

CS & IT ENGINEERING



Discrete Mathematics

Graph Theory

Lecture_04

By- Satish Yadav Sir



Topics to be Covered



Topic

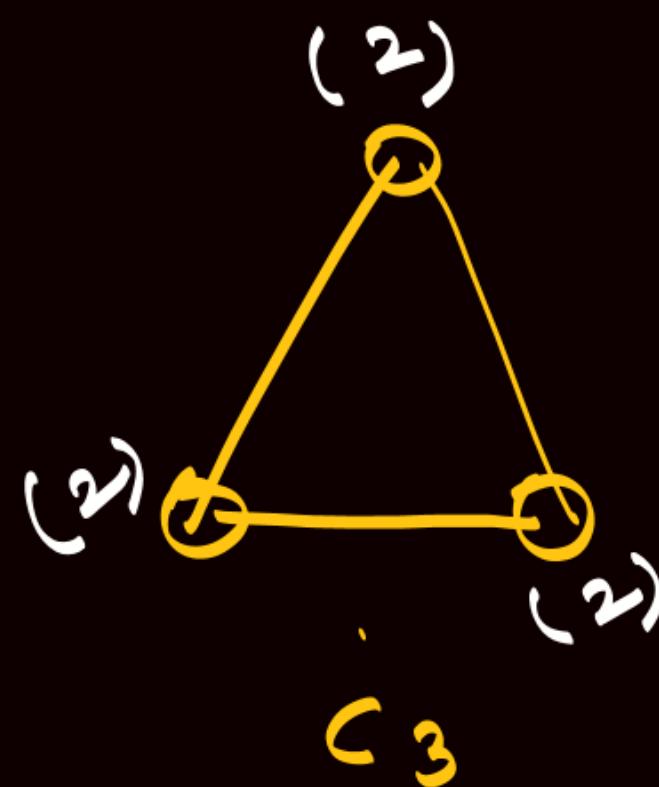
Types Of Graphs

Topic

Bipartite Graph

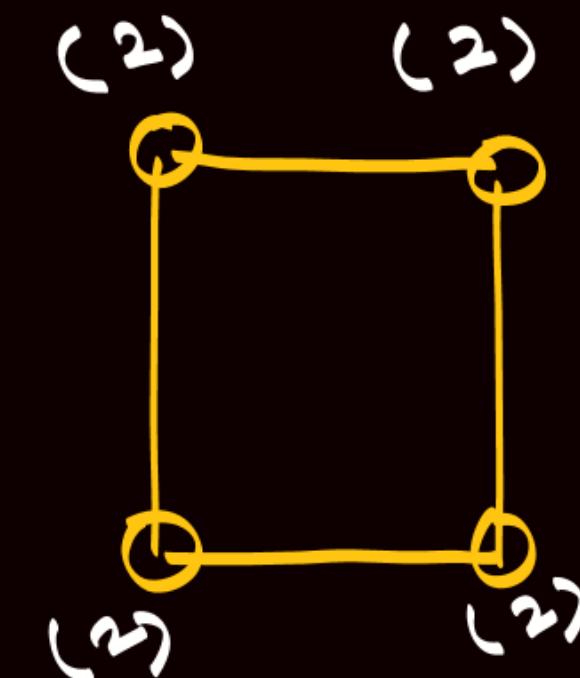


Cycle Graph (C_n) ($n \geq 3$)



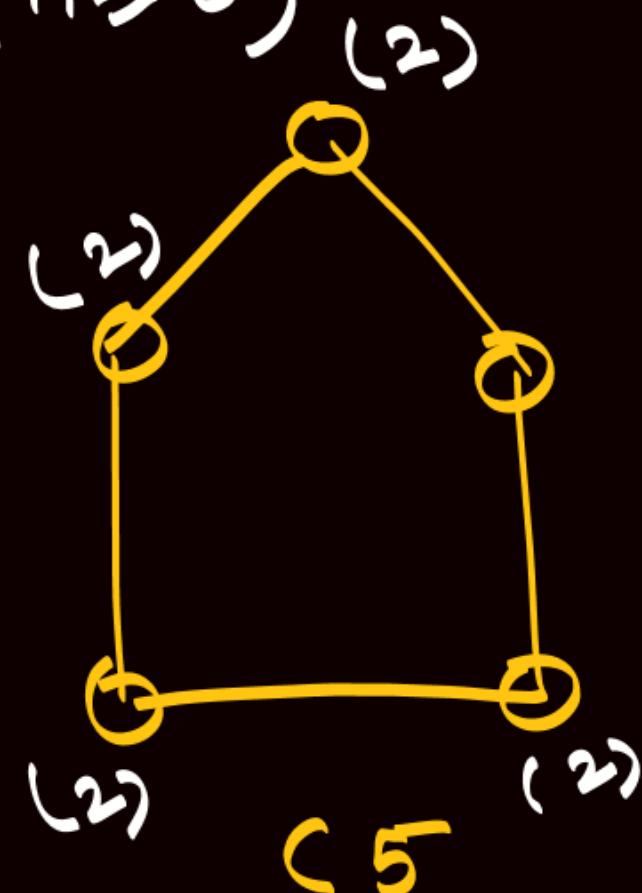
$$n = e = 3$$

odd
length cycle.



