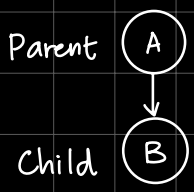
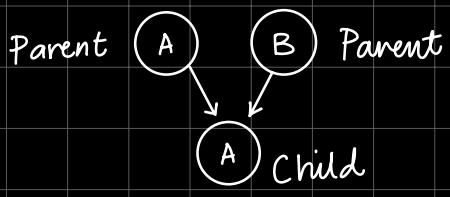
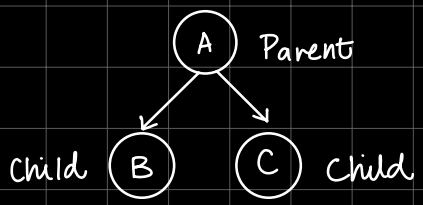
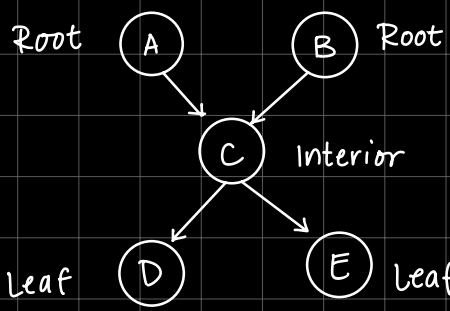
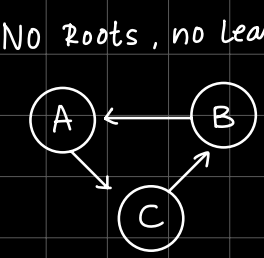
Terminology: Parent, Child, Root & Leaf Nodes





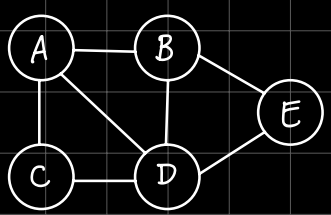






Path, Cycle, Trees:

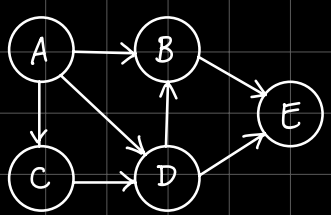
PATH:



- Path in an undirected graph from one node to another: Set of arcs

→ Paths from A to E:

$\{\{A,D\},\{D,E\}\}$ or $\{\{A,B\},\{B,D\},\{D,E\}\}$



- Path in a directed graph: Same, but arc order is important

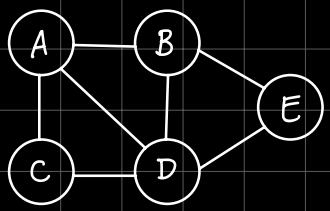
→ Directed Paths from A to E:

$\{(A,D),(D,E)\}$ or $\{(A,C),(C,D),(D,E)\}$

→ But NOT:

$\{(A,B),(B,D),(D,E)\}$ because (B,D) is not an arc

Cycle :

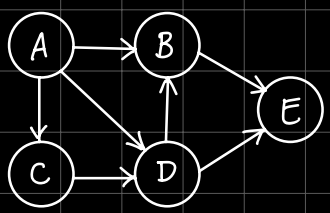


- Cycle in an undirected graph:

→ A path where the first vertex is repeated

→ Cycles involving A:

$\{\{A,C\},\{C,D\},\{A,D\}\}$ or $\{\{A,B\},\{B,D\},\{D,A\}\}$



- Cycles in a directed graph:

same, but arc order is important

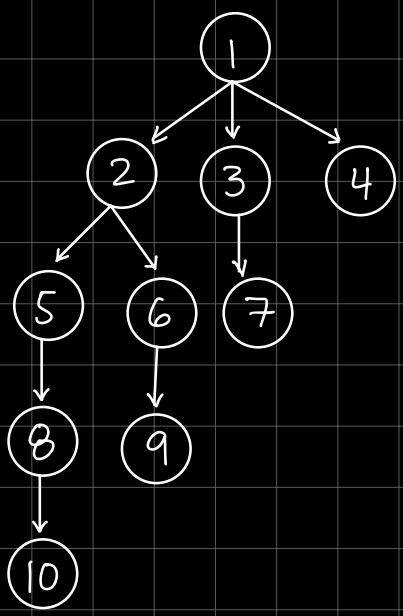
→ Directed paths from A to A:

$\{(A,D),(D,B),(B,A)\}$ or

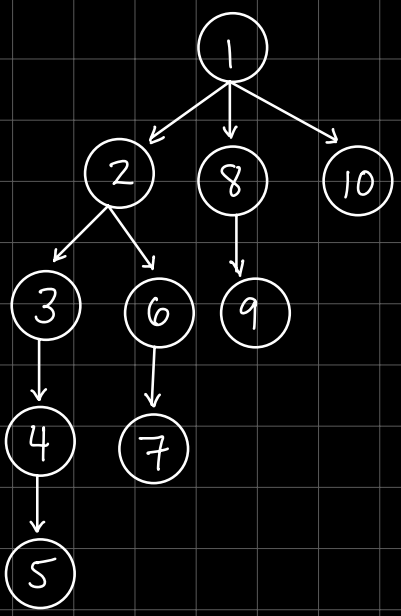
$\{(A,C),(C,D),(D,B),(B,A)\}$

BFS, DFS : Depth-first vs. Breadth First Search

BFS $(1 \to 2 \to 4 \to 3)$



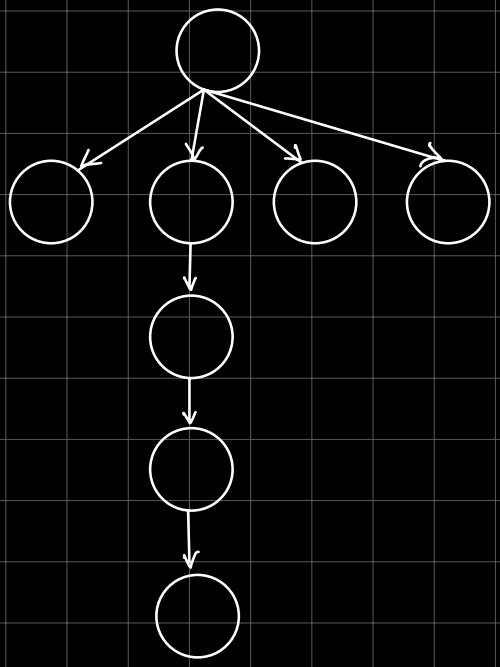
DFS $(1 \to 2 \to 3 \to 4)$



- Explores all neighbors at current depth before moving on to the vertices at the next depth. (level by level)

- Explores as far as possible.

Factors determing Search "Difficulty"



- Breadth / branching factor ($b = 4$)
- How many actions are available at a state?

- Depth ($d = 5$)
- Maximum length of an action seq.
- Maximum length of a solution

Algorithm:	Complete	Optimal	Time	Space
DFS	N	N	$O(b^m)$	$O(bm)$
BFS	Y	Y	$O(b^d)$	$O(b^d)$

b = branching factor
d = depth of shallowest goal state
m = max. path length