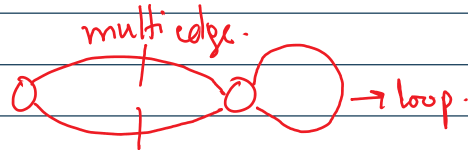
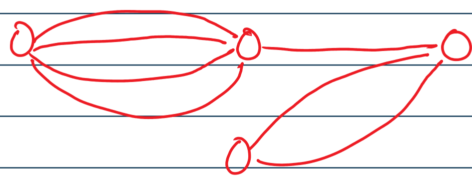
lecture 20 GRAPHS

Syntax	Semantics.
O	Set of Vertices.
→, —	Set of Edges.

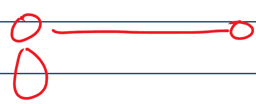
Types:- Simple Graph. 1) ¬ multi edge. and.
2). ¬ loops.



Multi Graph: which Contain multi edges.

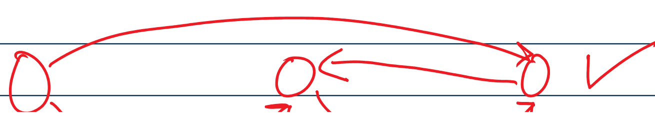


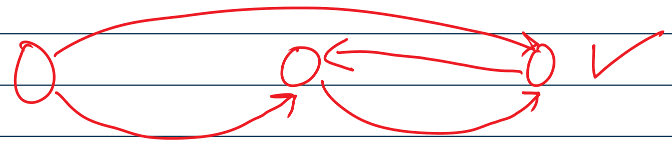
Psuedo graph:- 1) loop. OR.
2) multiedge.



Undirected Graph:- edges do not have arrows.

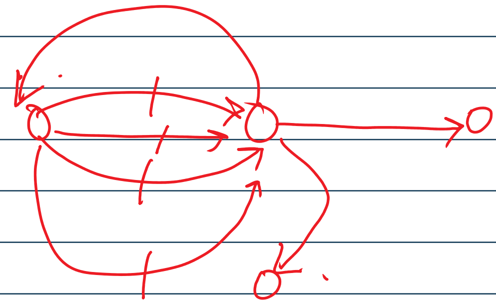
directed Simple Graph:-





multiplicity.

§4.



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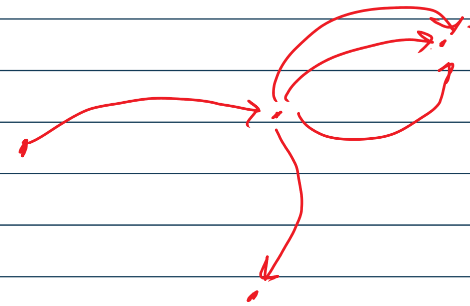
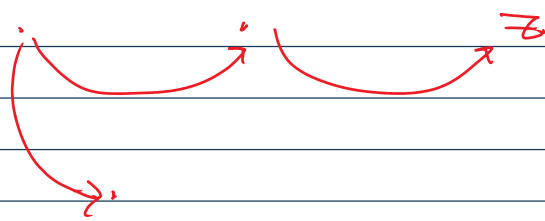
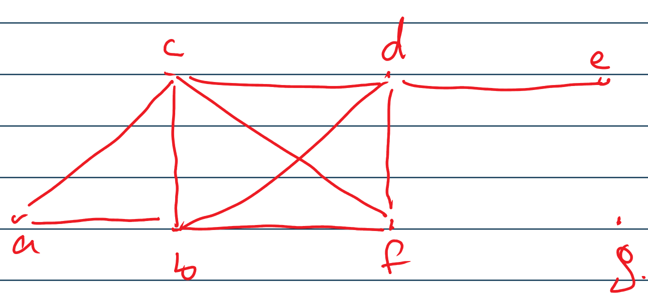


Call Graph:



Degree of a Graph:

Ex 2
536



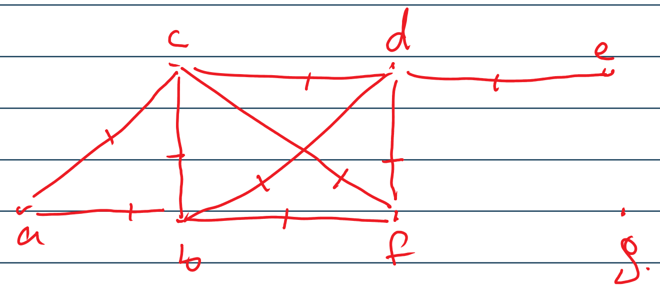
deg(a) = 2
" (b) = 4
" (c) = 4
" (d) = 4

" (e) = 2
" (f) = 3
" (g) = 0

18.

