Beginner tree algorithms

William Fiset

Rooting a tree

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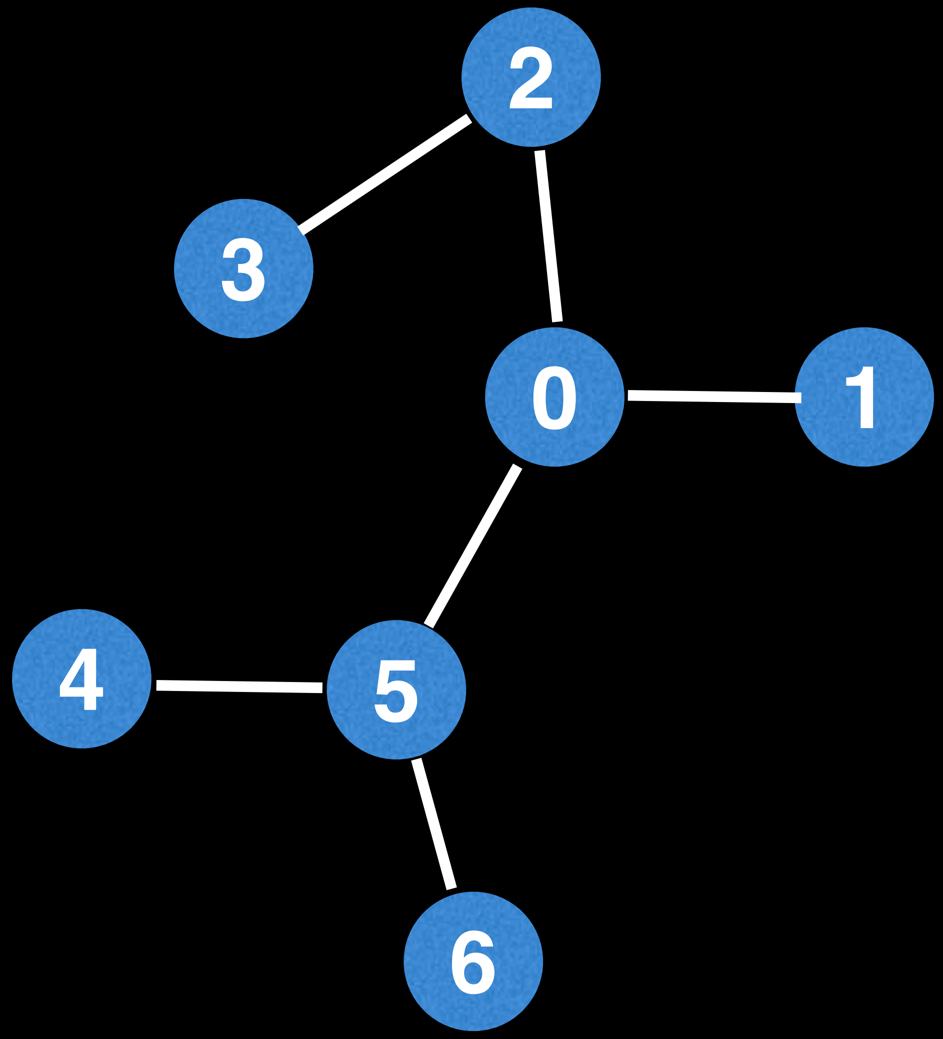
Rooting a tree

Sometimes it's useful to root an undirected tree to add structure to the problem you're trying to solve.

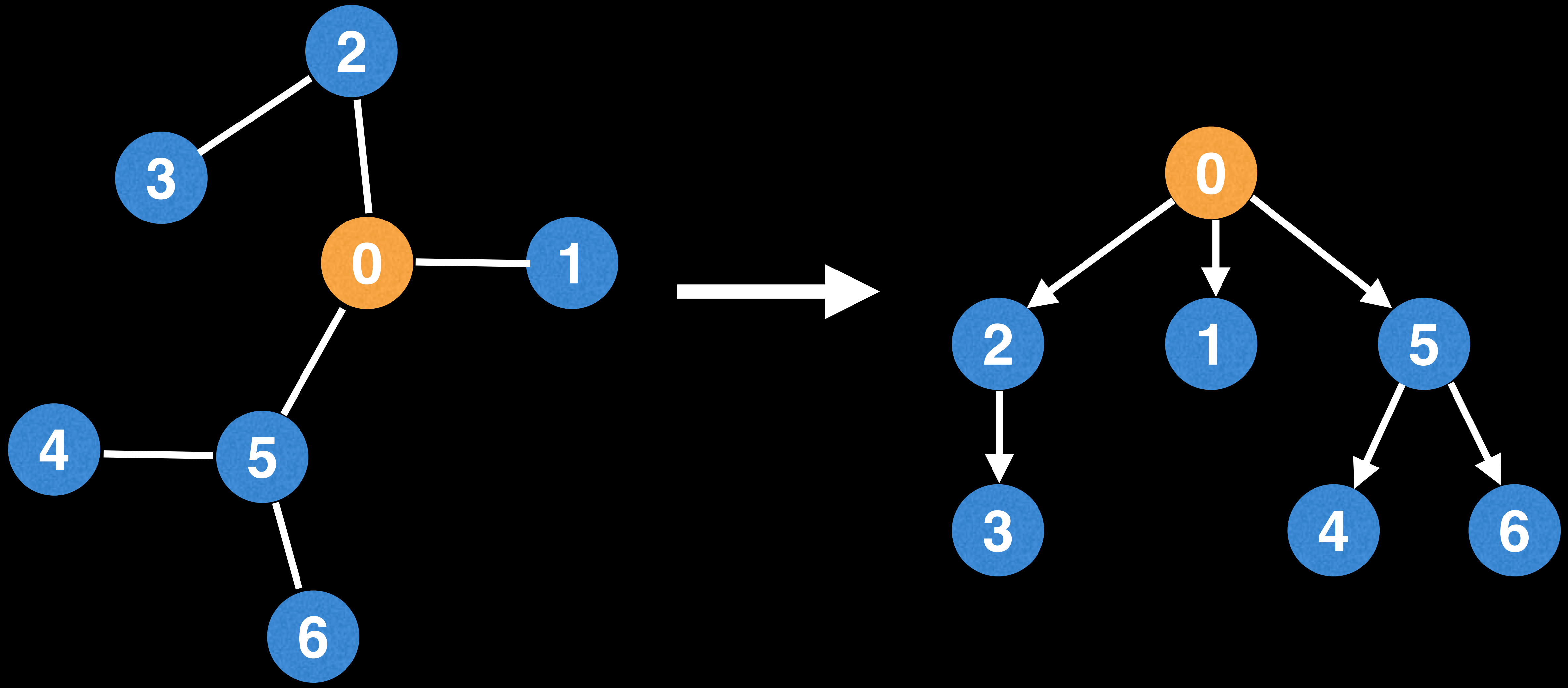


Undirected graph adjacency list:

```
0 -> [2, 1, 5]
1 -> [0]
2 -> [3, 0]
3 -> [2]
4 -> [5]
5 -> [4, 6, 0]
6 -> [5]
```

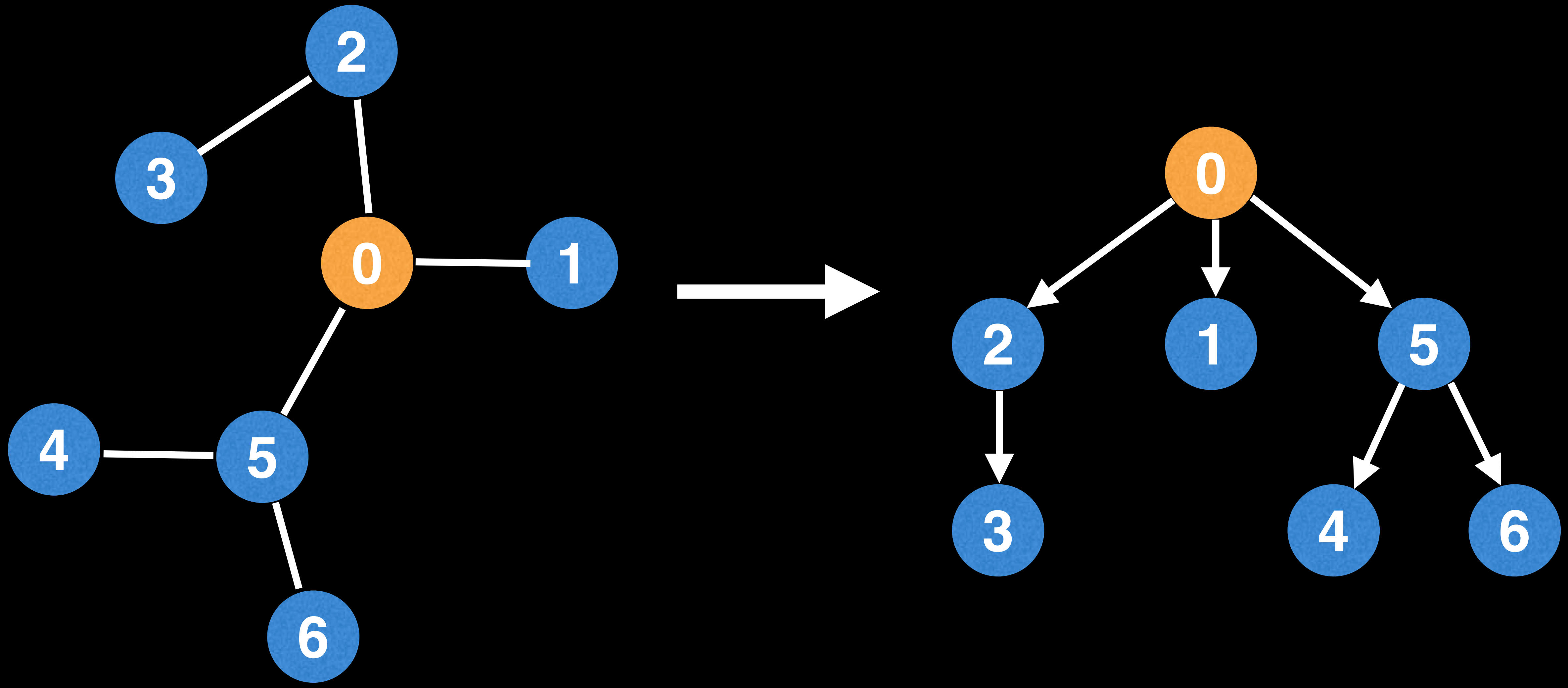
Rooting a tree

Sometimes it’s useful to root an undirected tree to add structure to the problem you’re trying to solve.



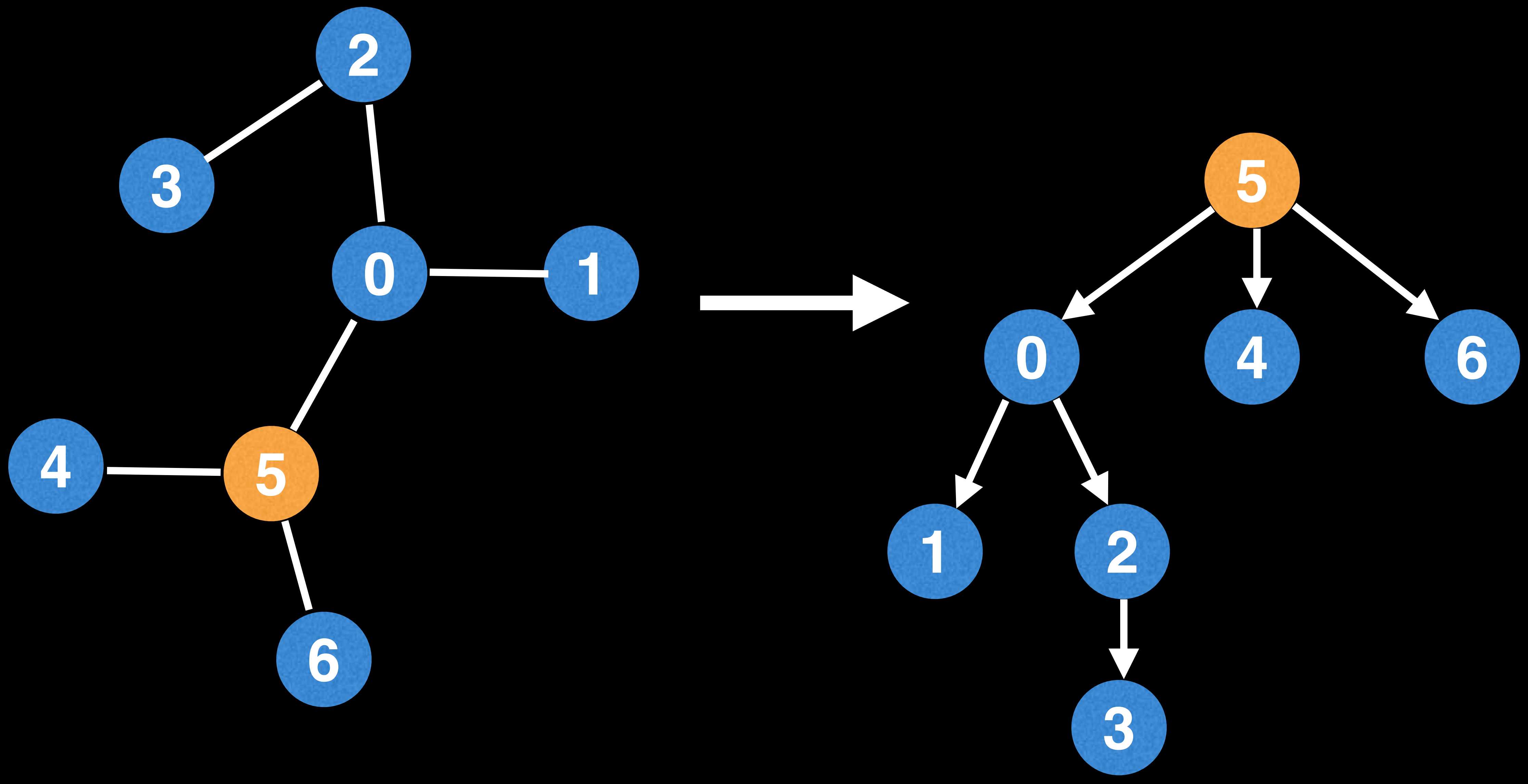
Rooting a tree

Conceptually this is like "picking up" the tree by a specific node and having all the edges point downwards.

