

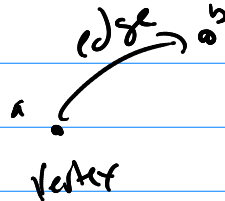
Math 322

toys = relationships

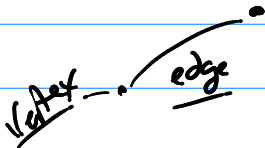
rels = $R_1 \circ R_2, R_1 = R_n, \dots$

↓
 objects, function

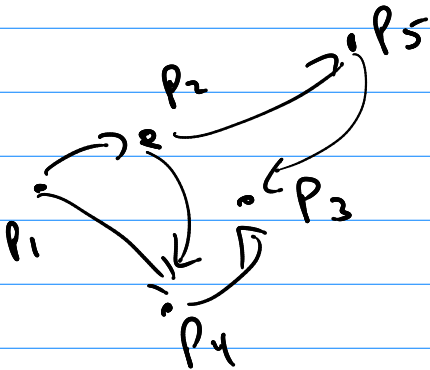
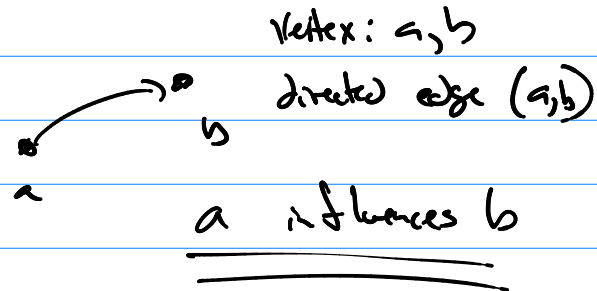
1) Visualization: digraph



New Def: - sets of vertices (non-empty)
 - sets of edges between the vertices } - graph
 $G(V, E)$



Why? (ex) Influence graph



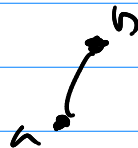
Undirected Graphs

$G = (V, E)$

Directed Graphs

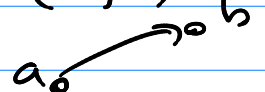
E are unordered sets of pairs.

(ex) edge = $\{a, b\}$



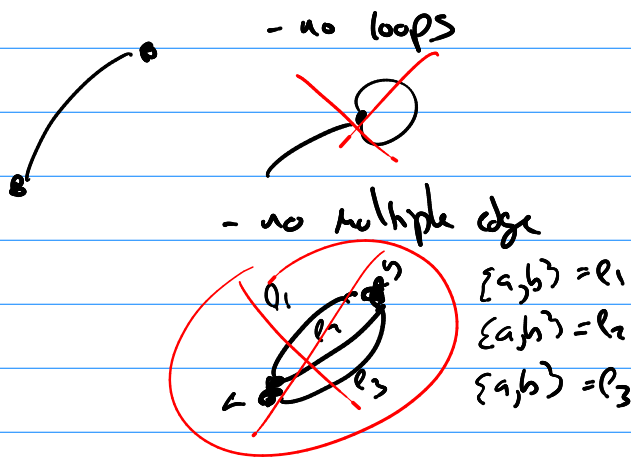
E are ordered sets of pairs

(ex) edge = (a, b)

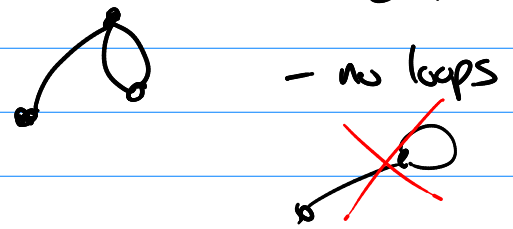


For undirected graphs ..

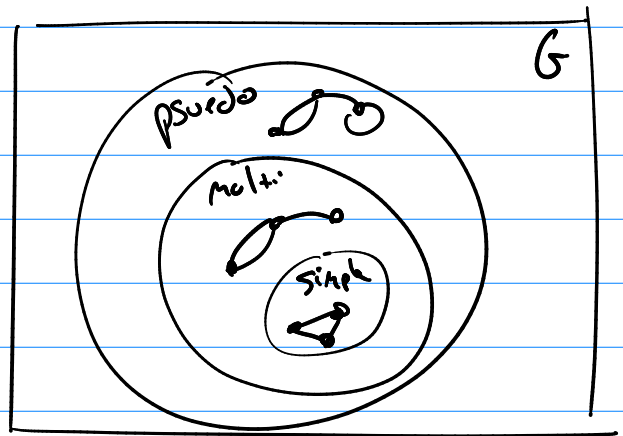
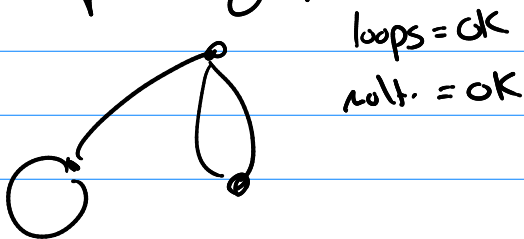
(1) Simple undirected graph



