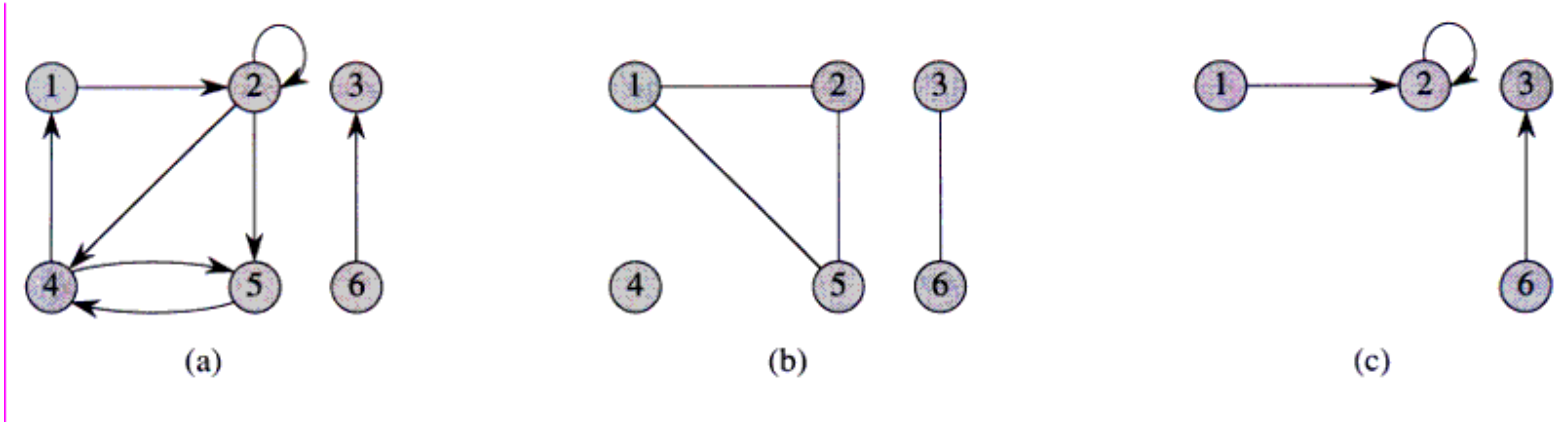
Graph and Tree

Graph

- G = (V, E)
  - V : set of vertices (or nodes)
  - E : set of edges

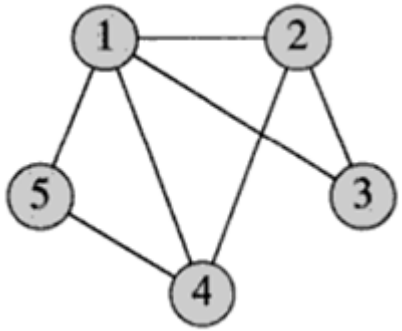
- Directed graph vs. Undirected graph

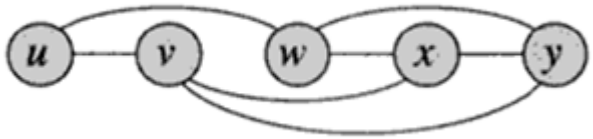


Graph

- Cycle
  - A path $<v_0, v_1, \ldots, v_k>$ ($v_i \in V$) is a cycle if $v_o = v_k$
  - Acyclic graph: a Graph with no cycle

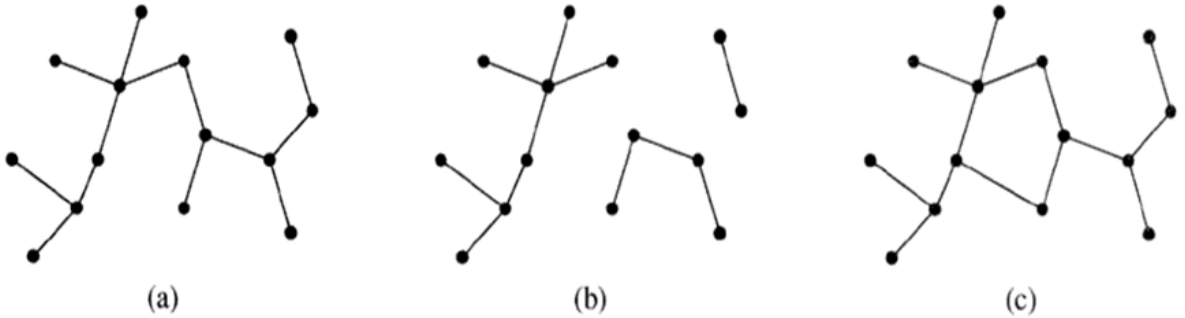
- Connected
  - A graph is connected if every pair of vertices is connected by a path