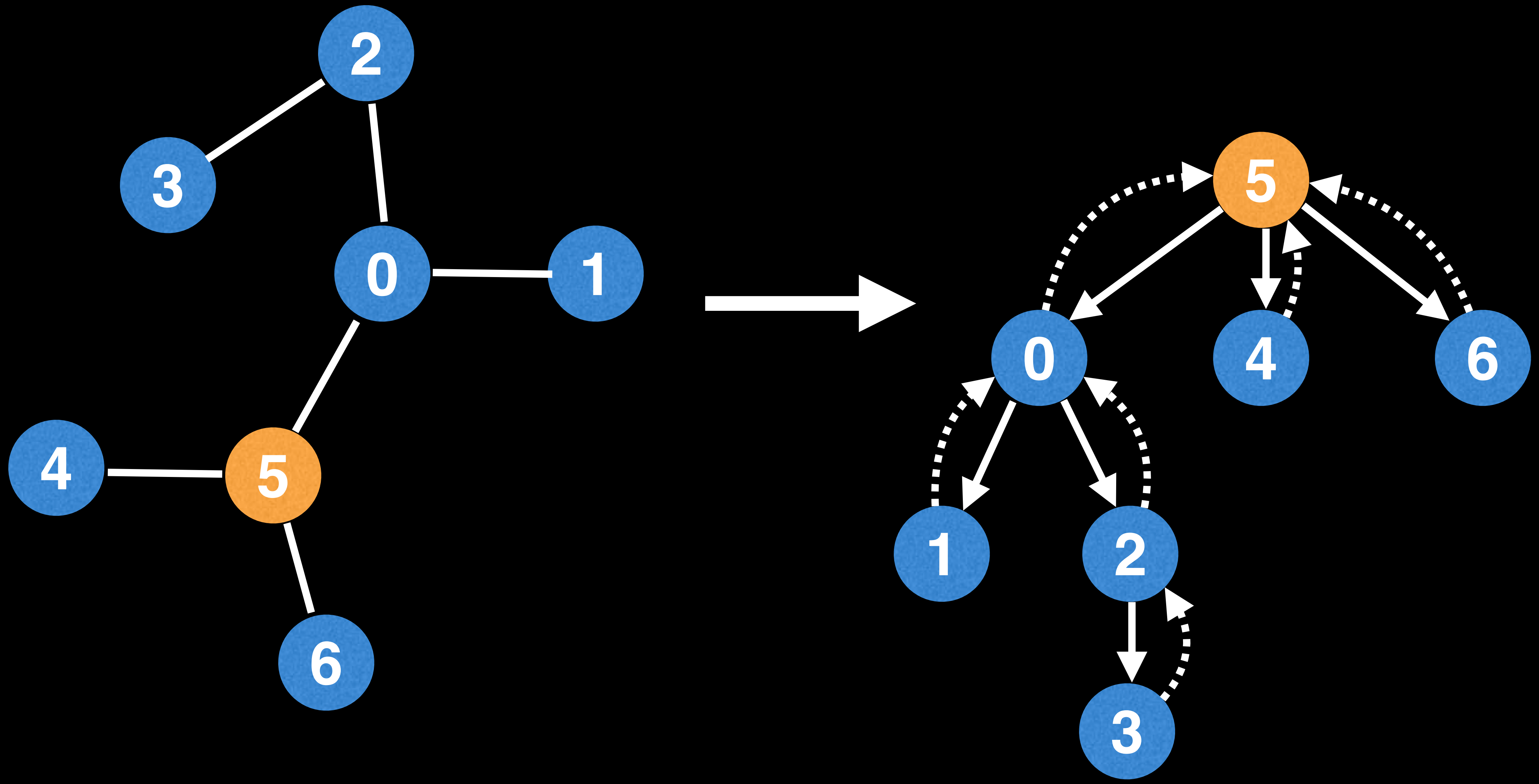


Rooting a tree

You can root a tree using any of its nodes.



In some situations it's also useful to keep have a reference to the parent node in order to walk up the tree.



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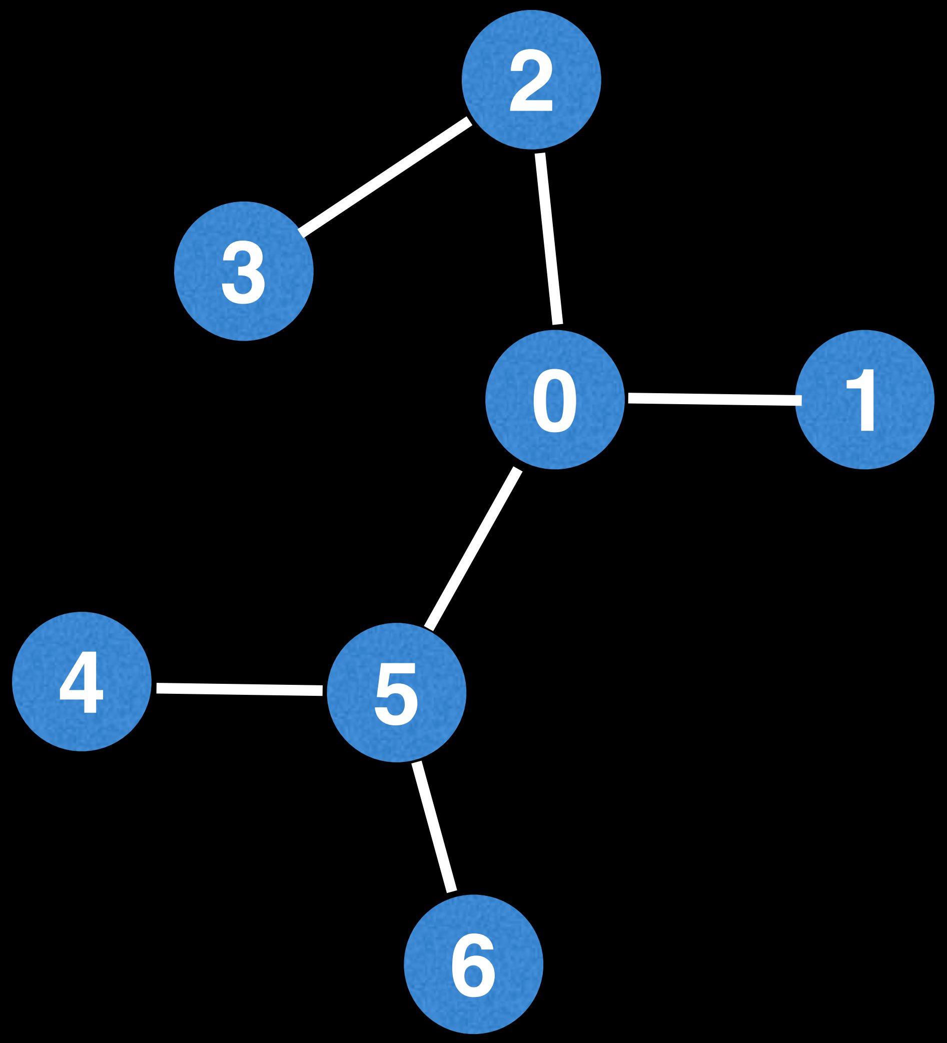

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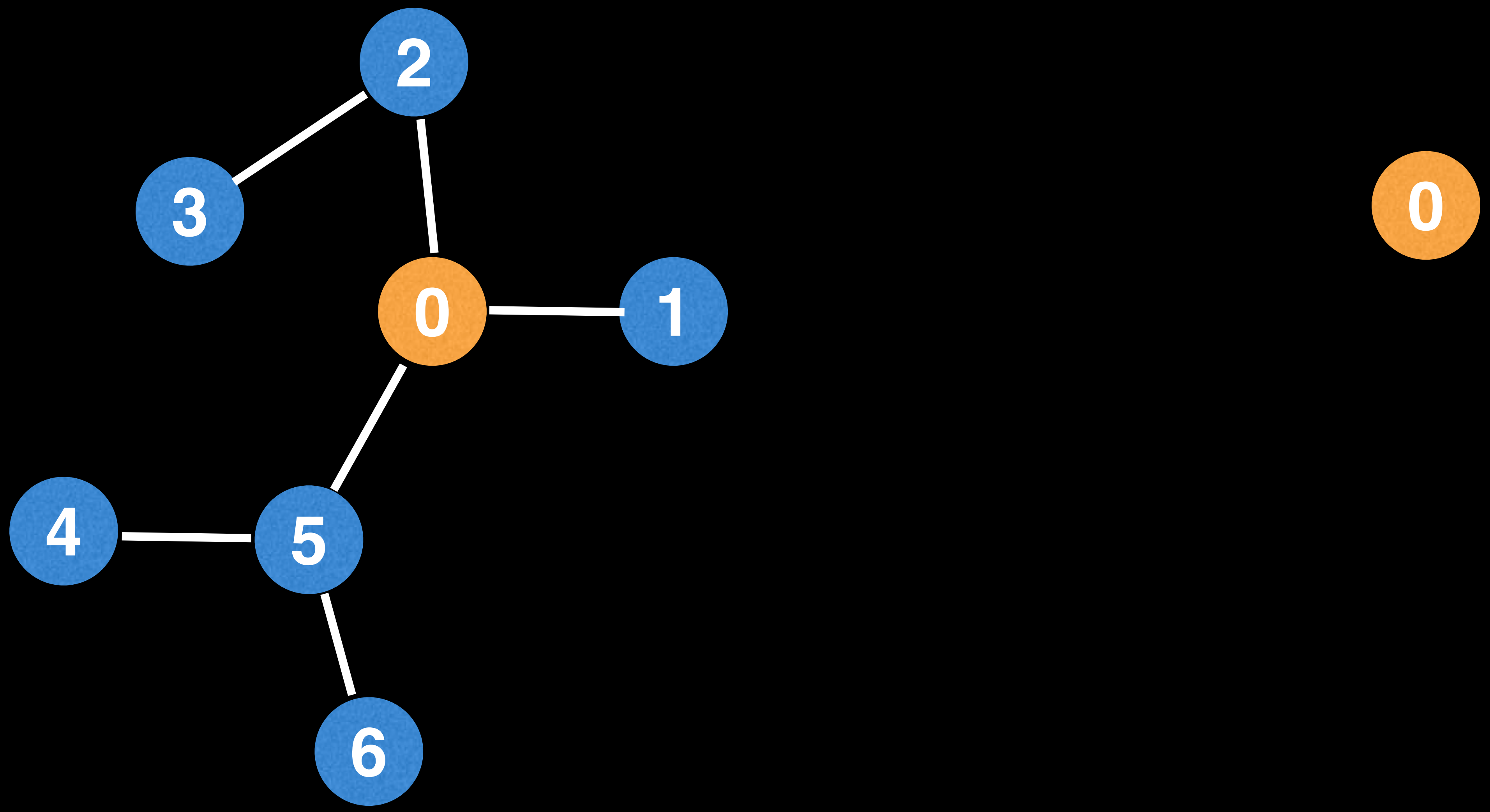

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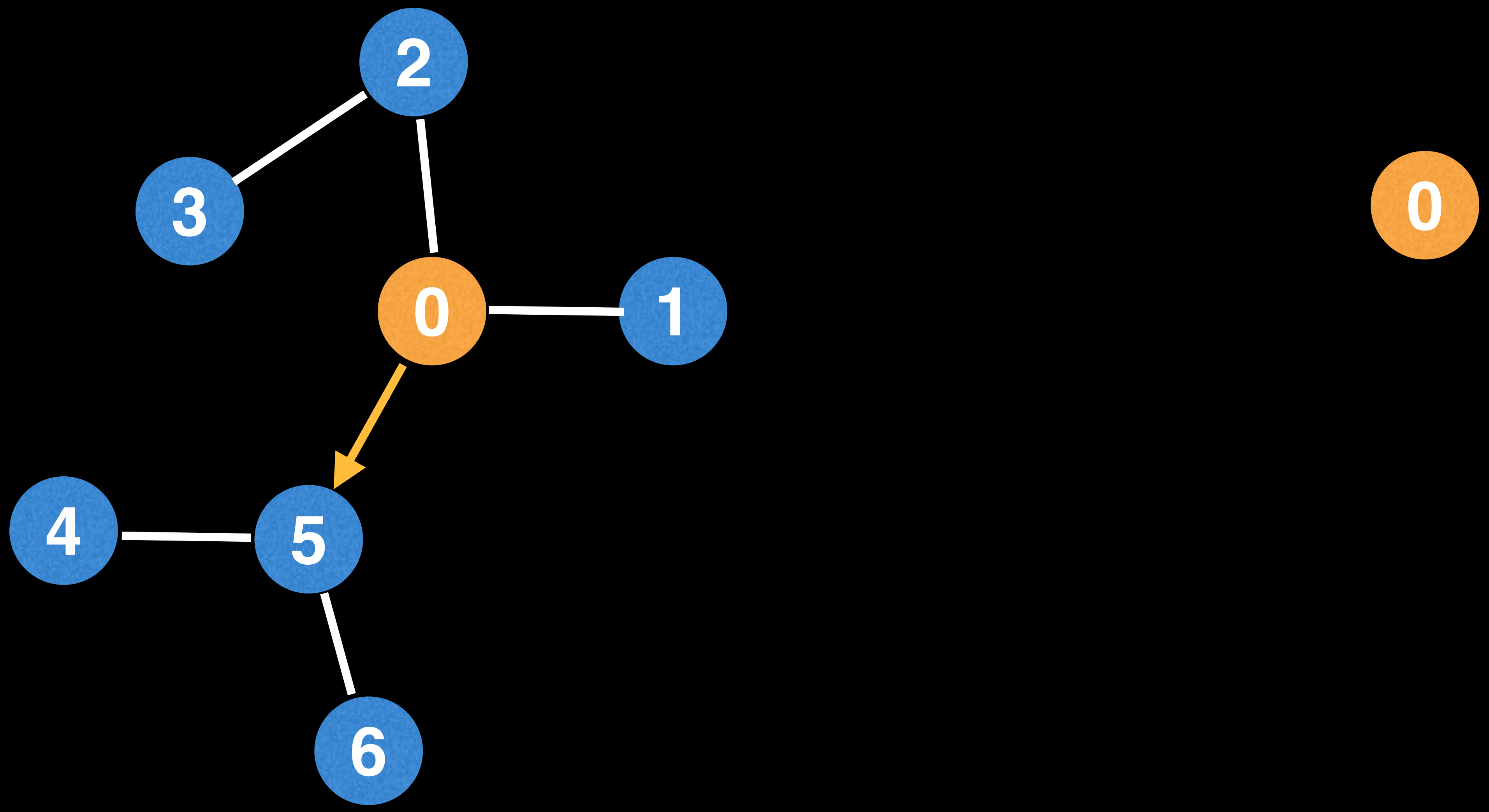