(2) undirected multigraph

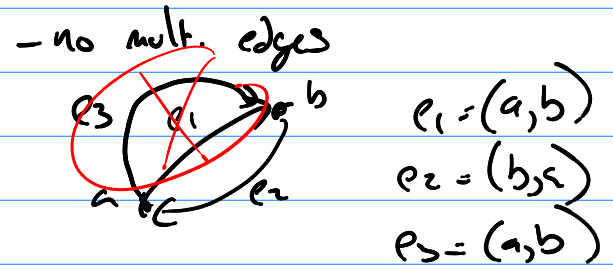


(3) pseudograph

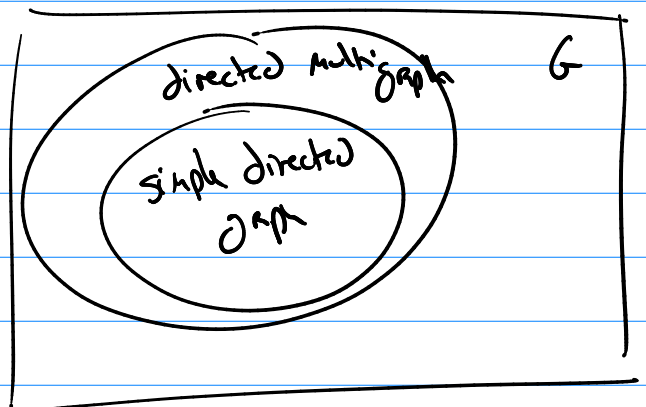
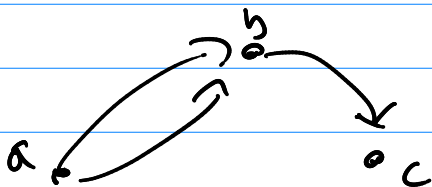


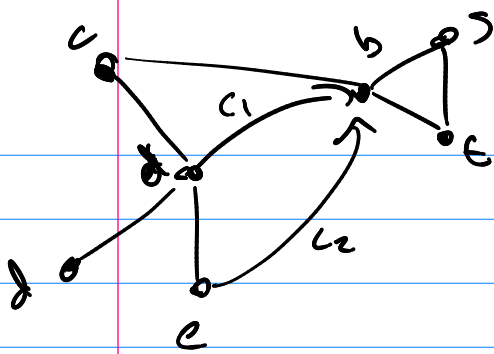
Directed Graphs (loops are always OK)

(1) simple directed graph



(2) directed multigraph



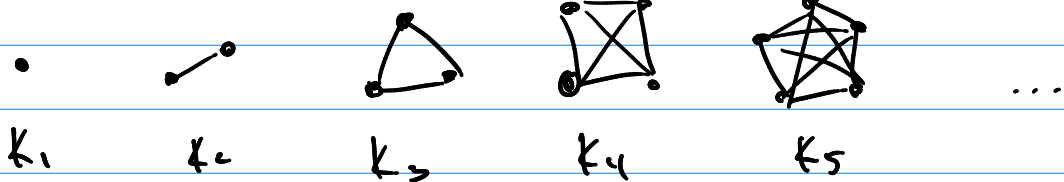


Mixed graph: both undirected and directed edges

types:

① Special Simple undirected graphs

a) Complete Graph: every vertex connects to every other vertex.

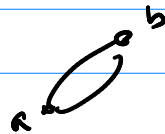


terms for undirected graphs

① loops $a \rightarrow a$

$$e = \{a, a\}$$

② multiple edges



$$e_1 = \{a, b\}$$

$$e_2 = \{a, b\}$$

③ $|V|$ = how many vertices

④ $|E|$ = how many edges

⑤ degree of a vertex

$\deg(v)$ = number of edges connected to v and loops (count for 2).

K_1



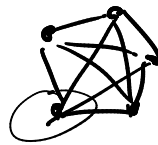
K_2



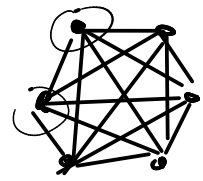
K_3



K_4



K_5



K_6

...

$|V|=1$

$|V|=2$

$|V|=3$

$|V|=4$

$|V|=5$

$|V|=6$

...

$|E|=0$

$|E|=1$

$|E|=3$

$|E|=6$

$|E|=10$

$|E|=15$

.

∴

∴

∴

∴

$\forall \deg(v) = 0$

