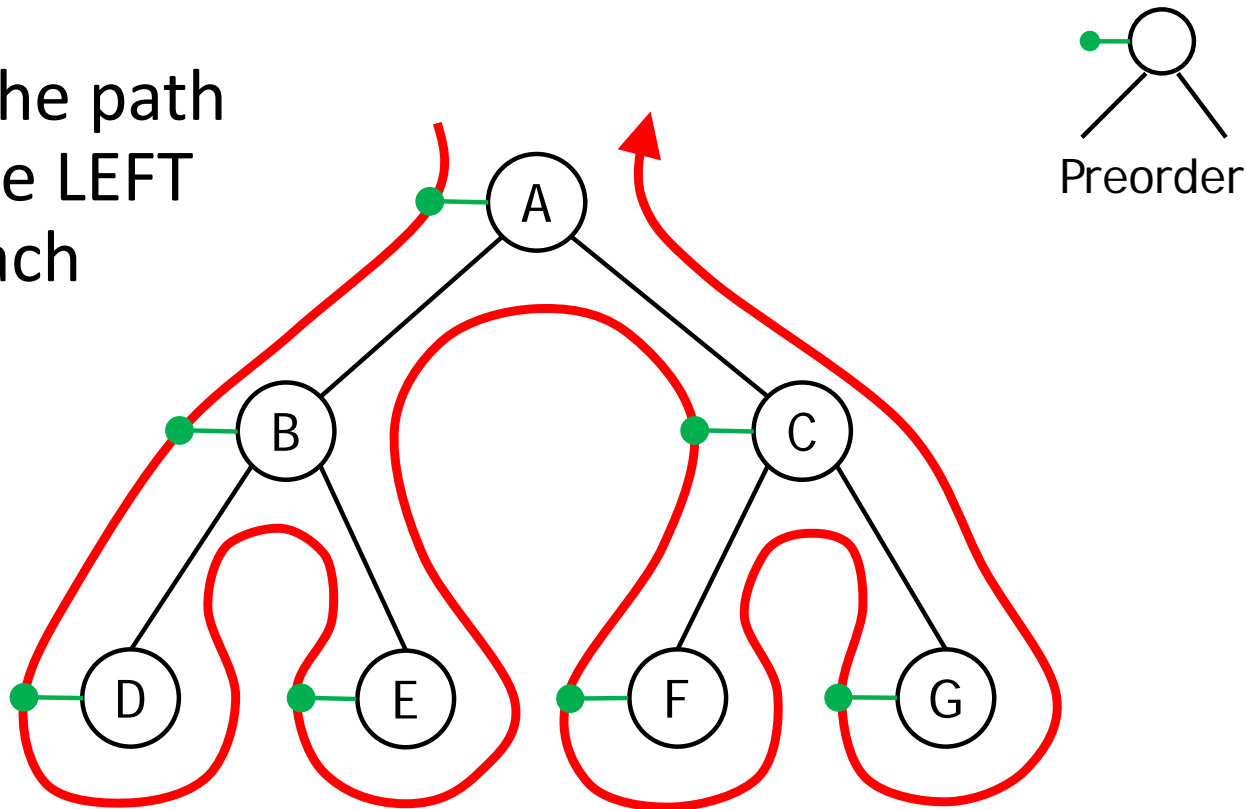
Another way to think about it

- Consider this path that meanders past all of the nodes



Preorder traversal

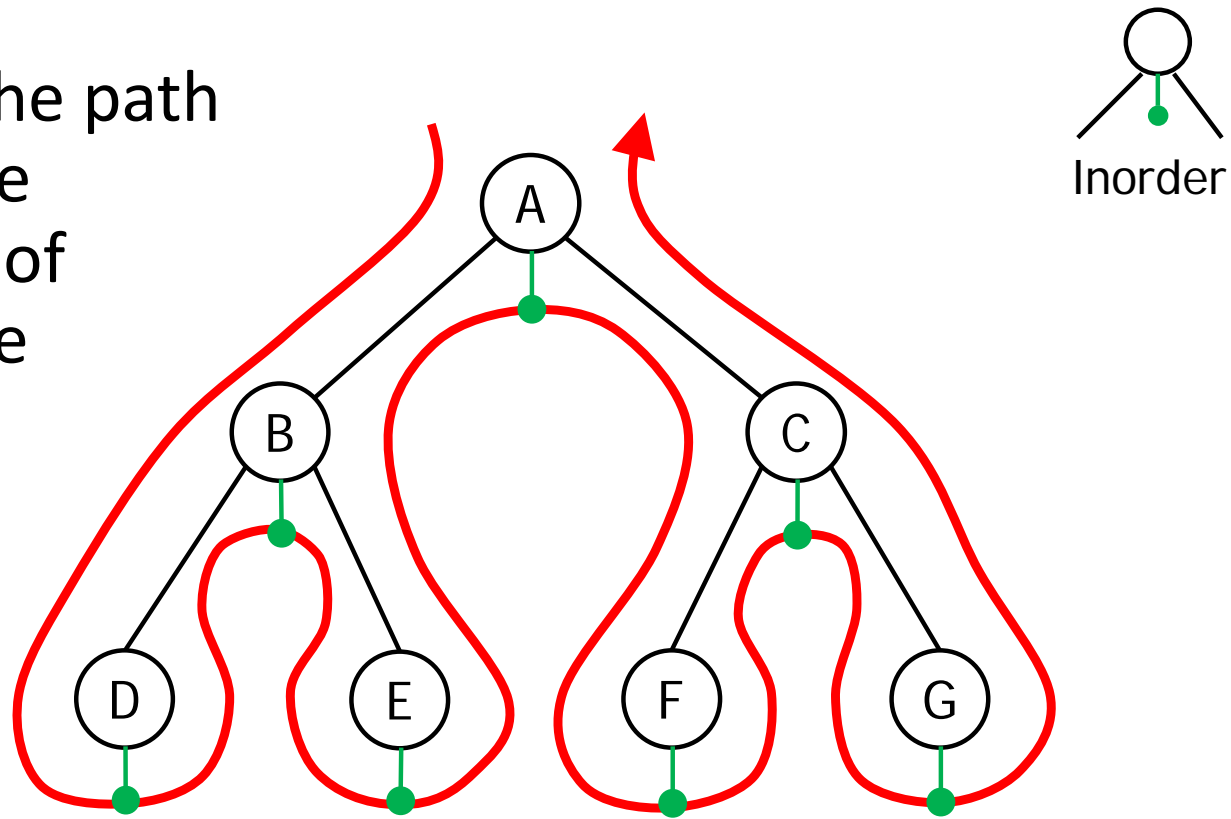
- Is when the path passes the LEFT side of each node



