

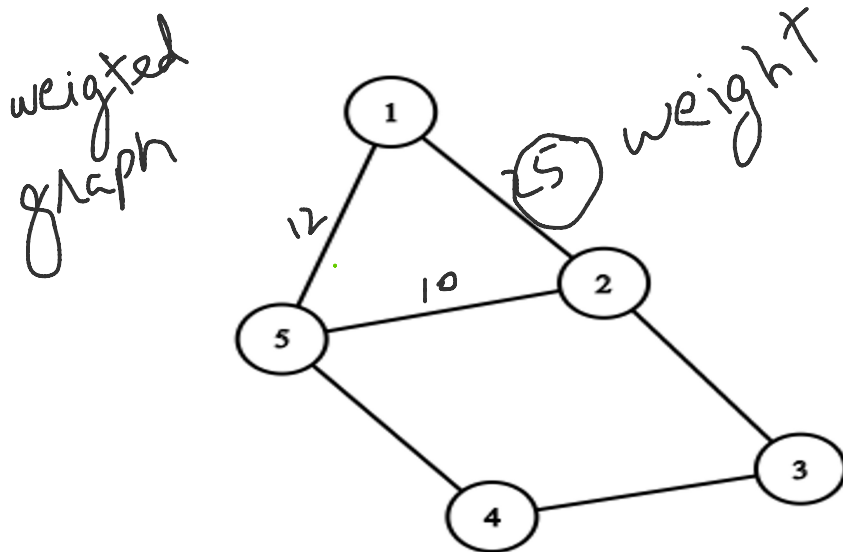
L18 - Graph Introduction

Thursday, May 21, 2020 8:35 AM

Basic Graph Definition

- A set of nodes (vertices, Points)
- A set/family of edges (Arcs, Links) that relate the nodes to each other

The set/family of edges describes relationships among the vertices.



	1	2	3	4	5
1	0	1	0	0	1
2	1	0	1	0	1
3	0	1	0	1	0
4	0	0	1	0	1
5	1	1	0	1	0

Adjacency Matrix ($|V| \times |V|$)
 $\theta(n^2)$

1	→ 2	5		
2	→ 1	→ 3	5	
3	2	4		
4	3	5		
5	1	2	4	

Adjacency List ($|V| + |E|$)
An array of linked lists
 $\theta(n + e)$

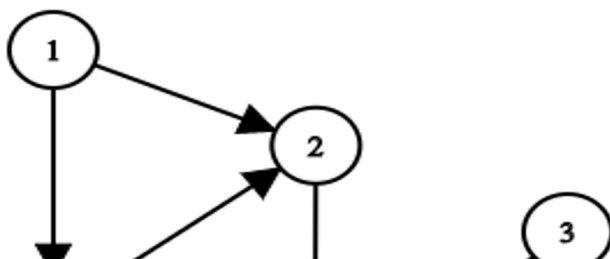
$G_1(V_1, E_1)$

$V_1 = \{1, 2, 3, 4, 5\}$

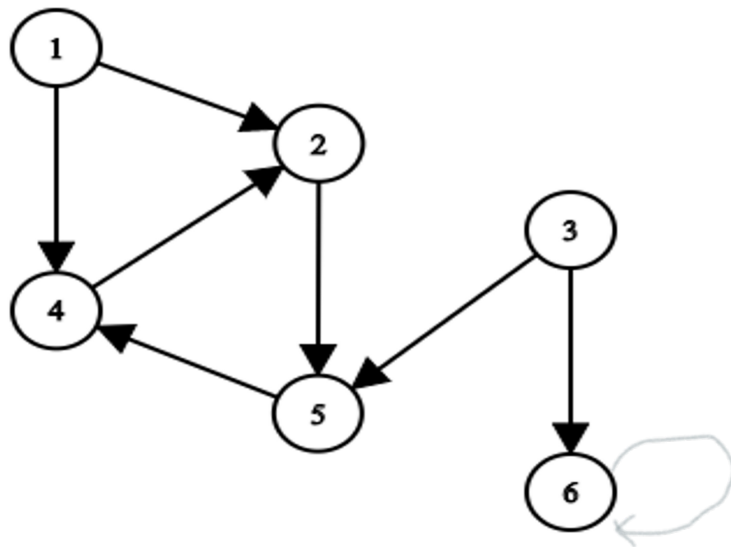
$E_1 = \{\{1, 2\}, \{2, 3\}, \{3, 4\}, \{4, 5\}, \{1, 5\}, \{2, 5\}\}$

G_1 is an **undirected** graph

A **tree** is an acyclical graph.



WDG



$G_2(V_2, E_2)$

$V_2 = \{1, 2, 3, 4, 5, 6\}$

$E_2 = \{ \langle 1, 2 \rangle, \langle 1, 4 \rangle, \langle 4, 2 \rangle, \langle 2, 5 \rangle, \langle 5, 2 \rangle, \langle 5, 4 \rangle, \langle 3, 5 \rangle, \langle 3, 6 \rangle, \langle 6, 6 \rangle \}$

G_2 is a **directed** graph

Two vertices are said to be **adjacent** if they are connected by an edge.

Vertices 1 & 5 are adjacent in G_1 .

An edge (v_1, v_2) is said to be **incident** on vertices v_1 and v_2 .

A **Path** is a sequence of vertices such that consecutive vertices (in the sequence) are adjacent (in the graph).

$(1, 2, 5, 4)$

Weighted Graphs

Weights are attached to the edges.