$$n = e = 4$$

Even
length cycle.



$$n = e = 5$$

[ODLC]

* Degrees of all vertices must be 2.

$$\sum d(v_i) = 2e$$

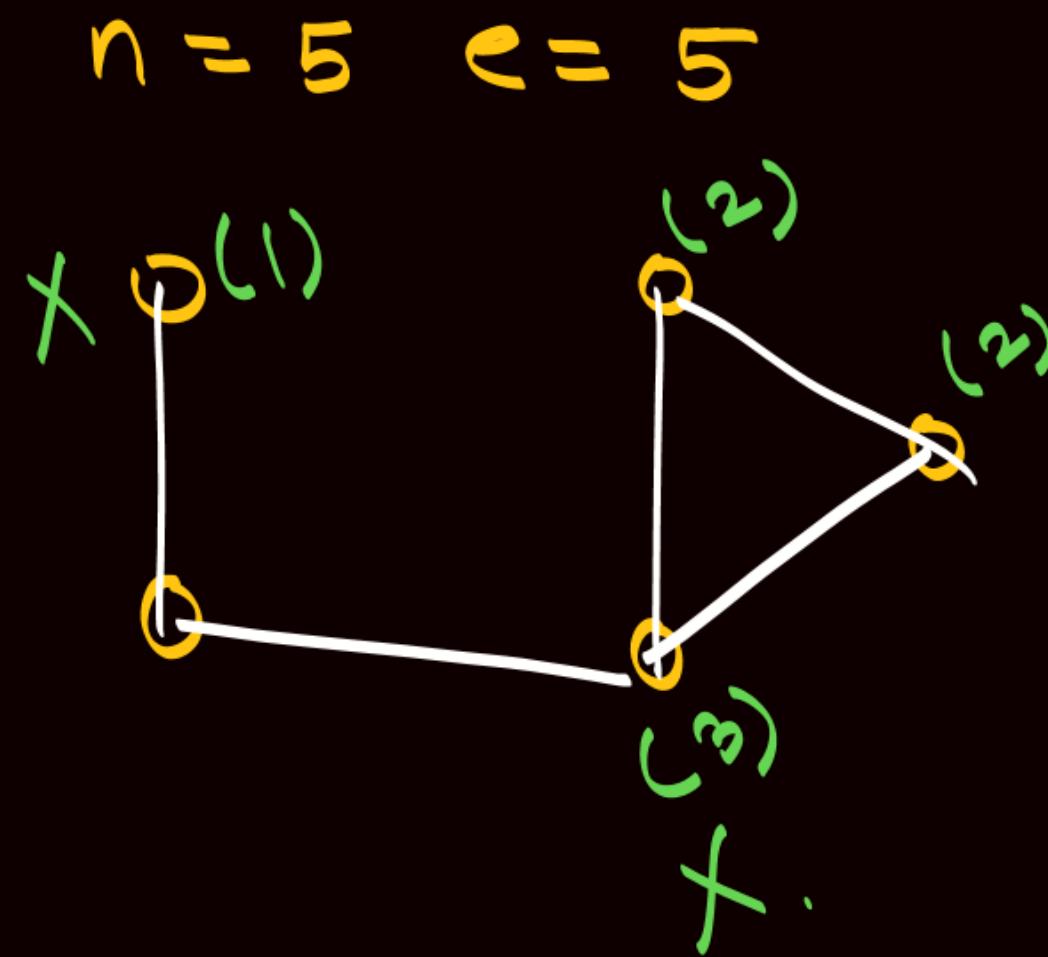
$$n \times 2 = 2e$$

↓

$$n = e.$$

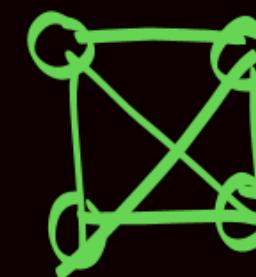
→ if G is C_n then $n = e(T)$

→ In G , $n = e$ then G is C_n . (F)

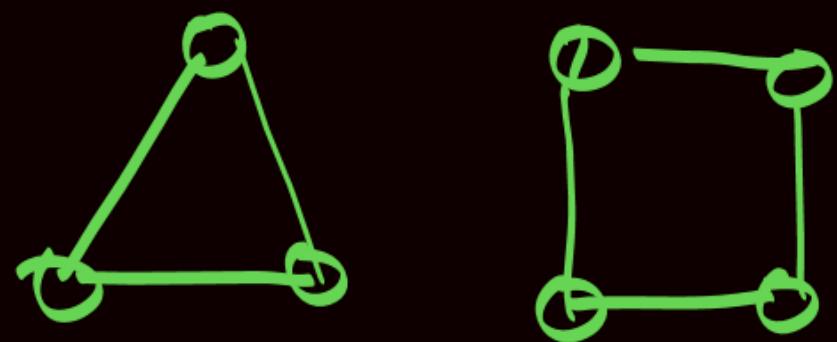


* if G is C_n then G is Regular (T)