Tree

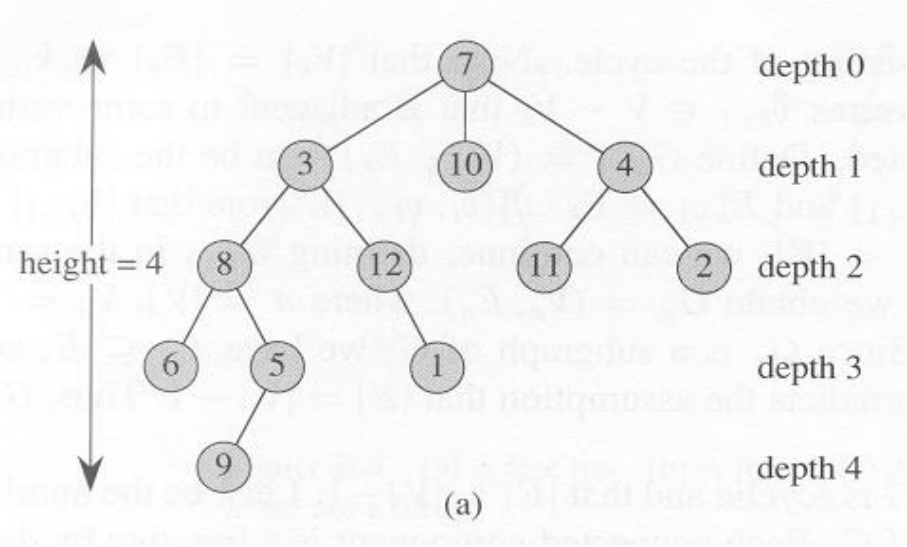
- Tree
  - connected, acyclic, and undirected graph



- Rooted Tree
  - Tree with a root node

Rooted Tree

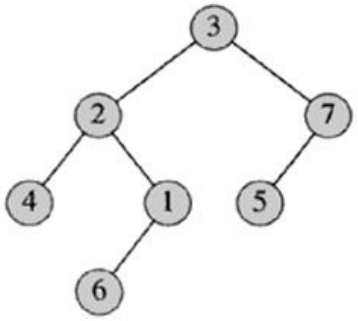
- Nodes
  - parent
  - child
  - sibling: Parent 가 같은 nodes
  - root: no parent
  - leaf (terminal, external): no child
  - internal: non-leaf node

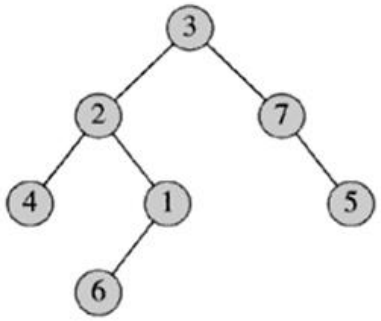


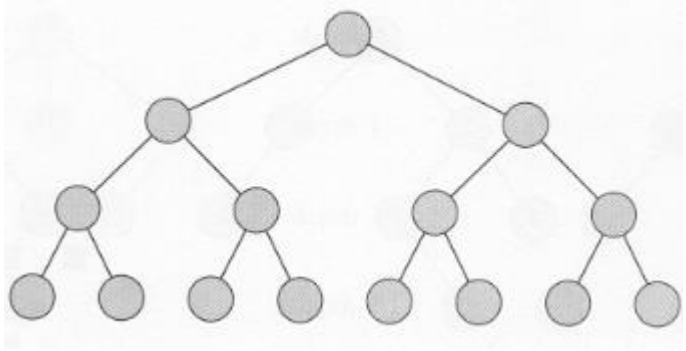
- Degree
  - degree of node: number of child nodes
  - degree of tree: maximum degree of nodes
- Depth / Height
  - depth of a node: root node 에서 해당 node 까지의 edge 수
  - height of a tree: maximum depth of nodes

Binary Tree

- Binary tree
  - degree of tree = 2
- Full binary tree
  - 모든 internal node 의 degree = 2
- Complete binary tree (CBT)
  1) Full binary tree
  2) 모든 leaf node 의 depth 가 같다.







Binary Tree

(ex) height = h 인 complete binary tree 의 노드 수 ?

(ex) n 개의 노드를 갖는 complete binary tree 의 height = ?