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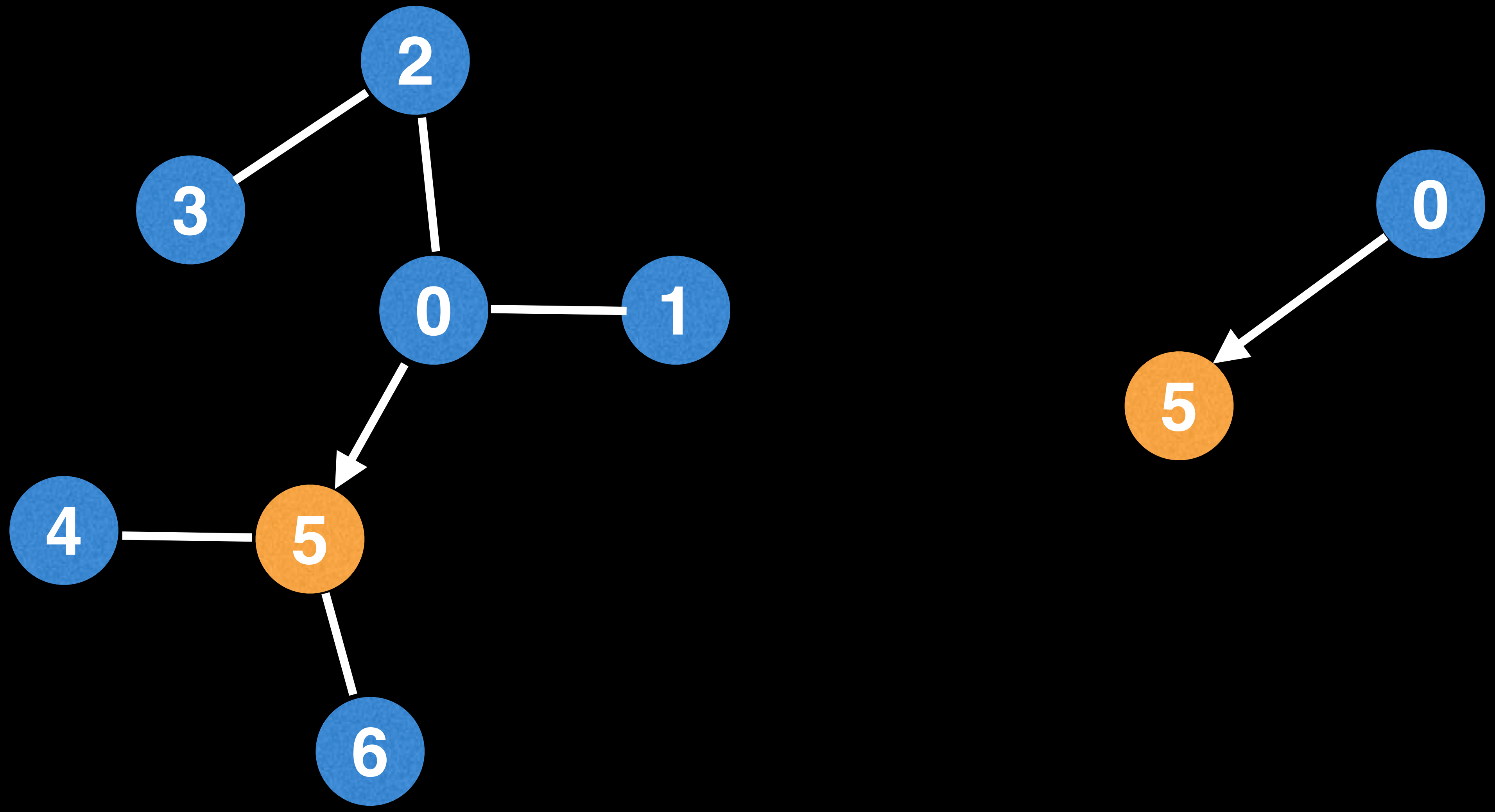

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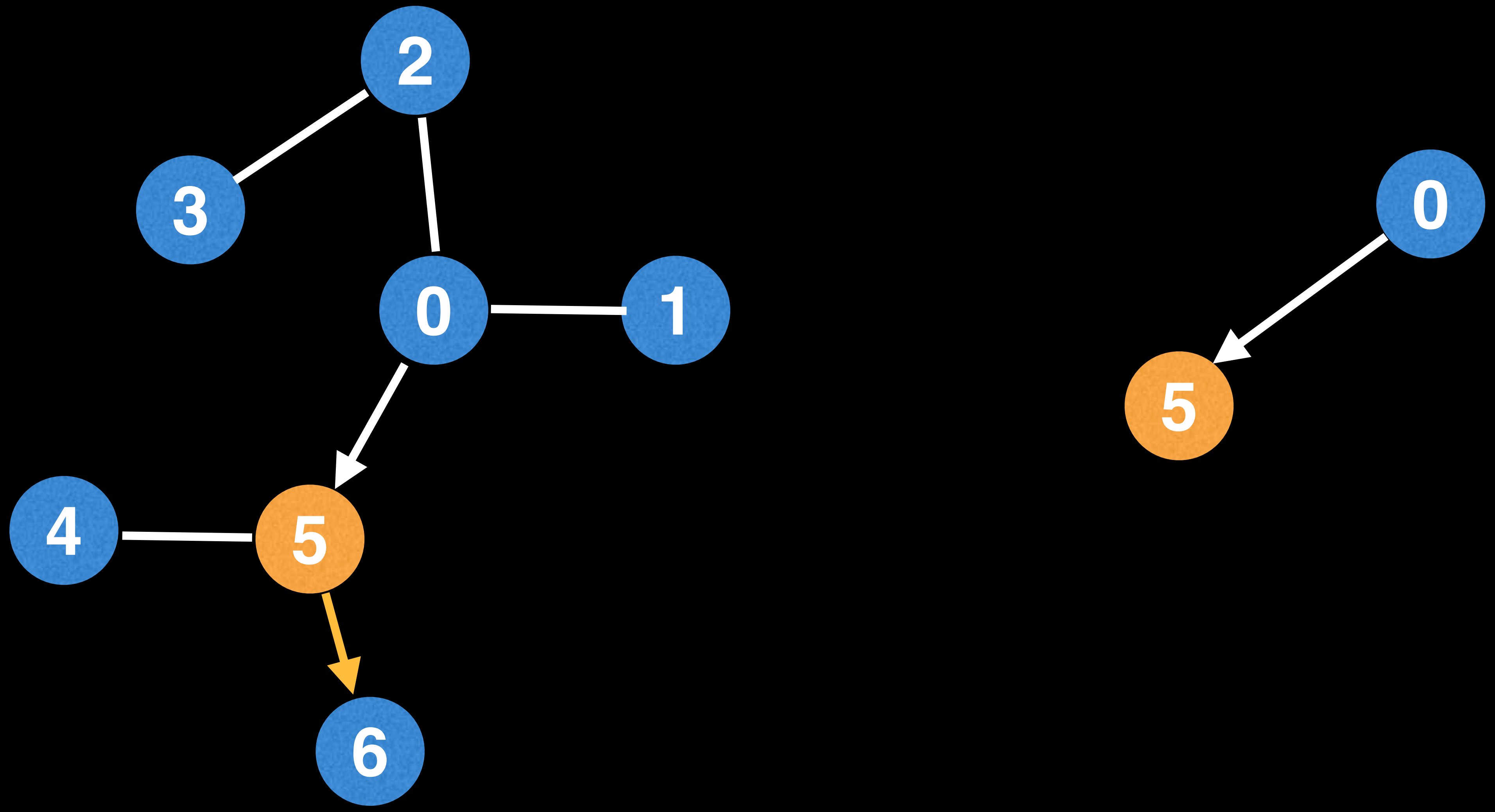

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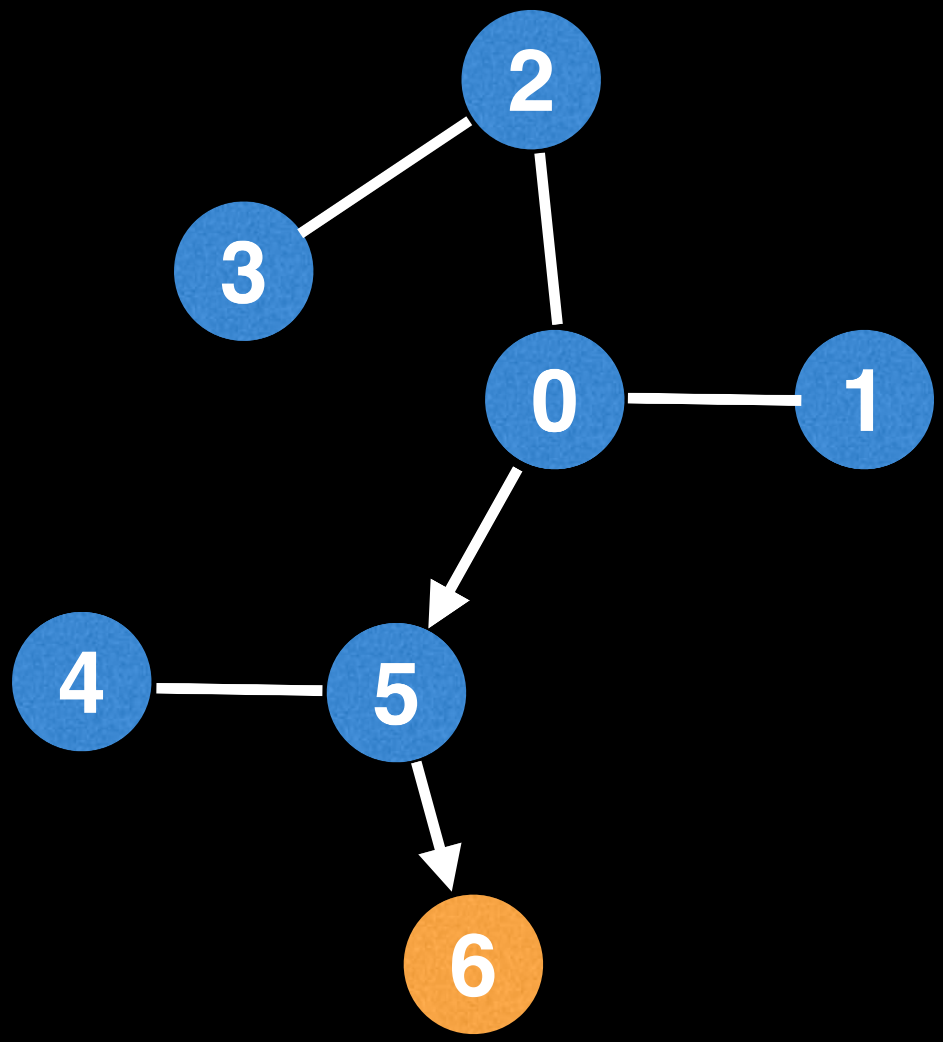

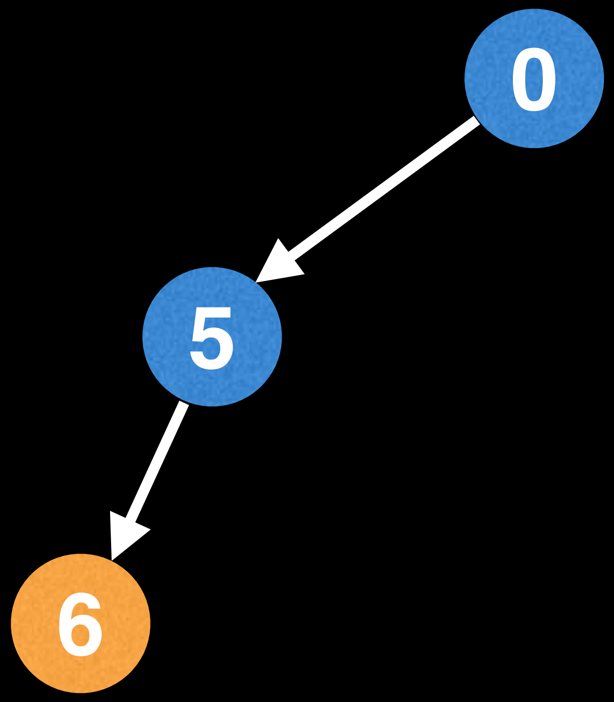

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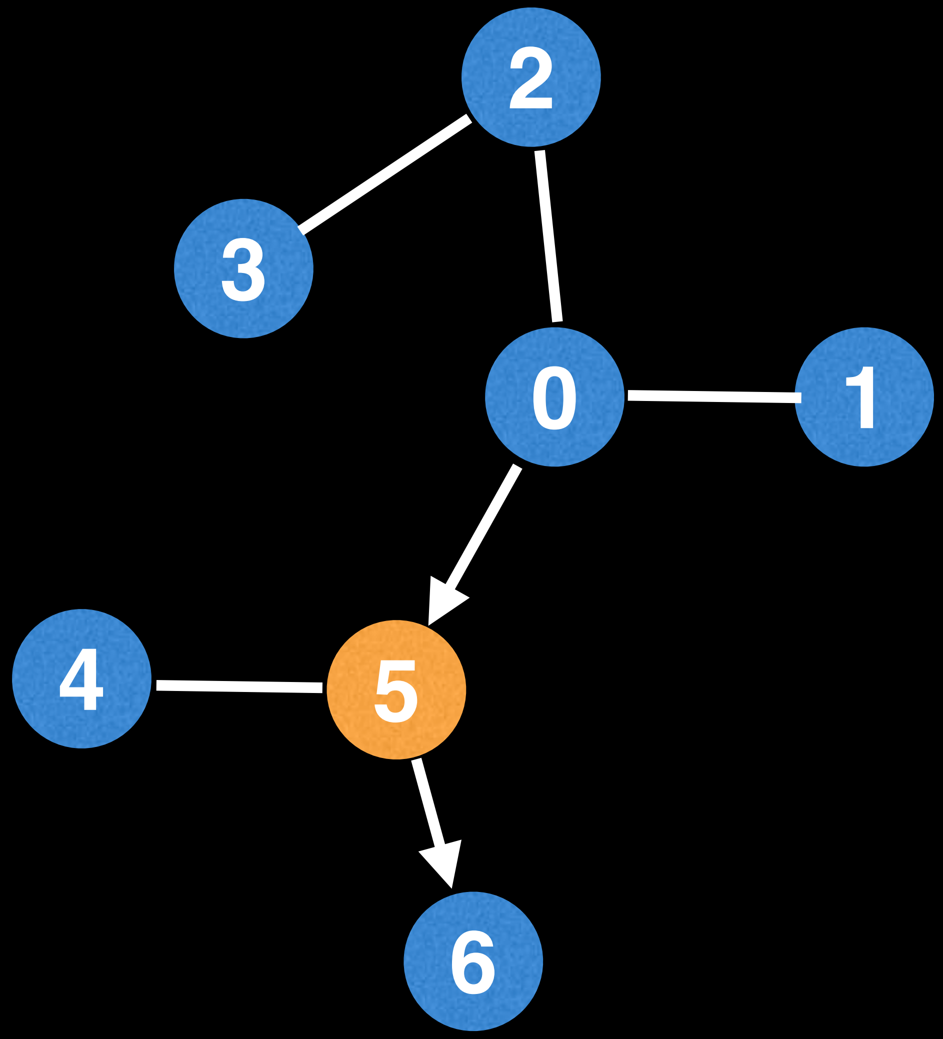