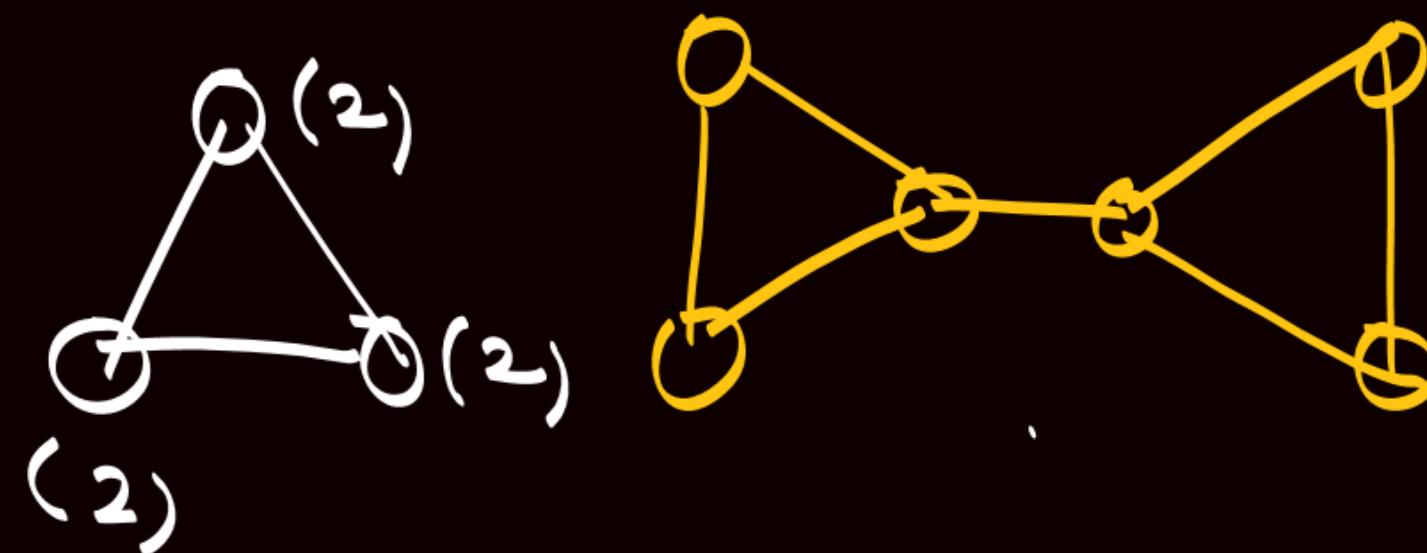
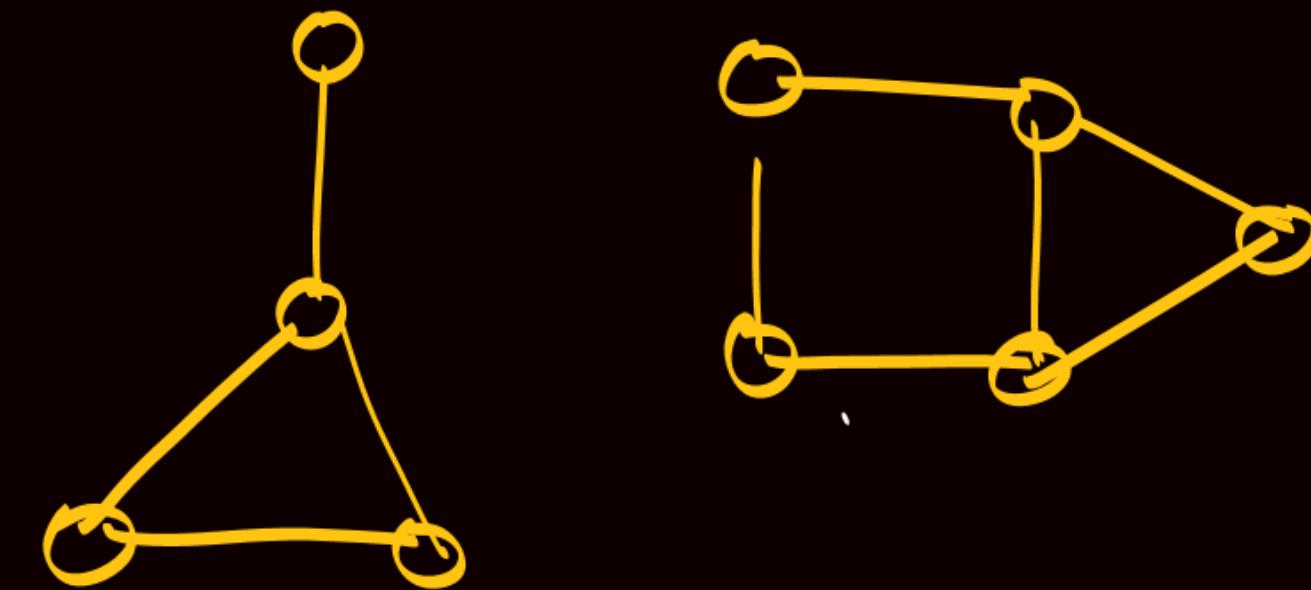
* if G is Regular then G is cycle. (F)



