

- Pa2 : Posted
- Pa1 : ext. 1 day
- New examples: Queue based on re-sizeable array.

Exercise :

re-create List ADT from Pa1 based on an array (use array doubling).

Defn

A Graph G is a pair of sets

$$G = (V, E)$$

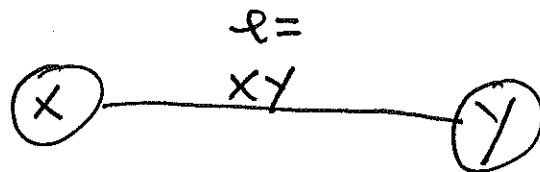
$\nearrow$ $\uparrow$
 Vertex Edge
 set set

where

$V \neq \emptyset$, and

$$E \subseteq V^{(2)} = \{ \text{2-element sets of } V \}$$

• if $\{x, y\} \in E$ Picture



- xy joins its two ends x and y .
- x is adjacent to y
- x is incident with xy

note:



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Defn

A Digraph G is a Pair of sets

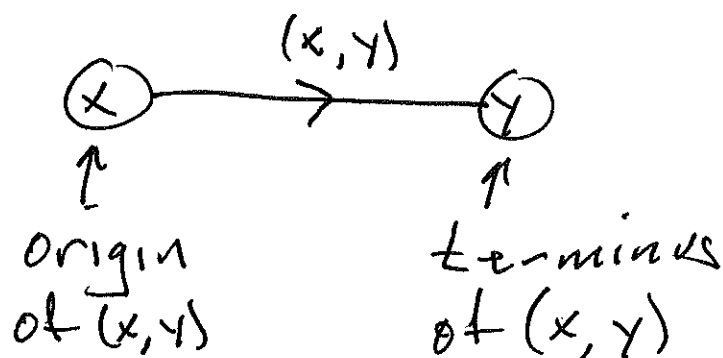
$$G = (V, E)$$

where

$$V \neq \emptyset$$

$$E \subseteq V \times V = \{ \text{ordered Pairs of vertices} \}$$

if $(x, y) \in E$ picture



note:-



allowed since
 $(x, y) \neq (y, x)$

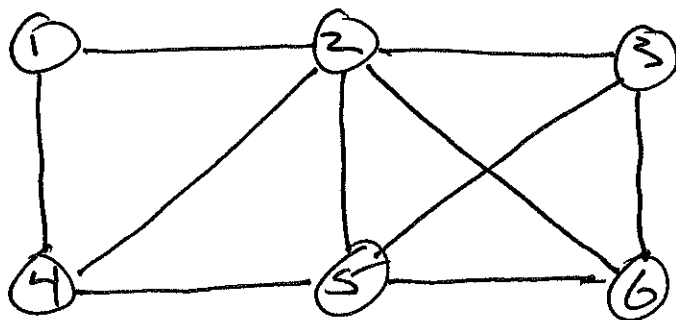


allowed since
 $(x, x) \in V \times V$

Ex. $V = \{1, 2, 3, 4, 5, 6\}$

$E = \{12, 14, 23, 24, 25, 26, 35, 36, 45, 56\}$

Picture:-



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• A ^{$x-y$} walk is a seq. of vertices

$$x = v_0, v_1, v_2, \dots, v_k = y$$

in which $\{v_{i-1}, v_i\} \in E$ for $1 \leq i \leq k$.

length = (# of edge traversals) = k

a trivial walk is one with $\text{length} = 0$

a walk is closed if $x = y$.

- an $x-y$ trail is a walk in which no edge is repeated.
- an $x-y$ Path is a trail in which no vertex is repeated (except possibly when $x = y$)

• a non-trivial closed path
is called a cycle



we say $y \in V$ is reachable from $x \in V$
iff G contains a x - y Path

Defn

we say graph G is connected
iff for all $x, y \in V(G)$: x is
reachable from y .

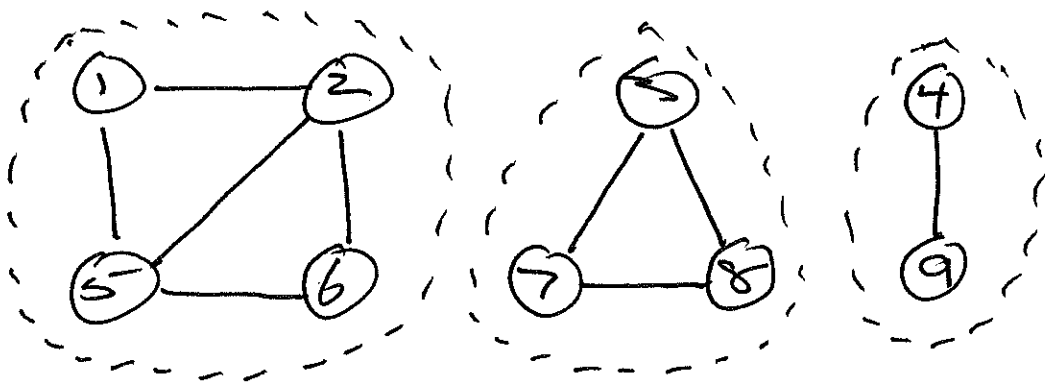
Defn

A subgraph H of G is called a connected component of G iff

- (1) H is connected, and
- (2) H is maximal w.r.t. (1)

Ex.

G

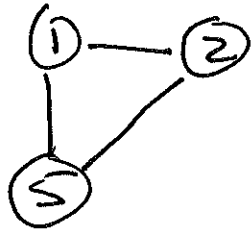


Subgraph



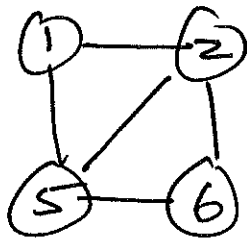
Disconnected

$(\{1, 2, 5\}, \{1, 2\})$

Subgraph

connected but
not maximal

$(\{1, 2, 5\}, \{12, 15, 25\})$

Subgraph

connected &
maximal.

$(\{1, 2, 5, 6\}, \{12, 15, 25, 26, 56\})$