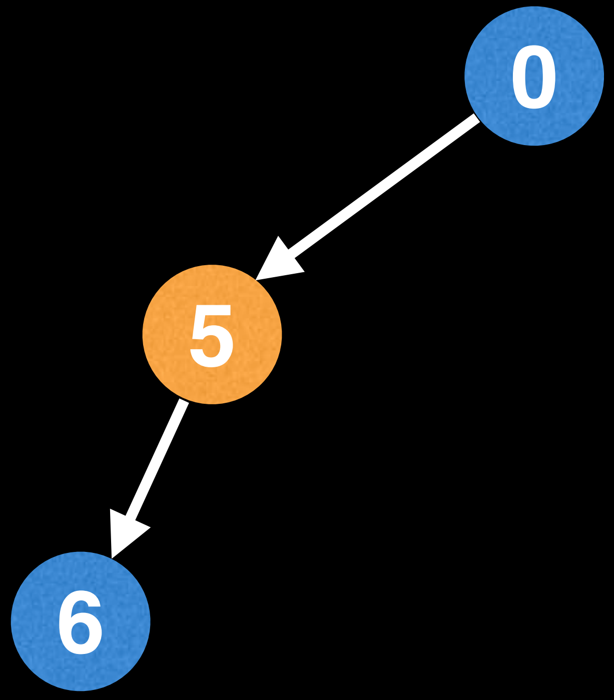

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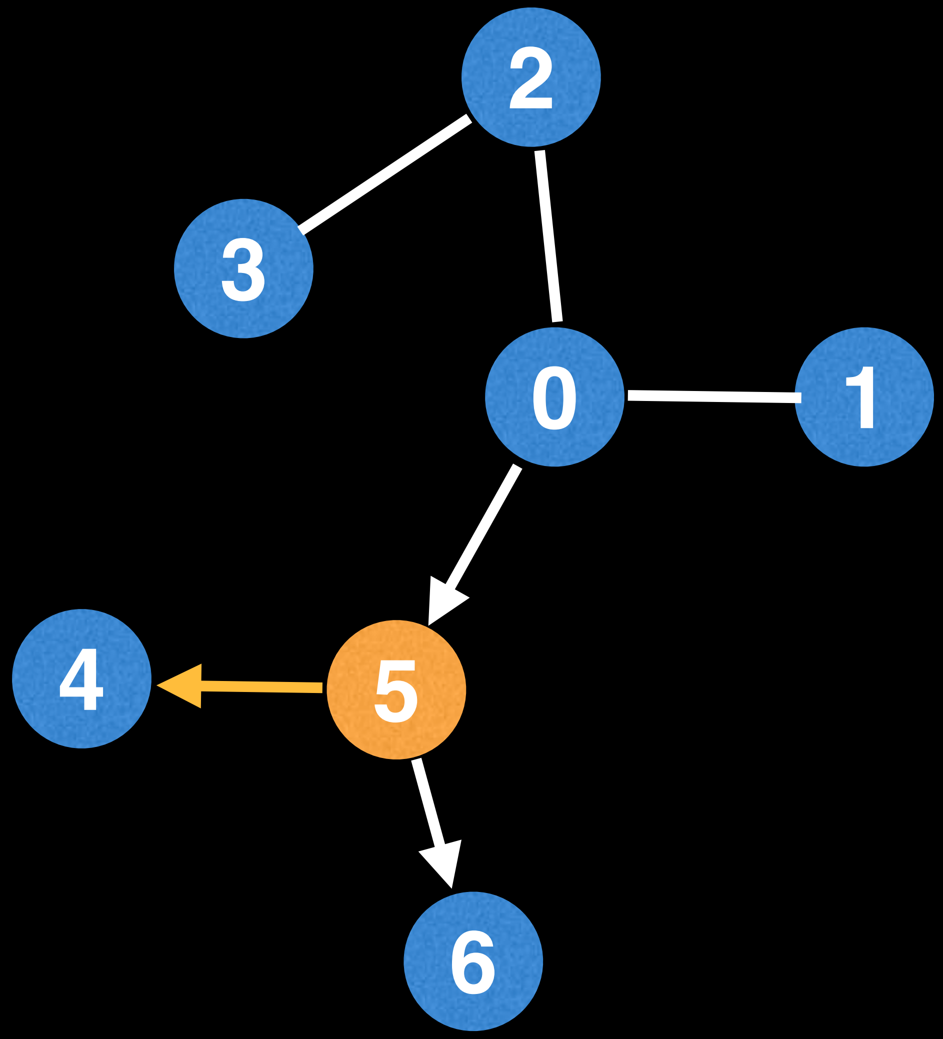

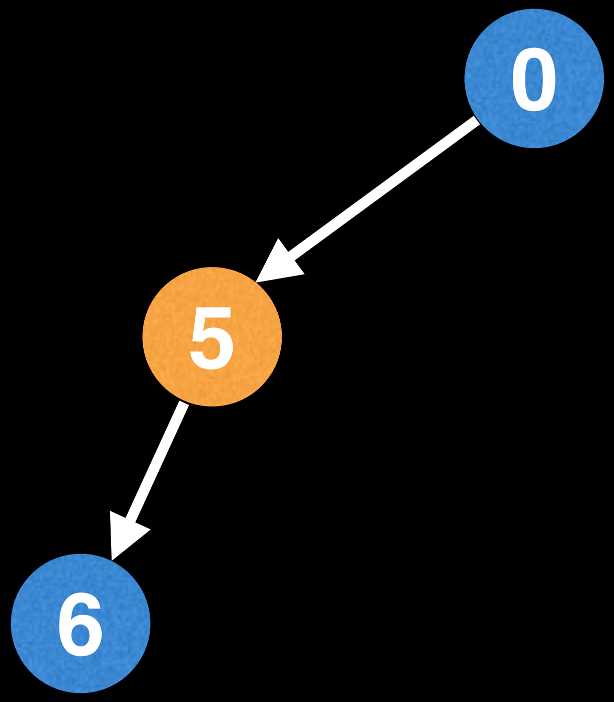

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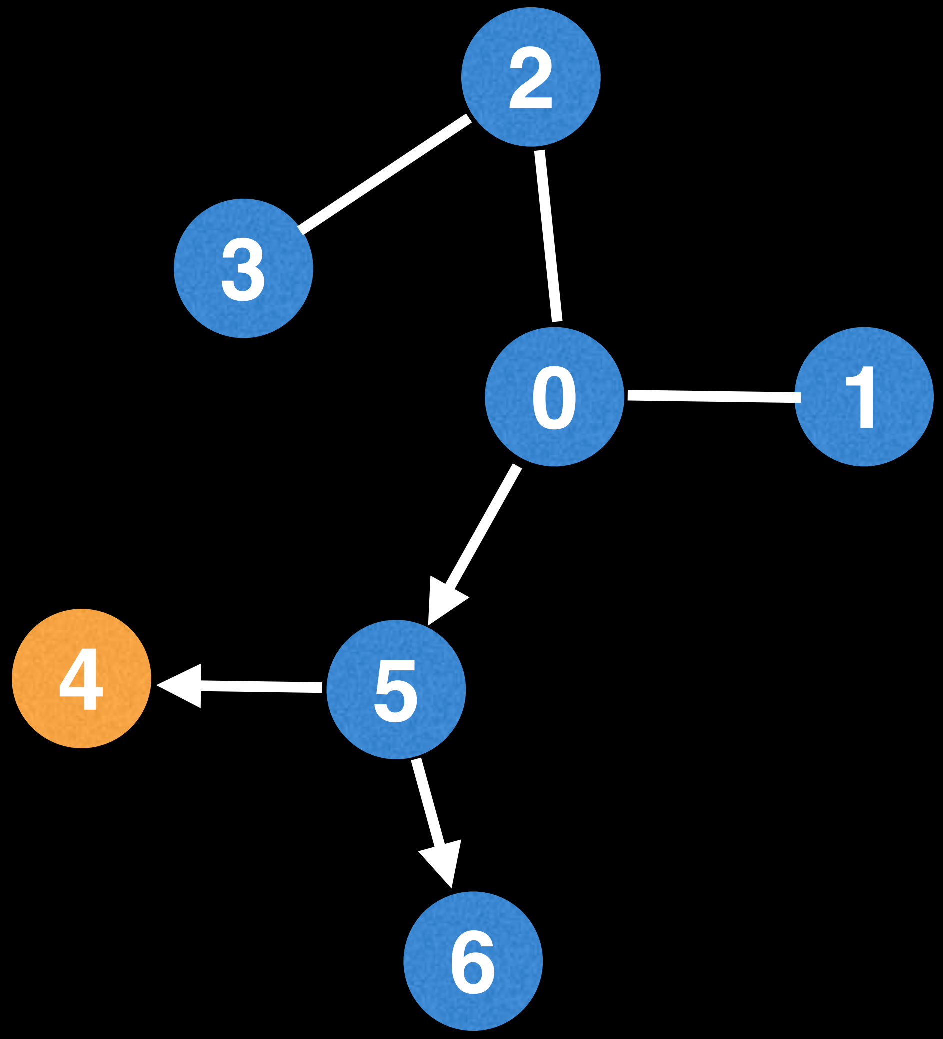

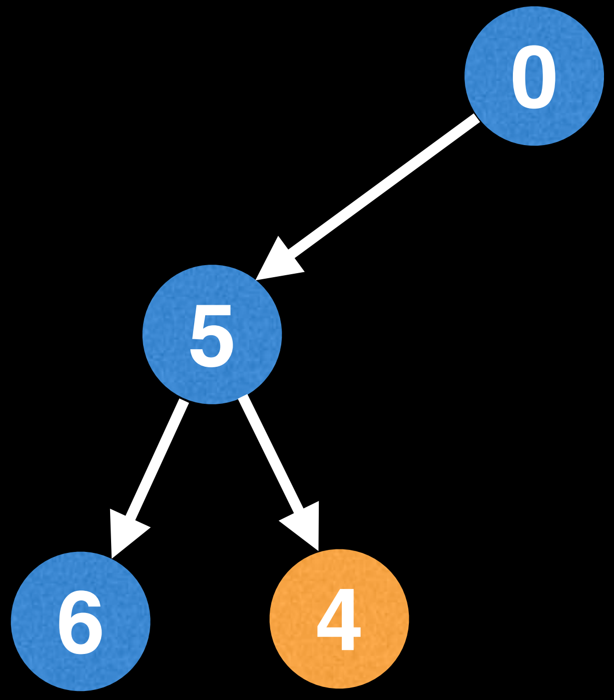

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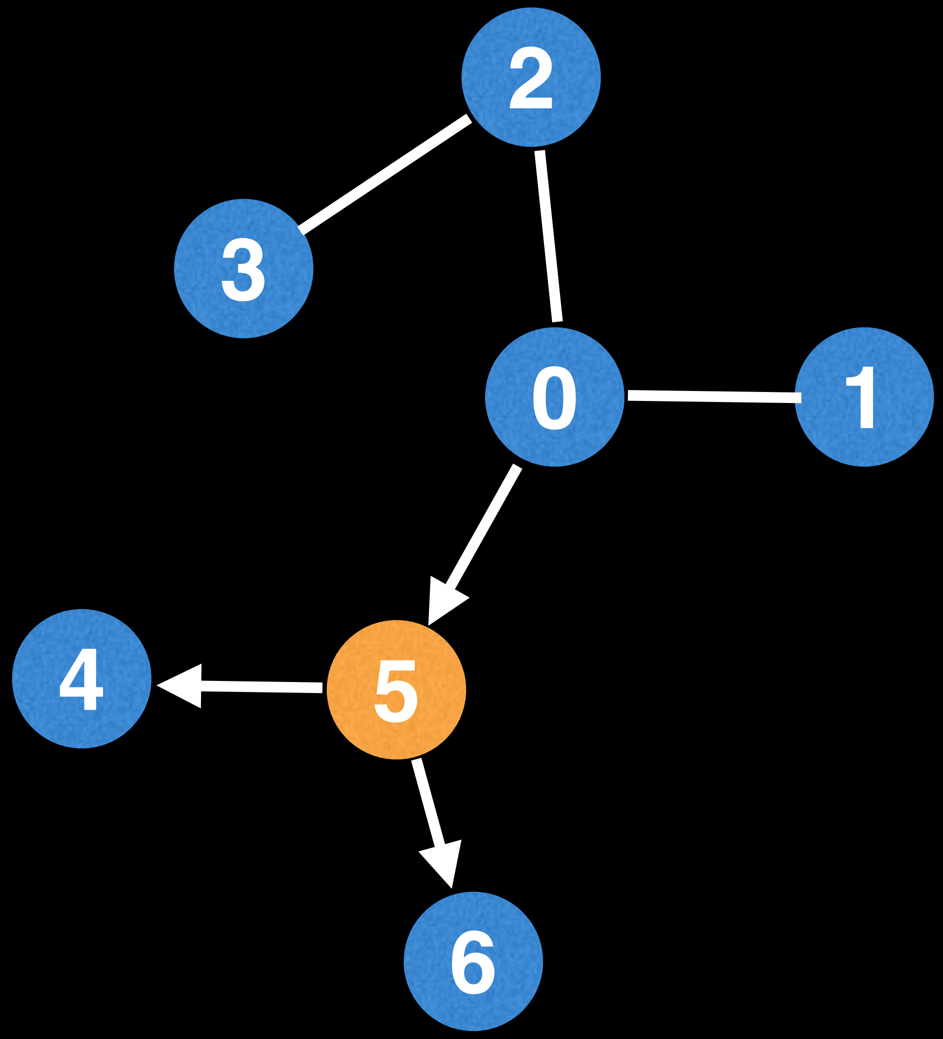