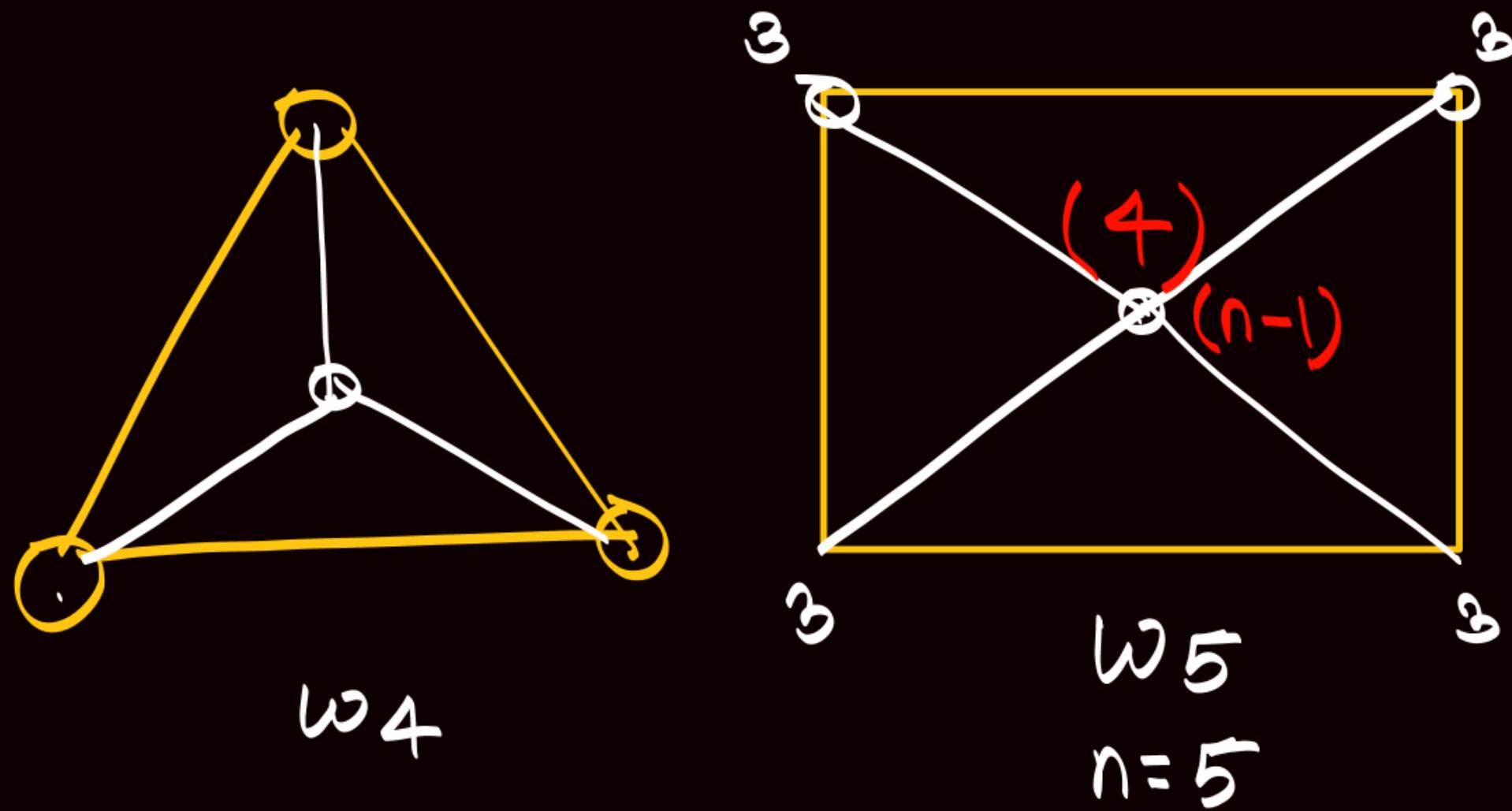
Cycle Graph



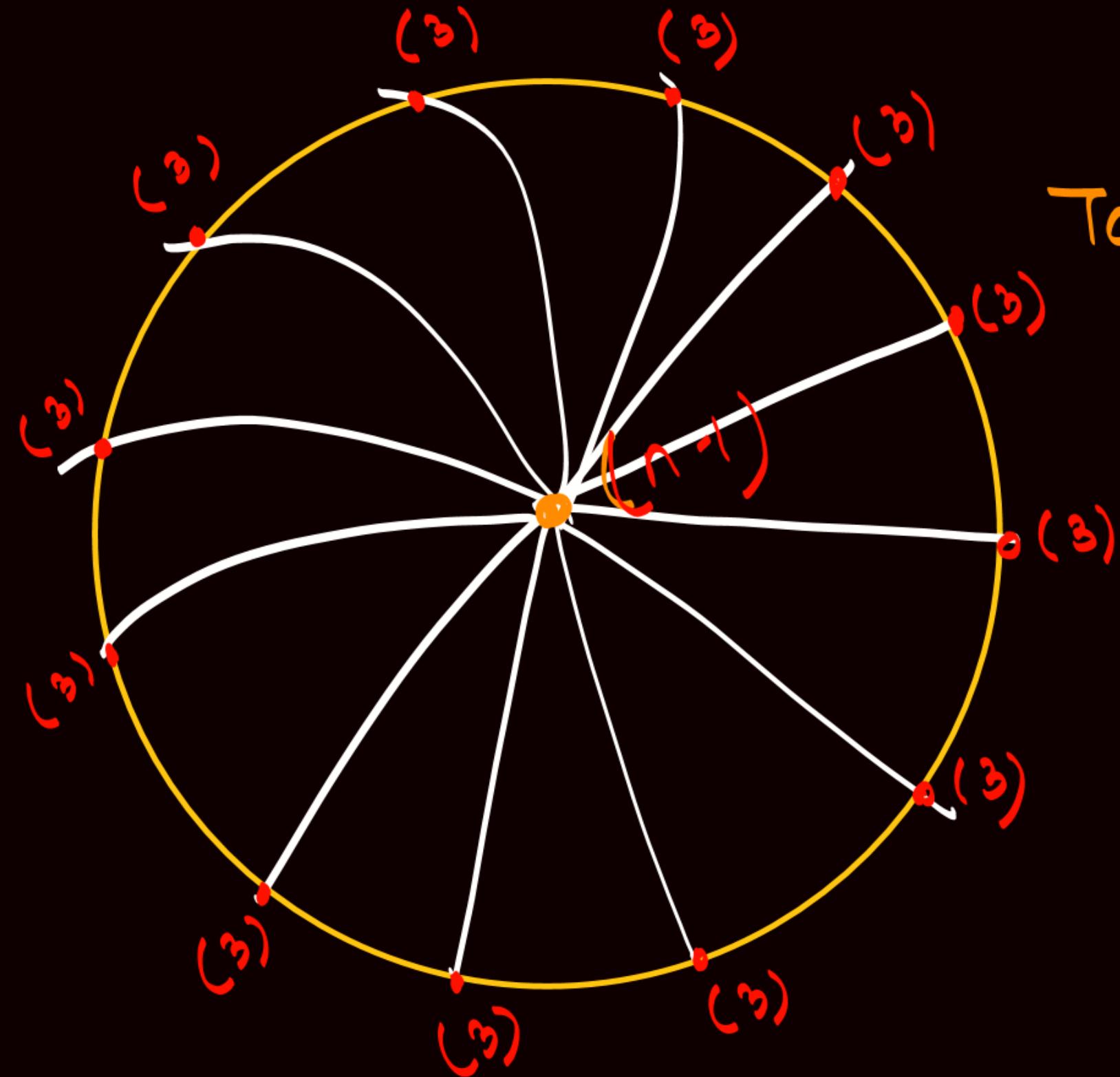
Graph containing cycle (cyclic graph)



Wheel Graph (W_n) ($n \geq 4$)



c_4 4 edges.
+
 4 edges.
 Const^n



Total vertices = n .