Preorder: A B D E C F G

Inorder traversal

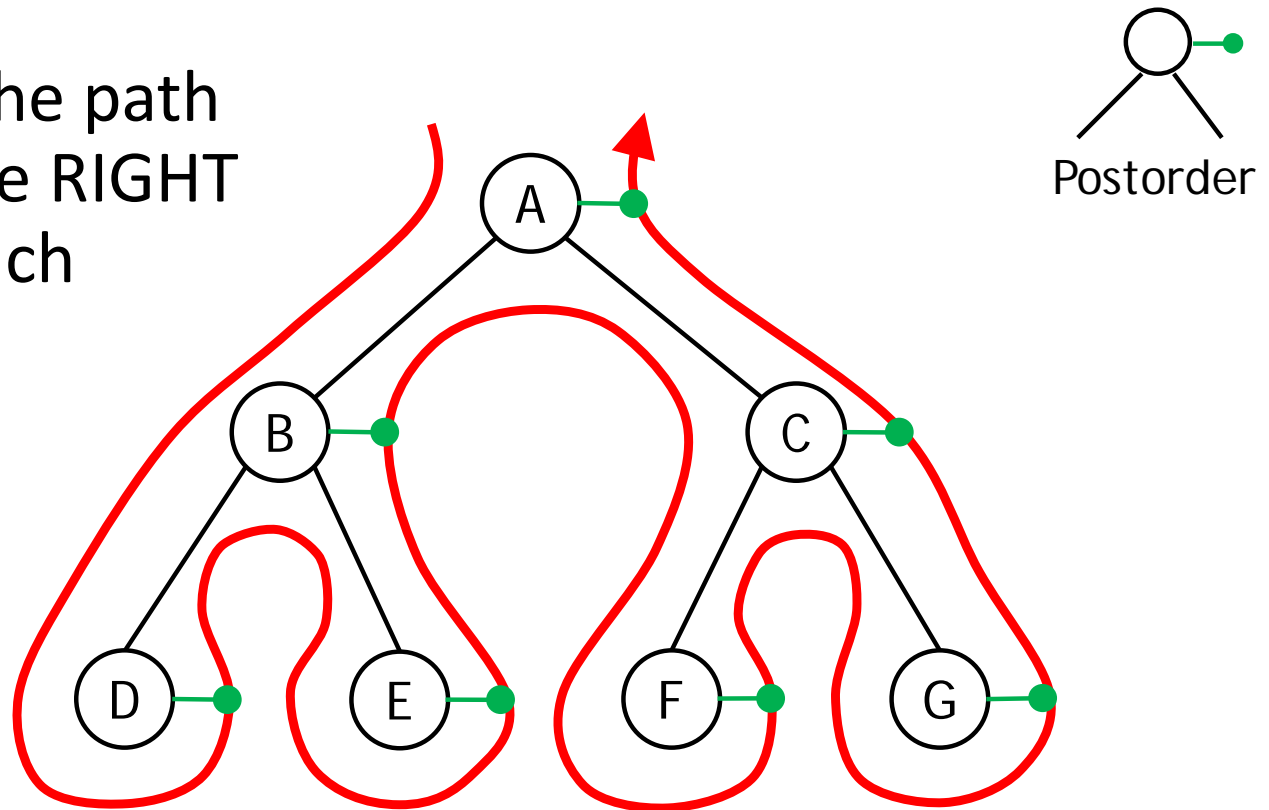
- Is when the path passes the **BOTTOM** of each node



Inorder: D B E A F C G

Postorder traversal

- Is when the path passes the **RIGHT** side of each node



Postorder: D E B F G C A

Pseudocode

```
Algorithm preOrder(Node N)
if N != null
    Print N.value
    preOrder(N.leftChild)
    preOrder(N.rightChild)
```

```
Algorithm inOrder(Node N)
if N != null
    inOrder(N.leftChild)
    Print N.value
    inOrder(N.rightChild)
```

```
Algorithm postOrder(Node N)
if N != null
    postOrder(N.leftChild)
    postOrder(N.rightChild)
    Print N.value
```

What if I told you

Preorder → A B D E C F G

Inorder → D B E A F C G

Fun facts about pre/in/postorder

- Given pre + in, you can reconstruct the tree
 - (and also determine postorder)
- Given post + in, you can reconstruct the tree
 - (and also determine preorder)
- Given pre + post, you can only *sometimes* reconstruct the tree
 - For you to ponder: under what condition(s)?

Practice problems

- Chapter 5.3, page 185, questions 5 & 6