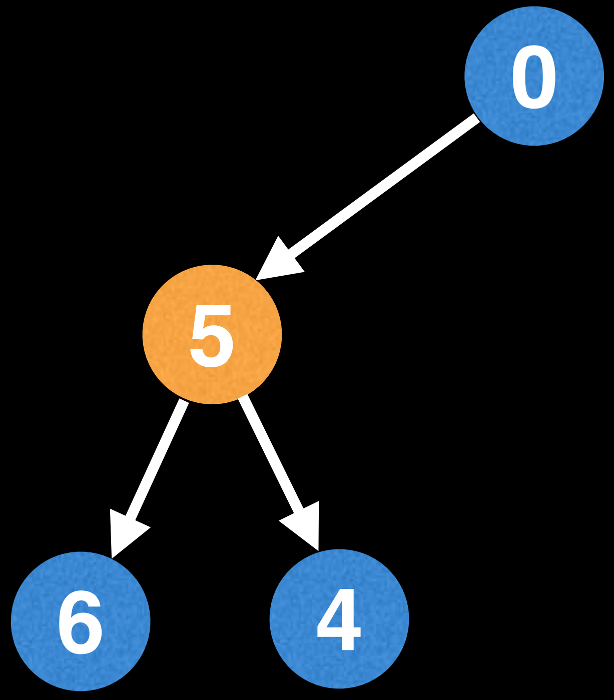

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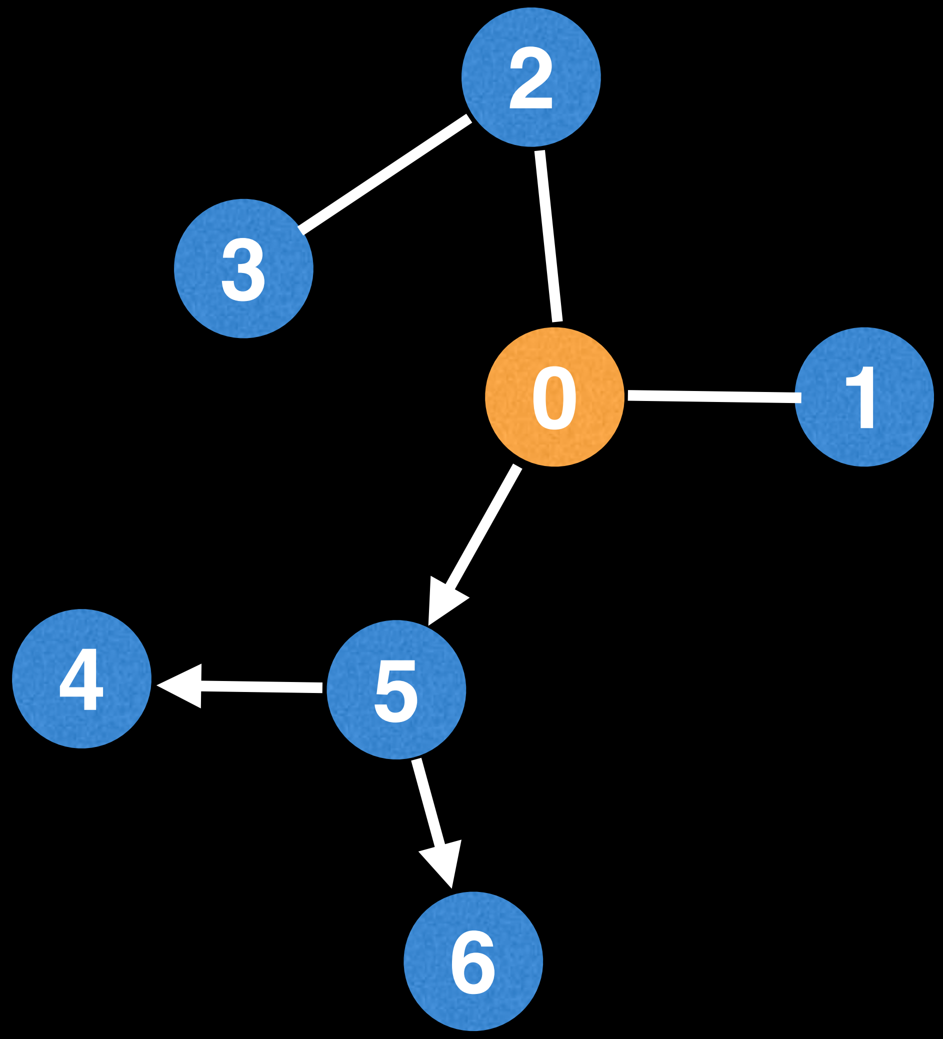

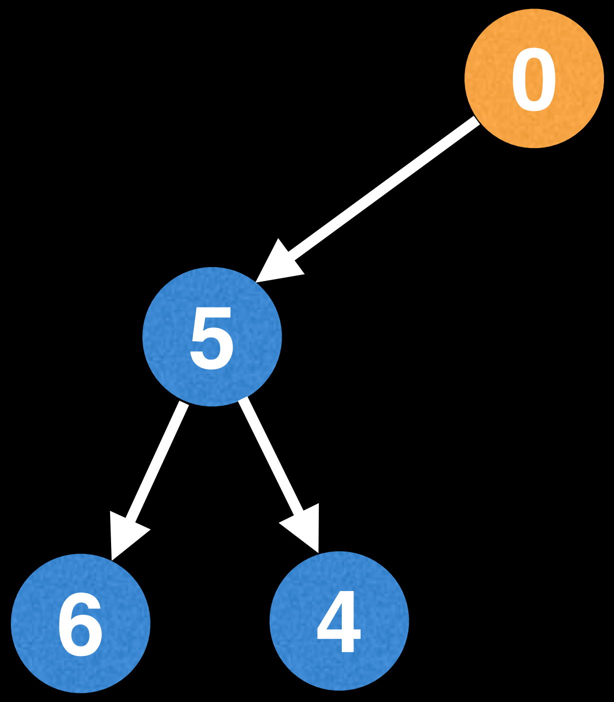

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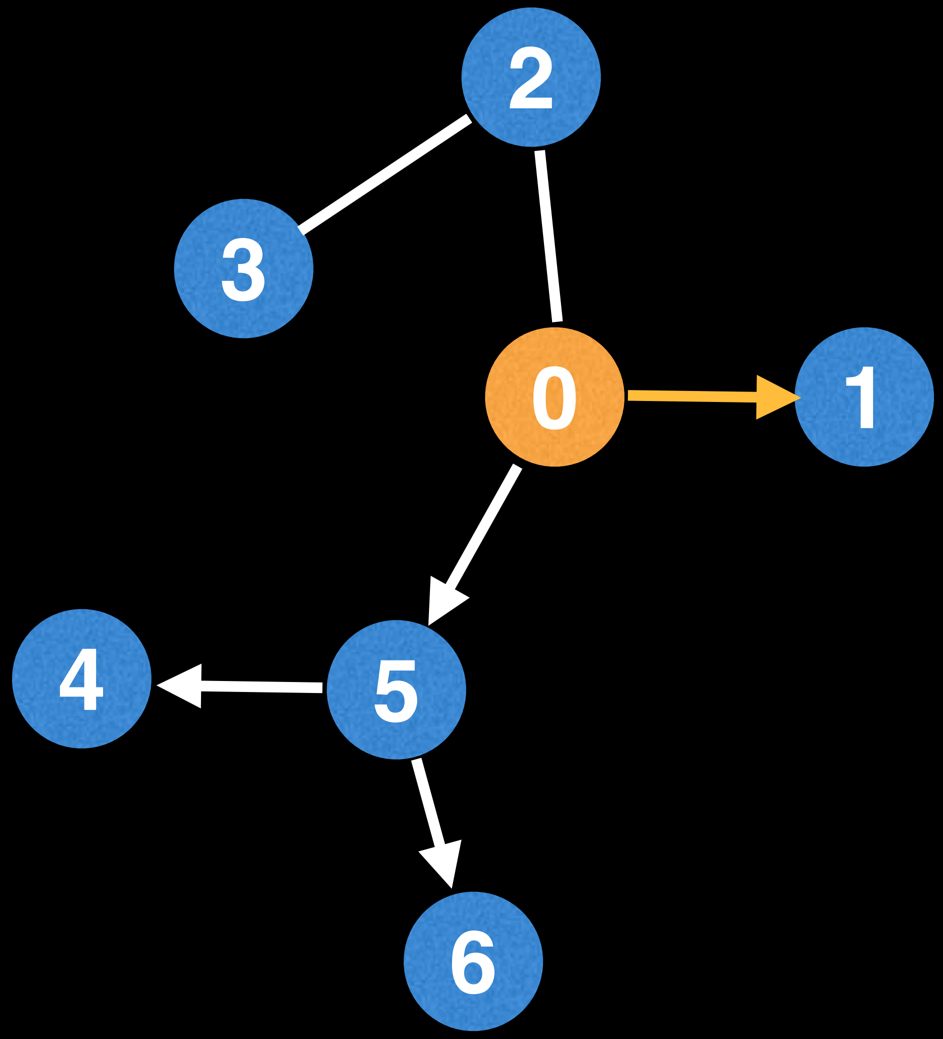

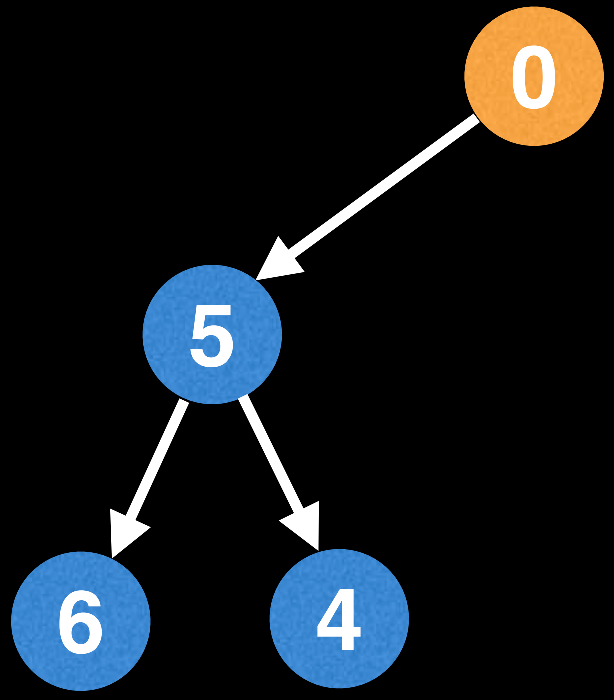

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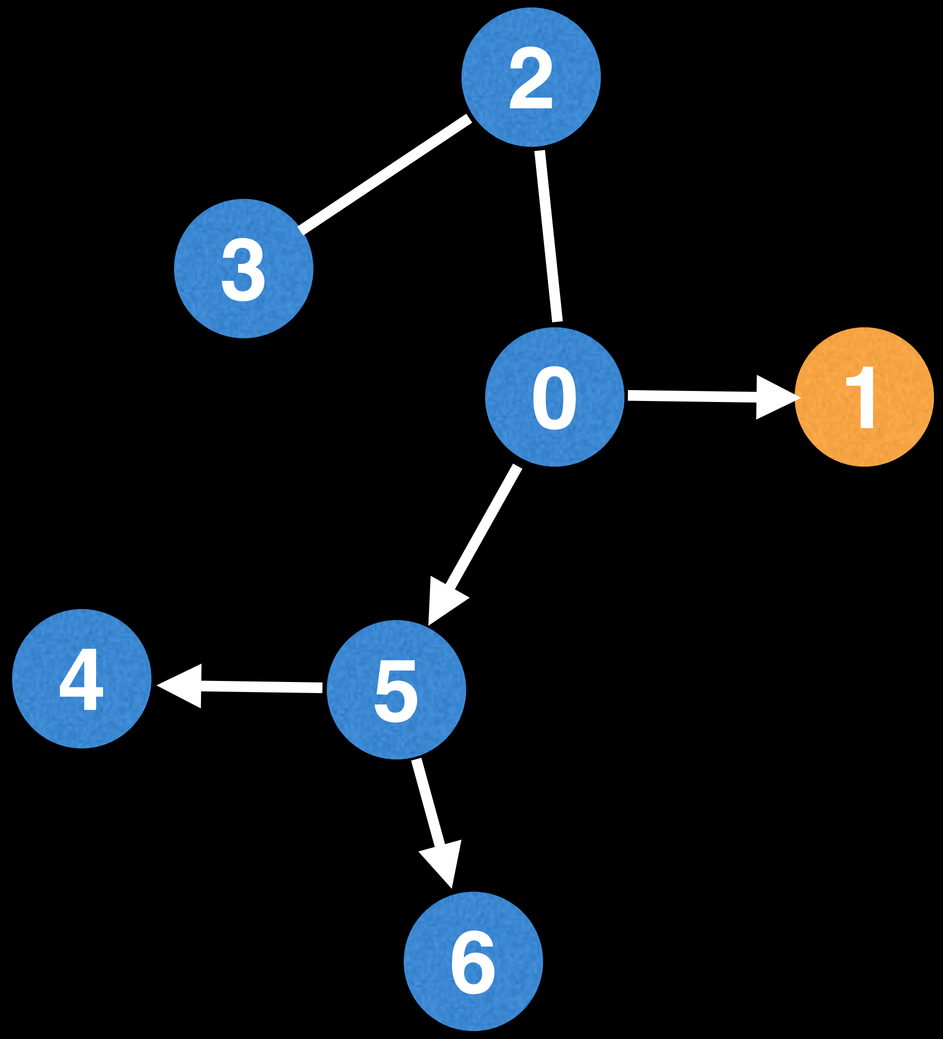