$n-1, \underbrace{3, 3, 3, \dots, 3}_{n-1 \text{ vertices}}$

$$\sum d(v) = 2e$$

$$1(n-1) + (n-1)(3) = 2e$$

$$4(n-1) = 2e$$

$w_5 \quad 4 \ 3 \ 3 \ 3 \ 3$

$$e = 2(n-1)$$

$w_6 \quad 5 \ 3 \ 3 \ 3 \ 3 \ 3$

$w_7 \quad 6 \ 3 \ 3 \ 3 \ 3 \ 3 \ 3$

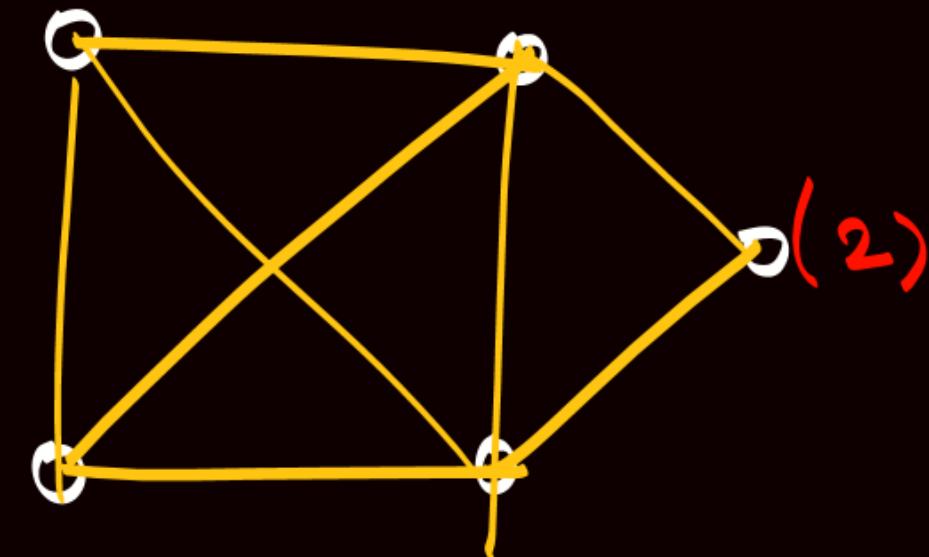
→ if G is W_n then $e = 2(n-1)$. (T)

→ if G is having $e = 2(n-1)$ then G is W_n (F)

$$n = 5 \quad e = 2(n-1)$$

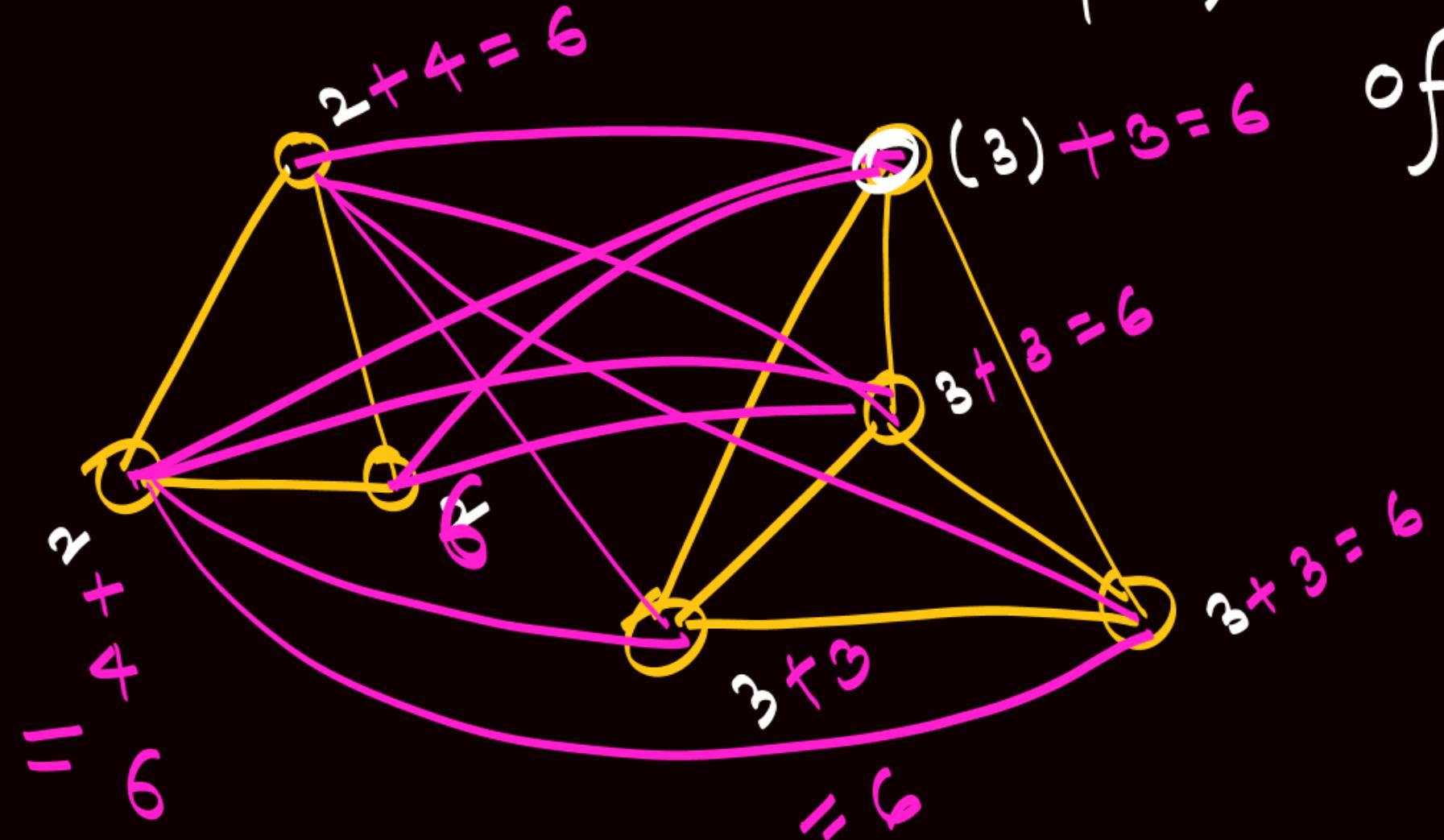
$$= 2 \cdot 4$$

$$e = 8$$



if we connect all vertices of C_3 with all vertices of W_4

then we will get Graph, what will be $\Delta(G)$ of resultant graph?