Handshaking theorem:

$$2e = \sum_{v \in V} \deg(v).$$



$2e = \deg(a) + \deg(b) + \dots + \deg(g).$

$= 2 + 4 + 4 + 4 + 2 + 3 + 0$

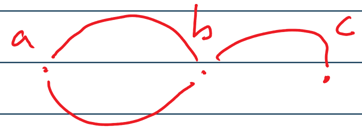
$2e = 18$

$\Rightarrow e = 9.$

$V = \{a, b, c, d, e, f, g\}.$

deg(a) = 2
" (b) = 4
" (c) = 4
" (d) = 4
" (e) = 2
" (f) = 3
" (g) = 0

theorem An Undirected graph has even number of Vertices having odd degree.

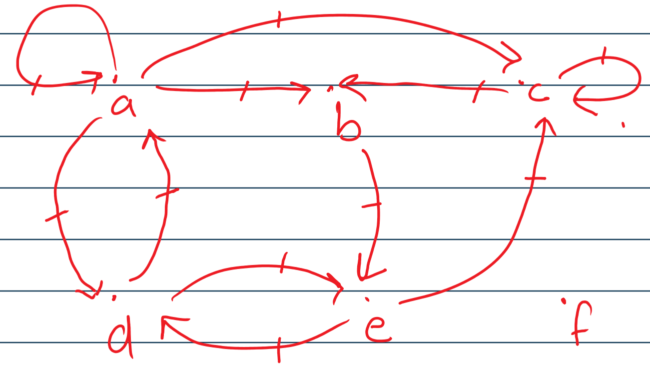


deg(a) = 2.
(b) = 3 ✓
(c) = 1. ✓

In degree & out degree.

Directed Graph.

Exy :-
P538



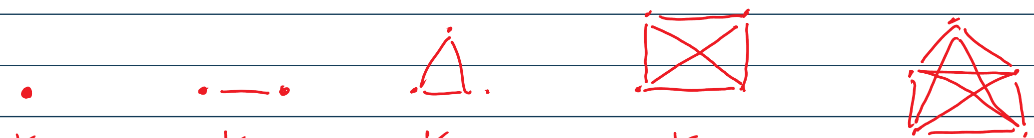
$\deg^-(a) = 2$
$\deg^-(b) = 2$
$\deg^-(c) = 3$
$\deg^-(d) = 2$
$\deg^-(e) = 2.$
$\deg^-(f) = 0/11.$

$\deg^+(a) = 4$
$\deg^+(b) = 1$
$\deg^+(c) = 2.$
$\deg^+(d) = 2$
$\deg^+(e) = 2$
$\deg^+(f) = 0/11.$

$$e = \sum_{v \in V} \deg^-(v) = \sum_{v \in V} \deg^+(v).$$

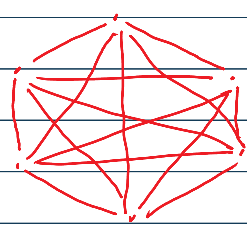
Special types of Simple Graphs.

1. Complete Graph. K_n. $n = 1, 2, \ldots \infty$



K_1 K_2 K_3 K_4 K_5

	Vertices	Edges.
K_1	1	0
K_2	2	1
K_3	3	3
K_4	4	6
K_5	5	10
	n	$\frac{n(n-1)}{2}$



K_6.

2. Cycles C_n $n \geq 3, 4, 5 \ldots$

$1, 2, 3, \ldots n.$

C_n

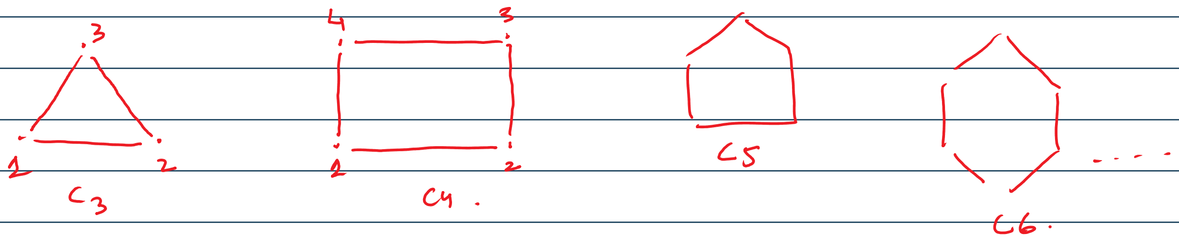
$(1,2)\ (2,3), (3,4) \ldots (n-1, n), (n,1).$