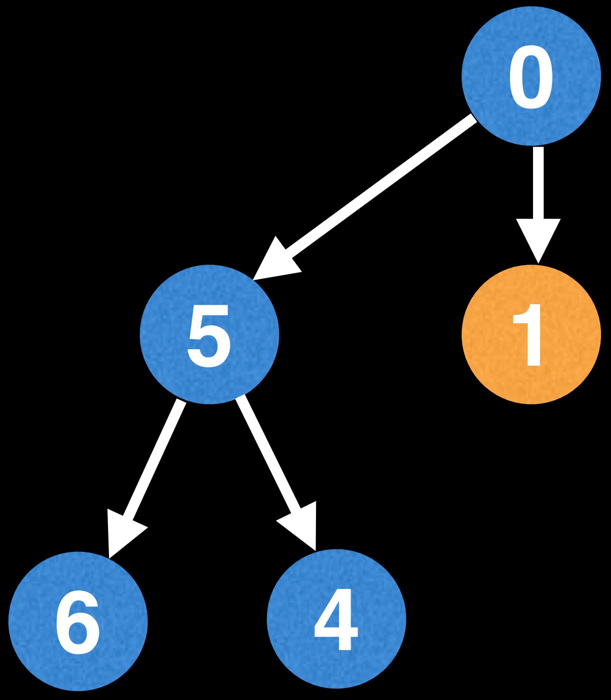

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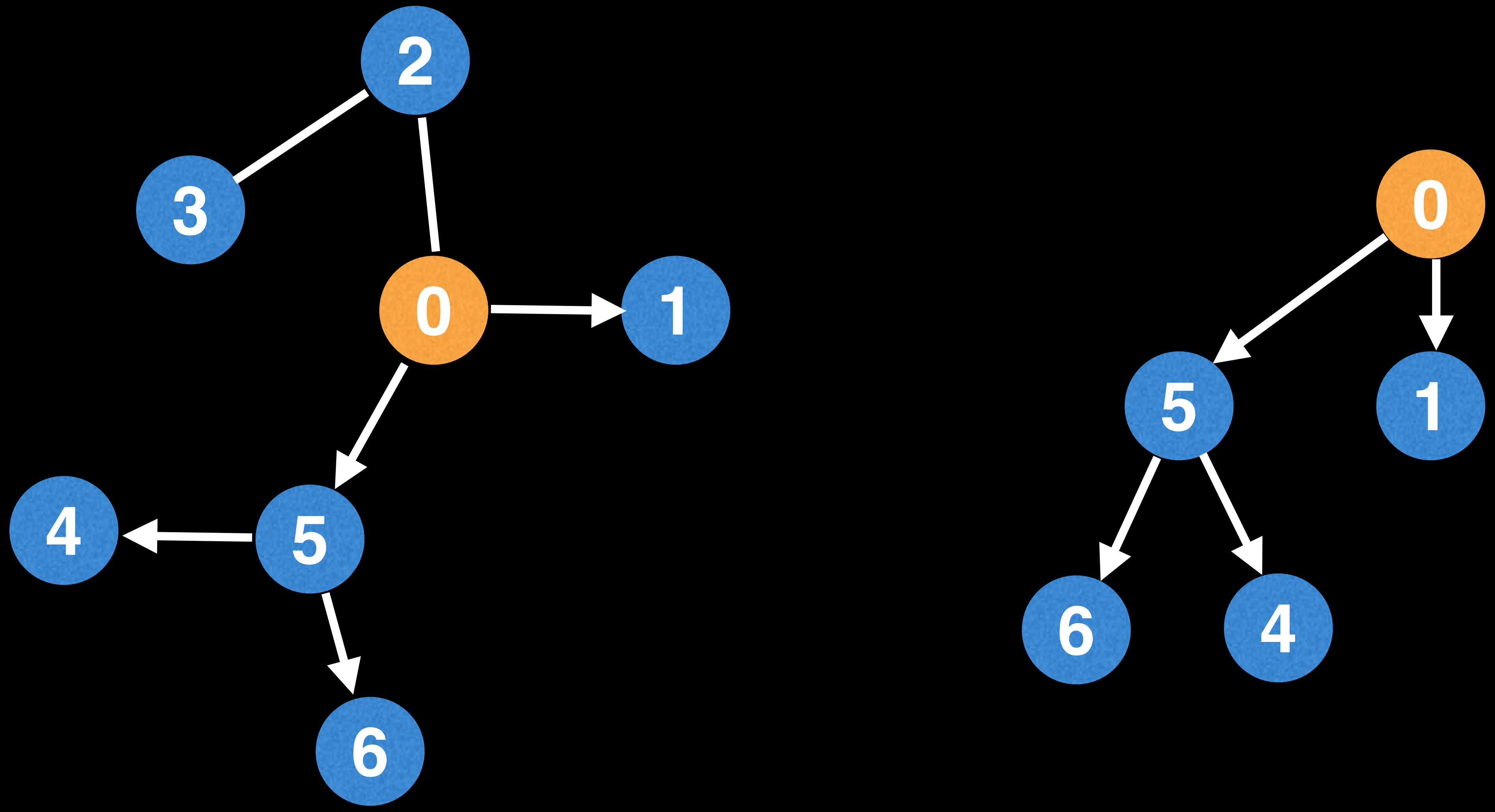

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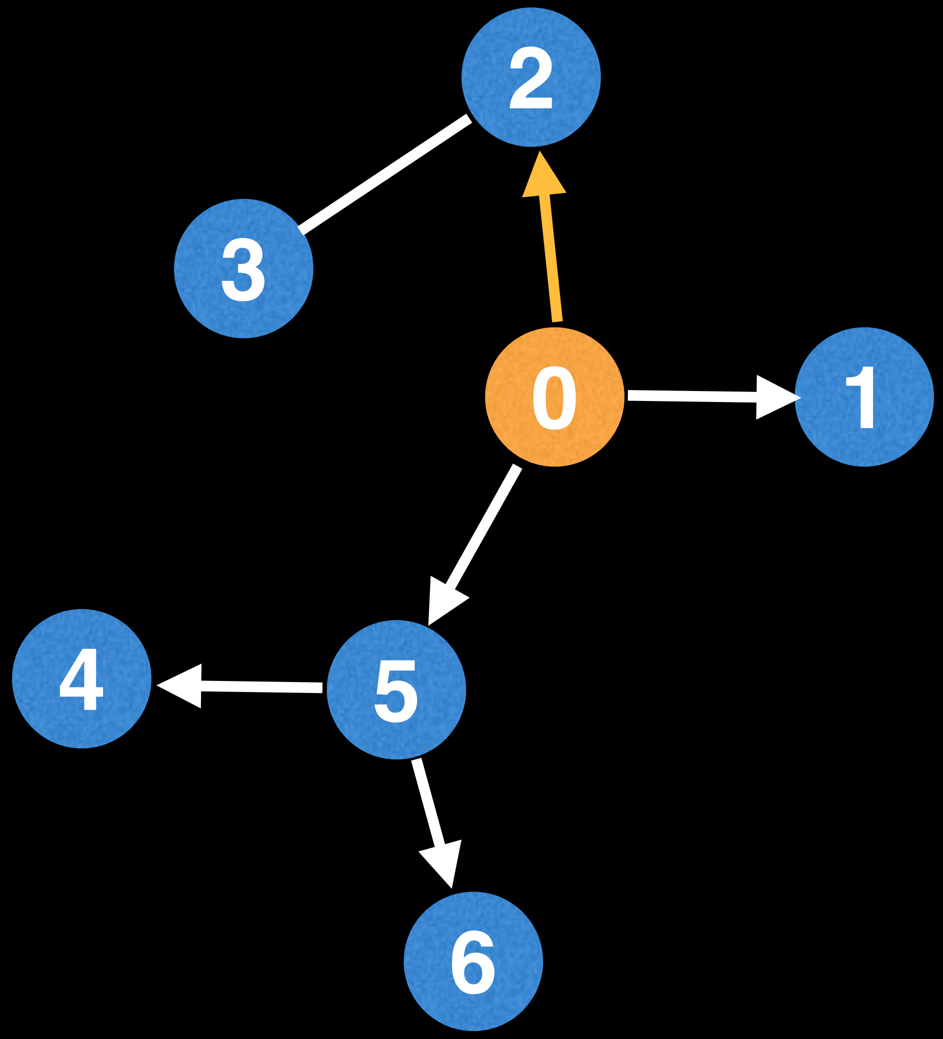

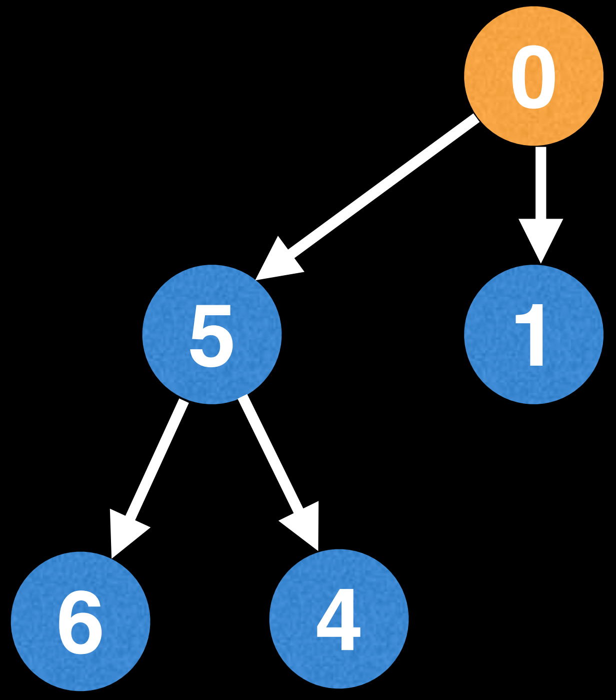

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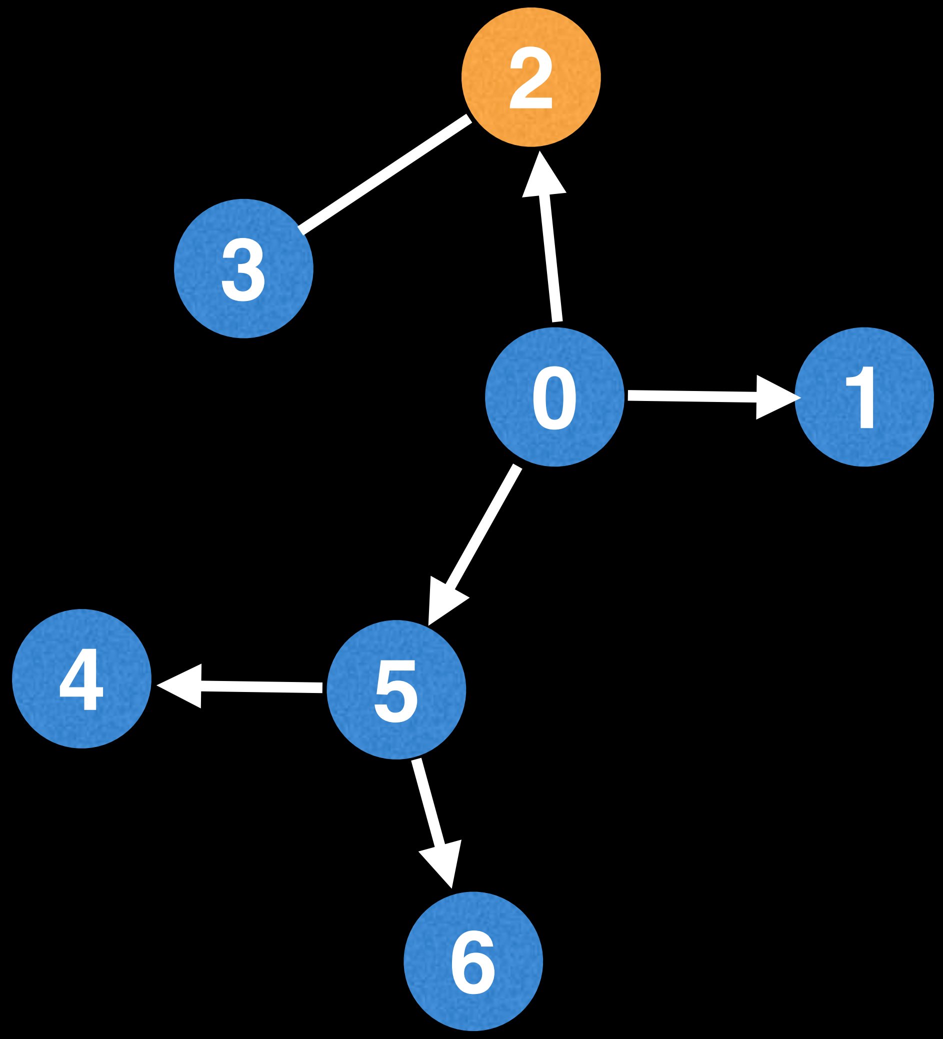

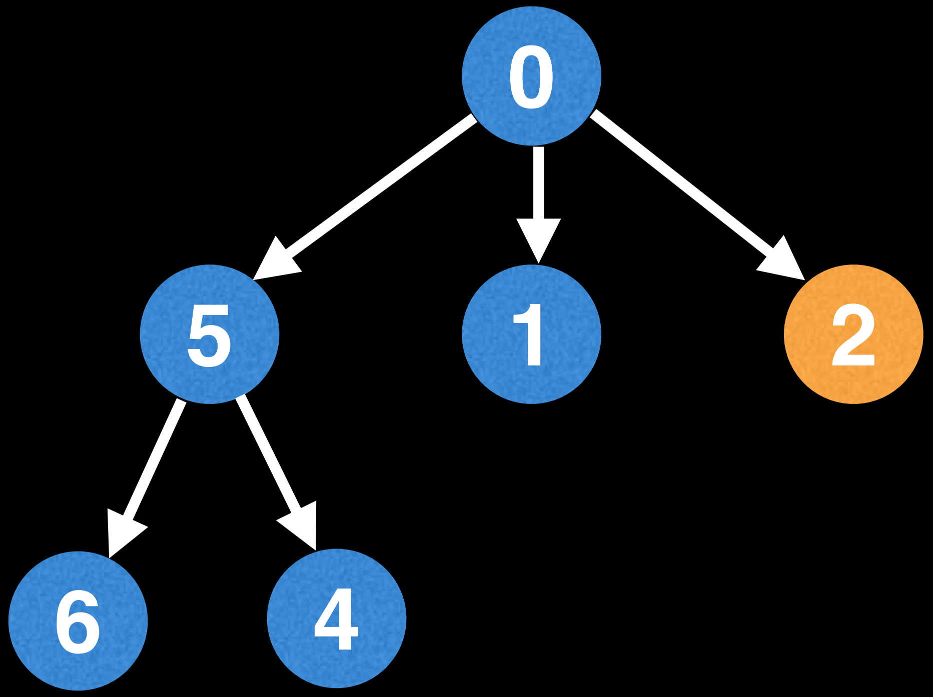

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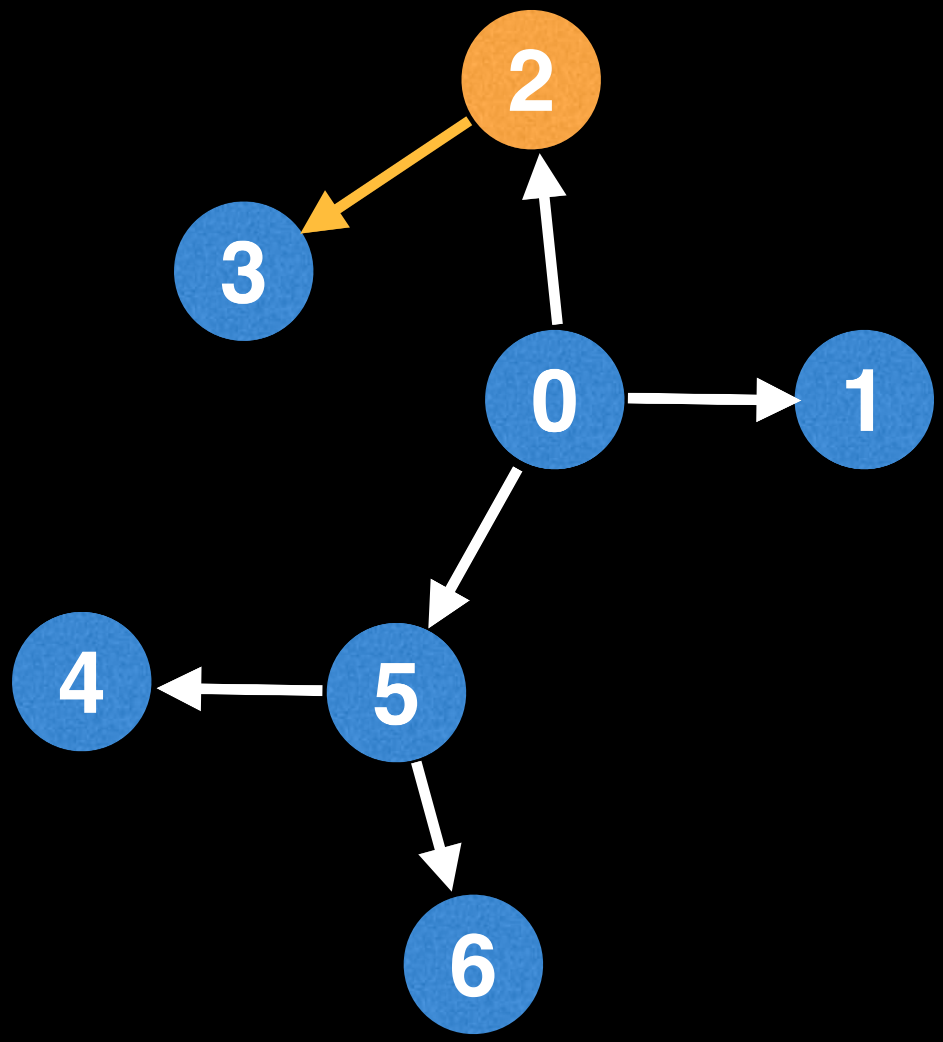