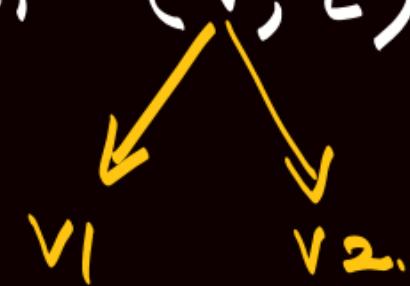


7 vertices &
degrees of all
vertices will be 6.

$$\Delta(K_7) = 6.$$

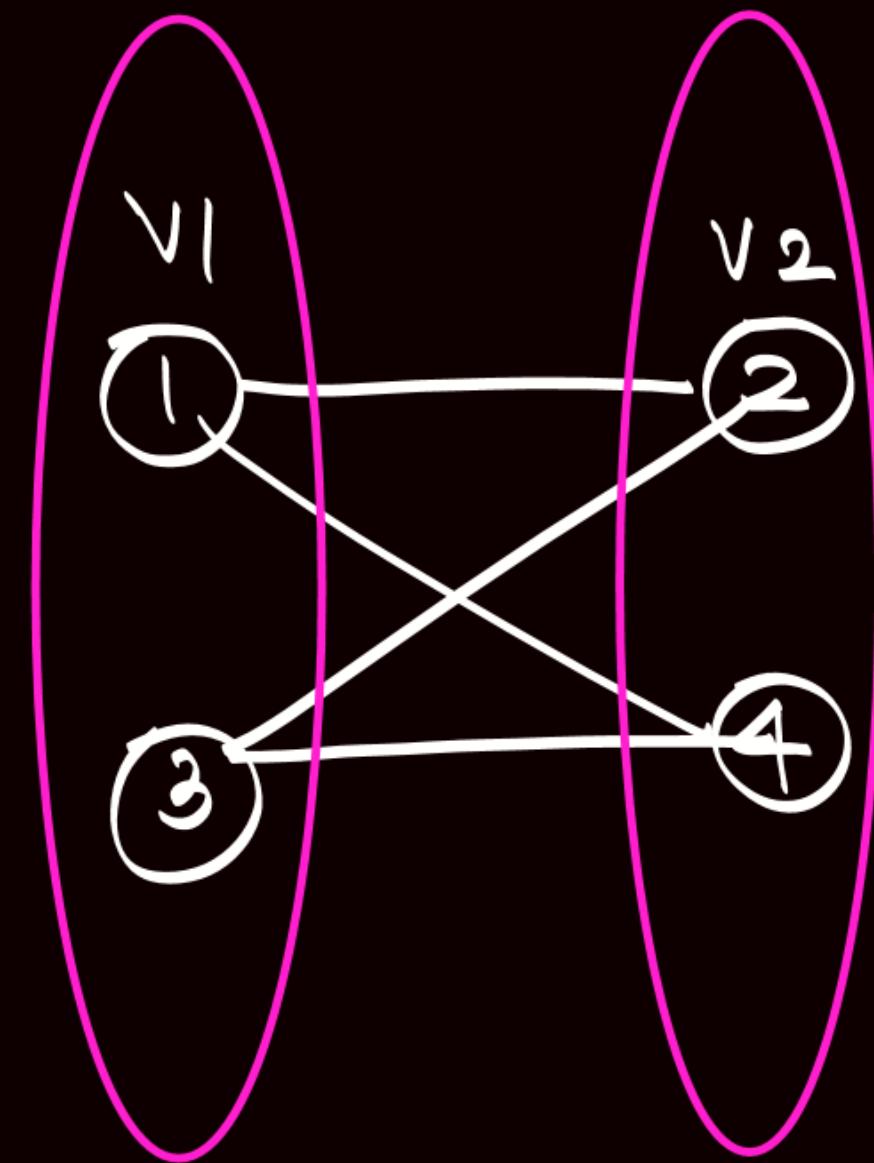
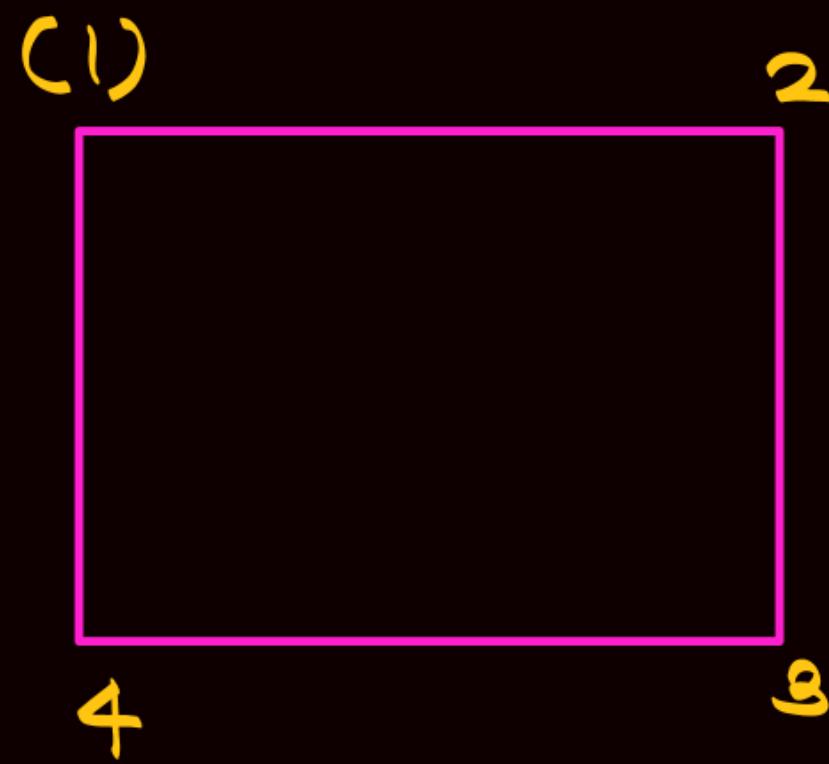
Bipartite Graph