Vertices n

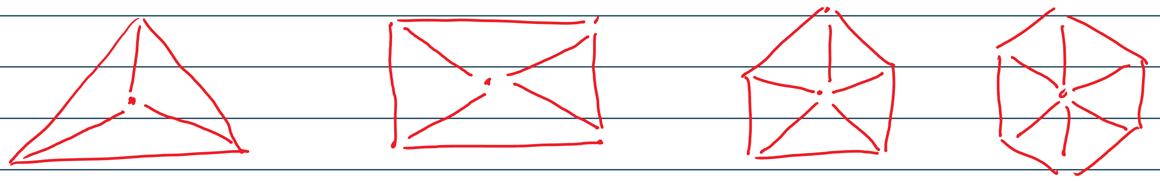
Edges n.

2 4 3

Edges n.



3- Wheels. W_n $n \geq 3, 4 \dots$



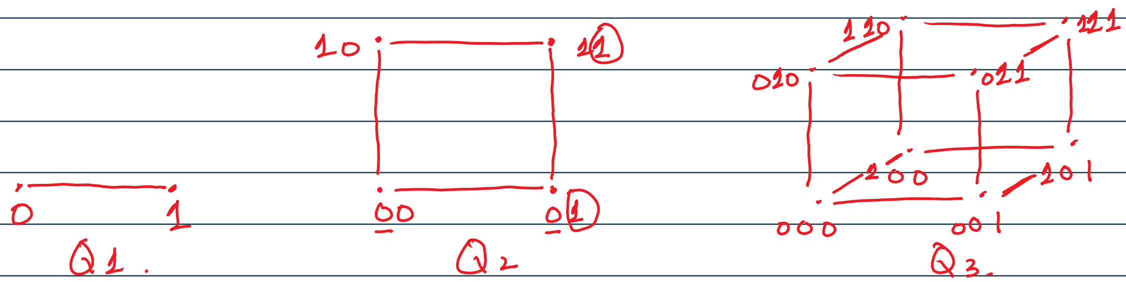
W_3 W_4 W_5 W_6.

W_n:

Vertices $n+1$

Edges. $2n$.

4- Cuboid. Q_n $n = 1, 2, 3 \dots$

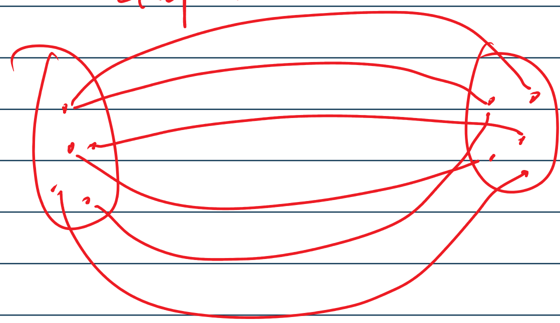


Q_n

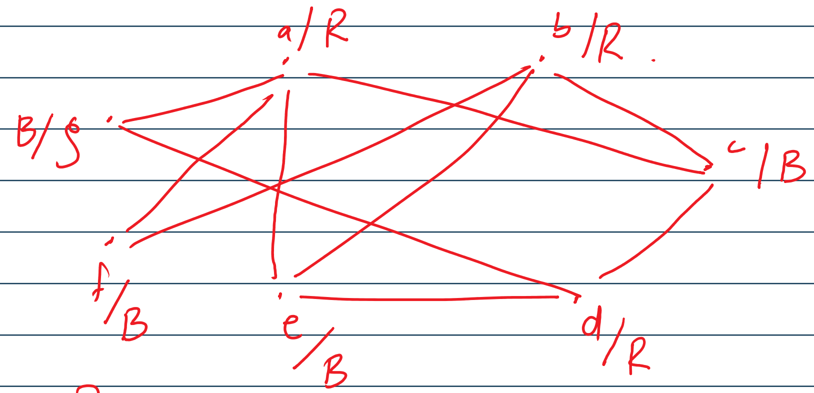
Vertices = 2^n

Edges = $2^{n-1} \cdot n$.

Bipartite Graph.



Ex 11
p541.



$G_1 = \{a, b, d\}$

$G_2 = \{g, f, e, c\}$