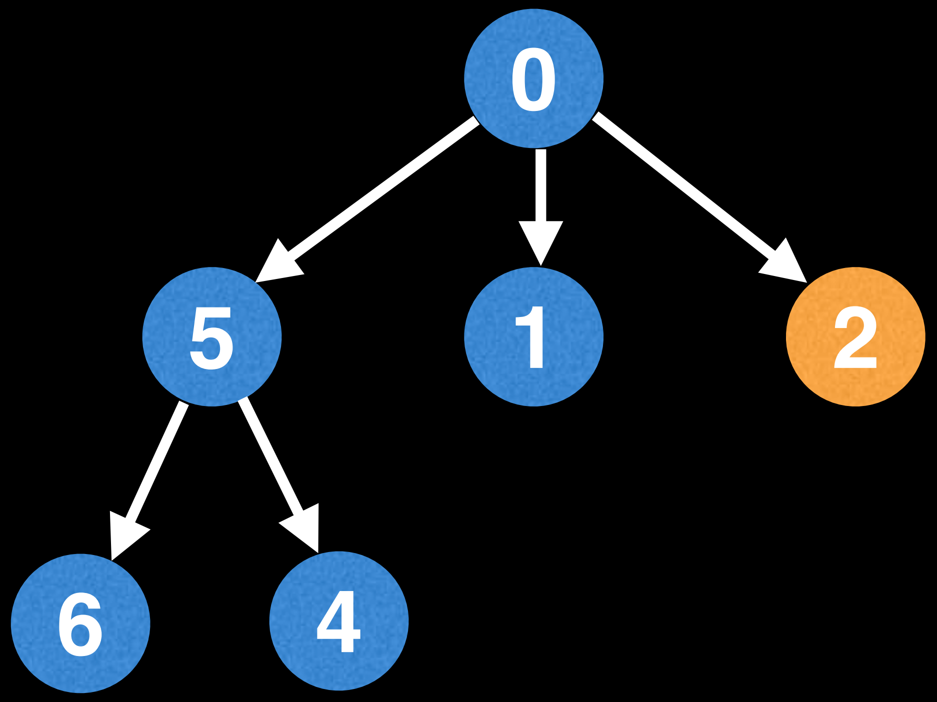

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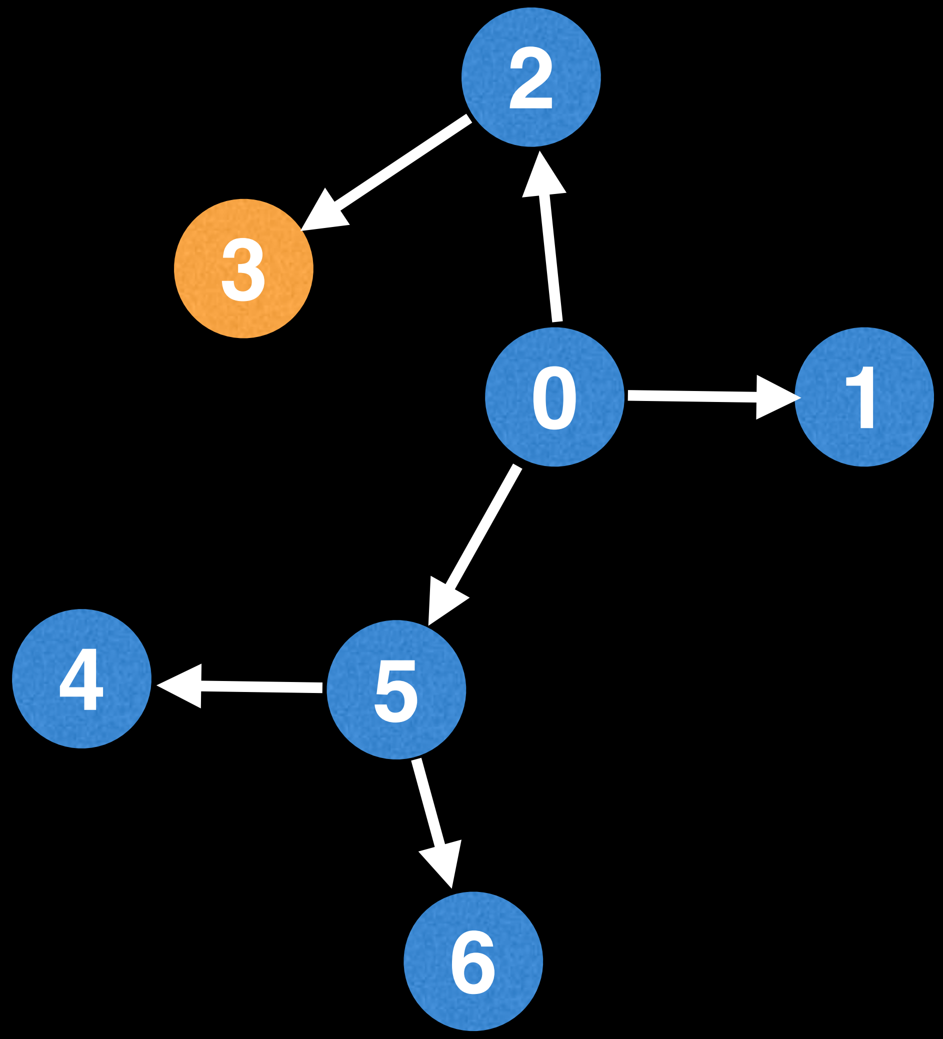

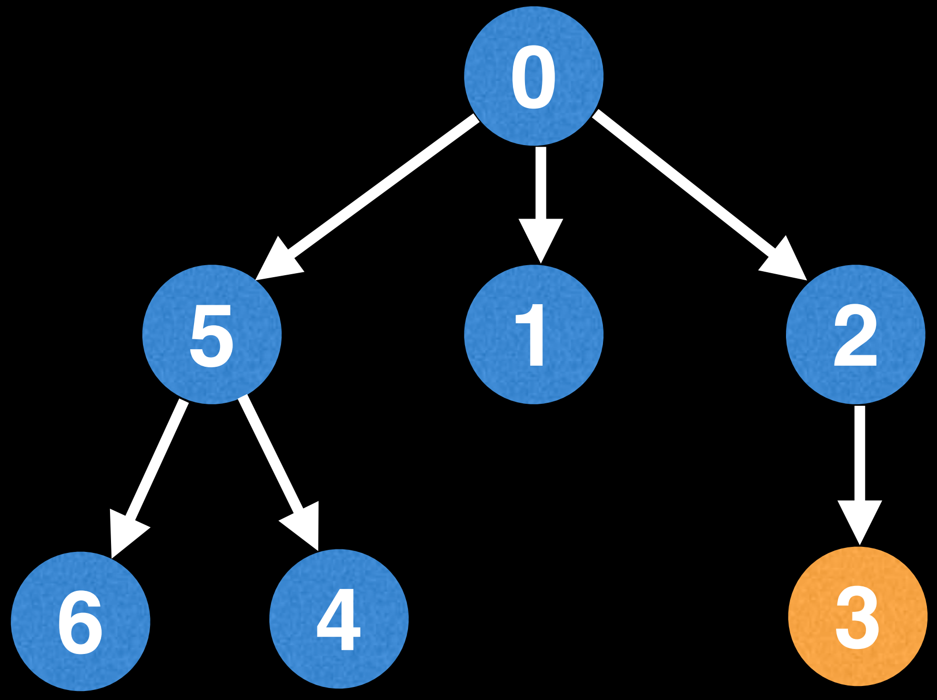

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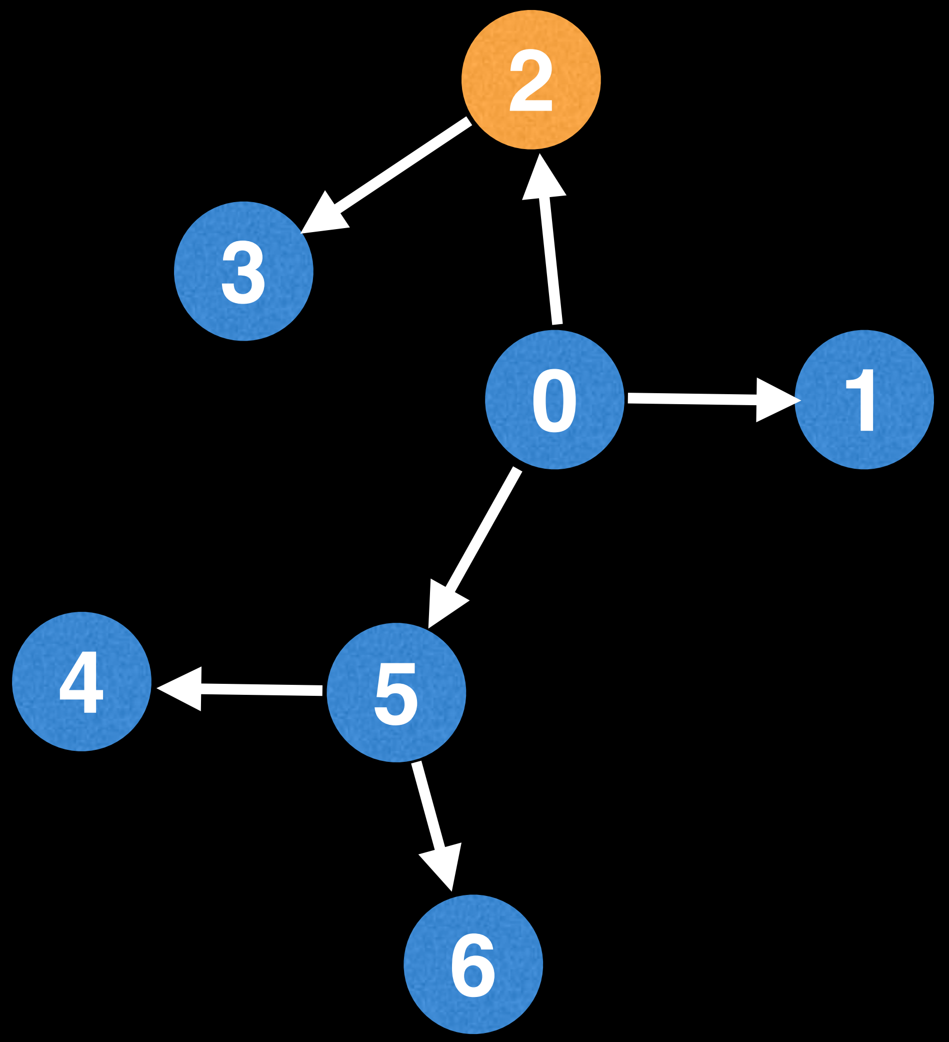

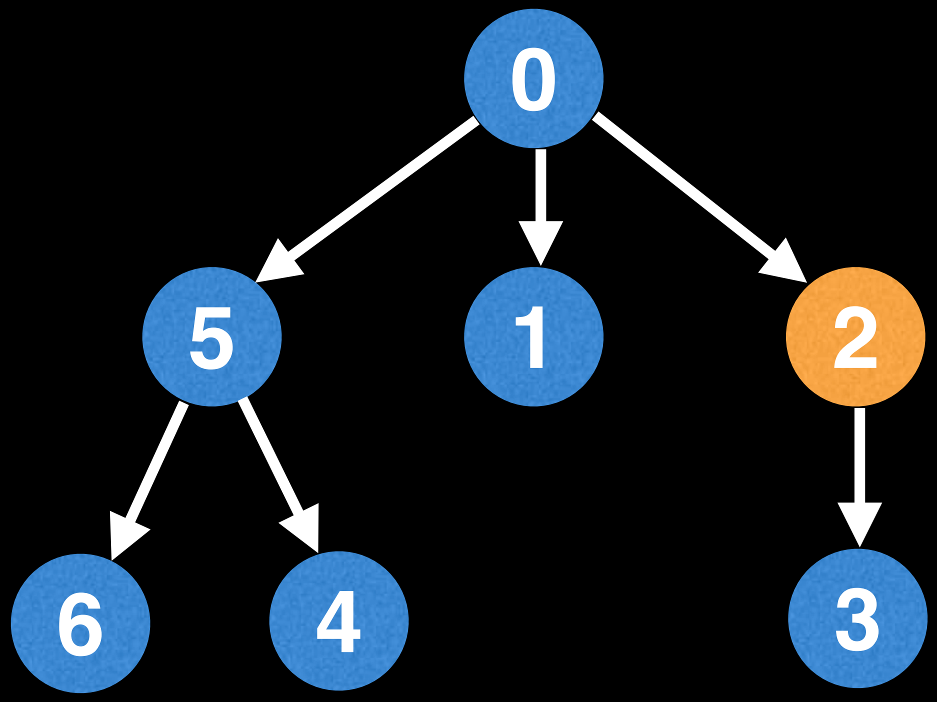

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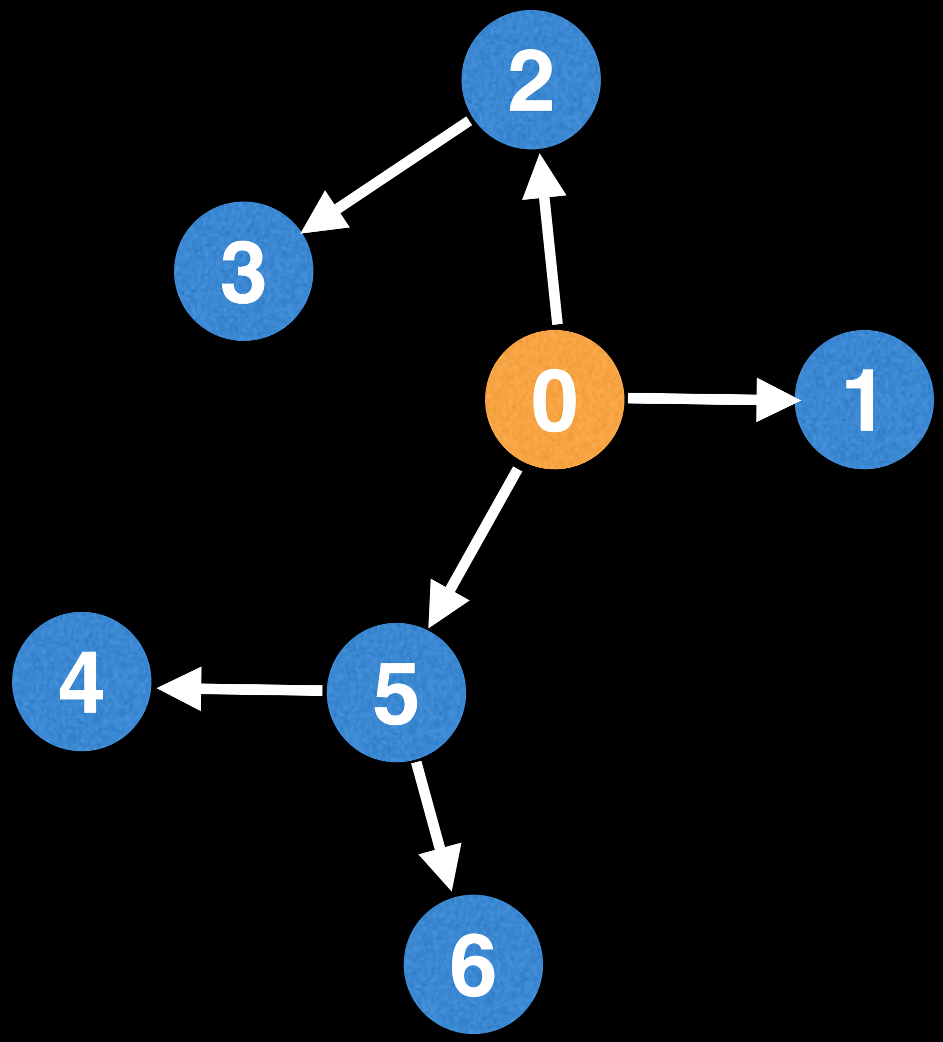

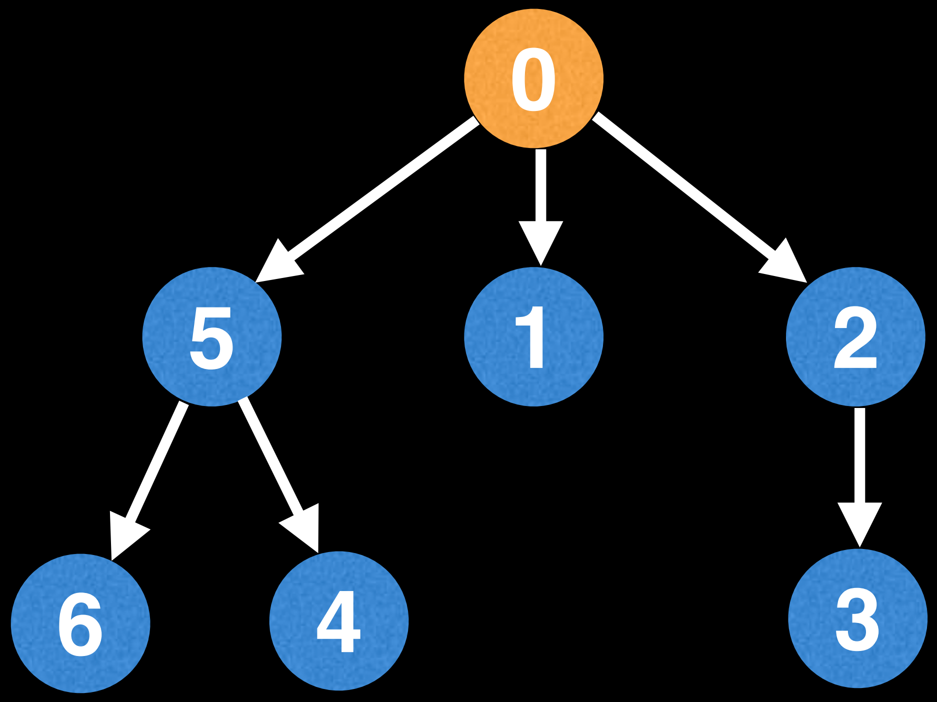

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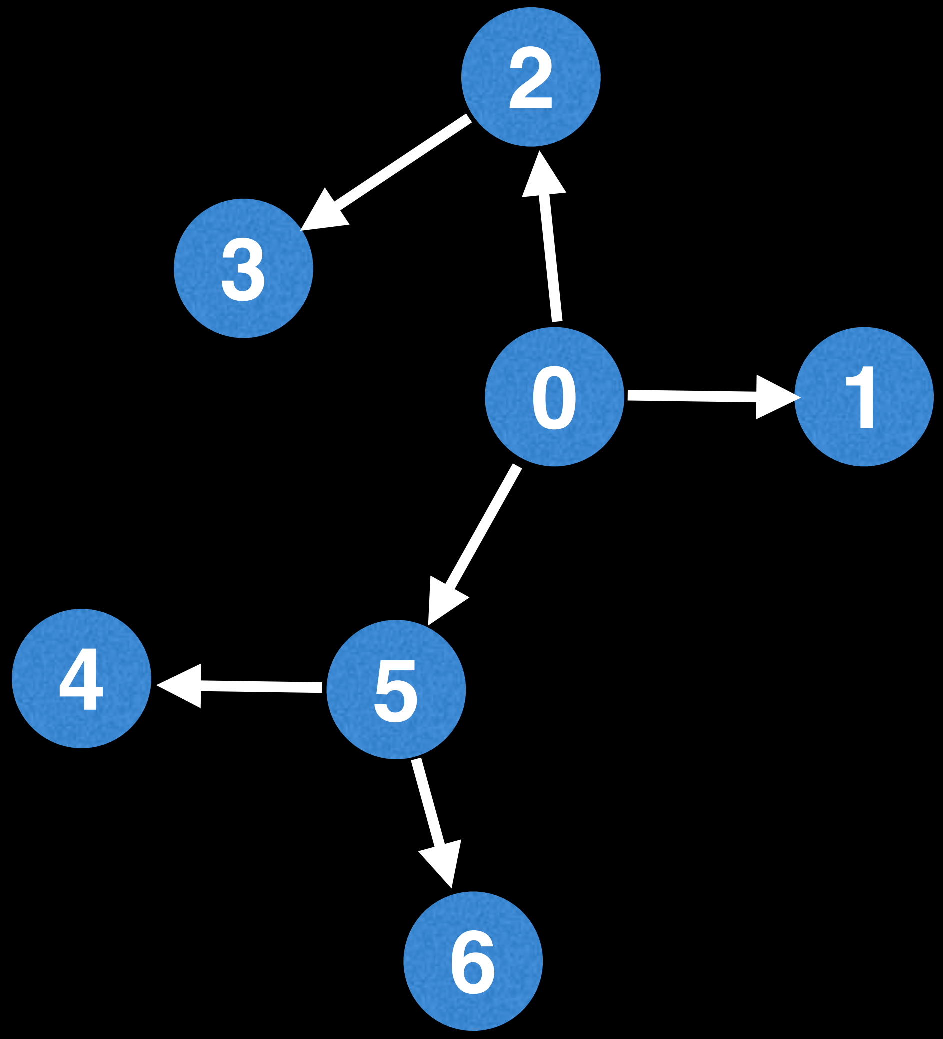

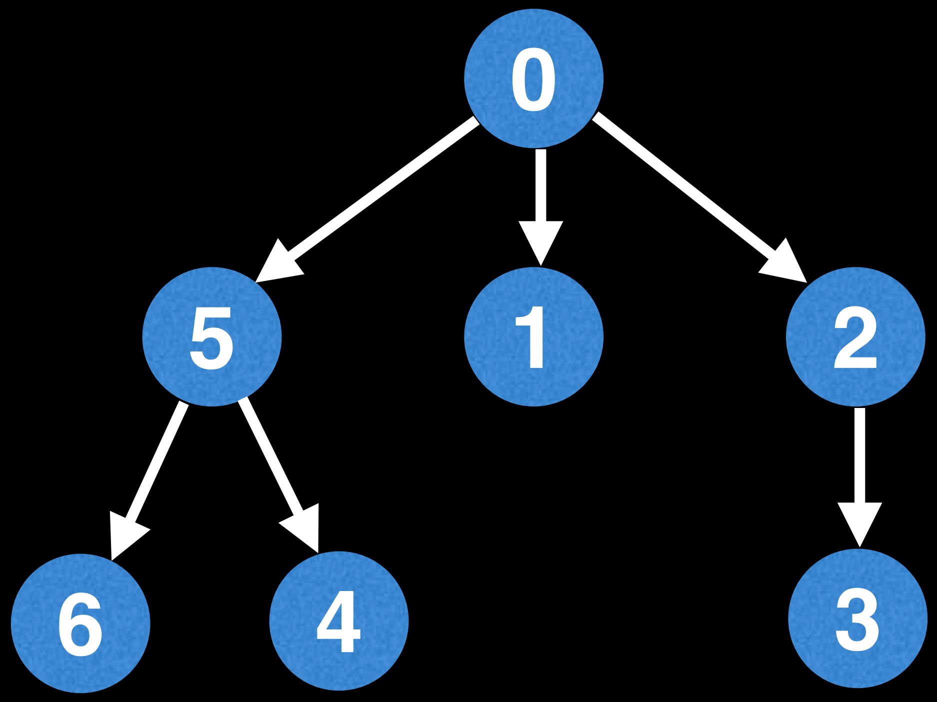

Rooting tree pseudocode

```
# TreeNode object structure.
class TreeNode:
  # Unique integer id to identify this node.
  int id;

  # Pointer to parent TreeNode reference. Only the
  # root node has a null parent TreeNode reference.
  TreeNode parent;

  # List of pointers to child TreeNodes.
  TreeNode[] children;
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# list with undirected edges. If there’s an edge between
# (u, v) there’s also an edge between (v, u).
# rootId is the id of the node to root the tree from.
function rootTree(g, rootId = 0):
  root = TreeNode(rootId, null, [])
  return buildTree(g, root, null)

# Build tree recursively depth first.
function buildTree(g, node, parent):
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root node has no parent!

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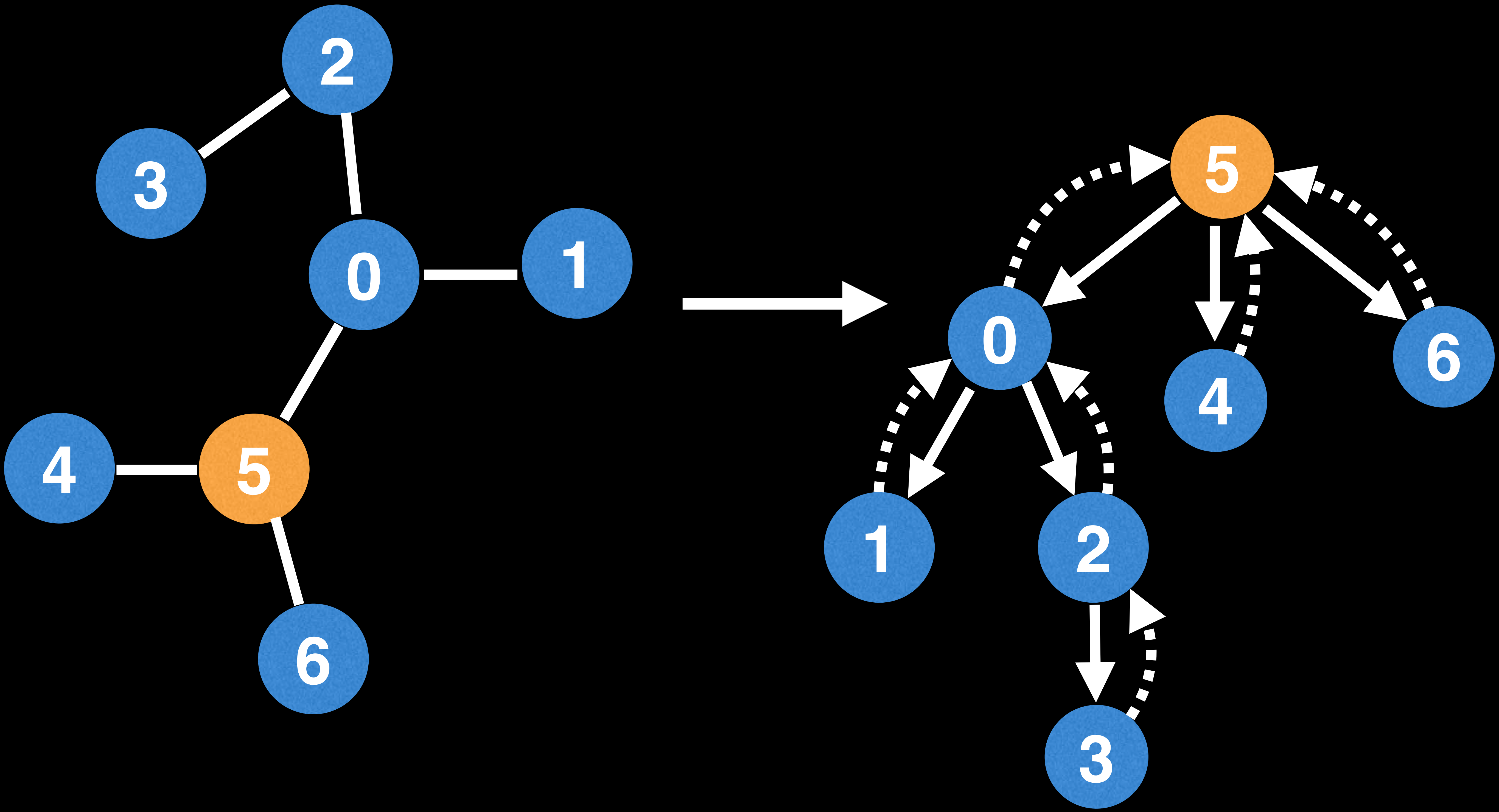
Rooting a Tree


2
3
0
1
4
5
6
5
0
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