$$G = (V, E)$$

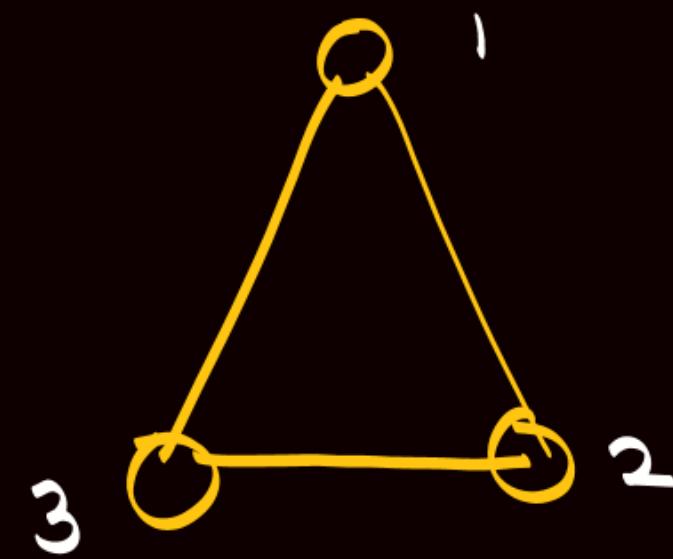


V can be divided into 2 partitions. (v_1, v_2)

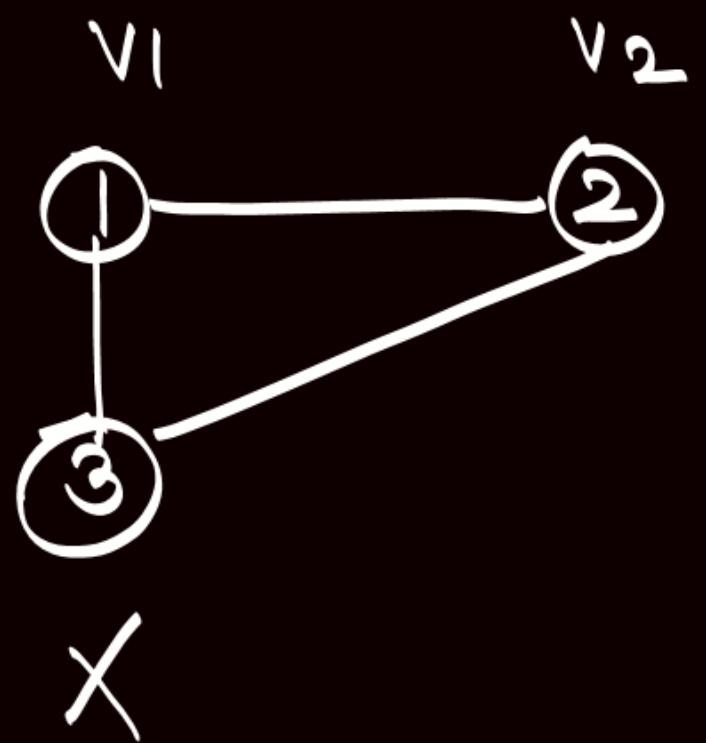
all the edges will be from one set to another set but not in same set.



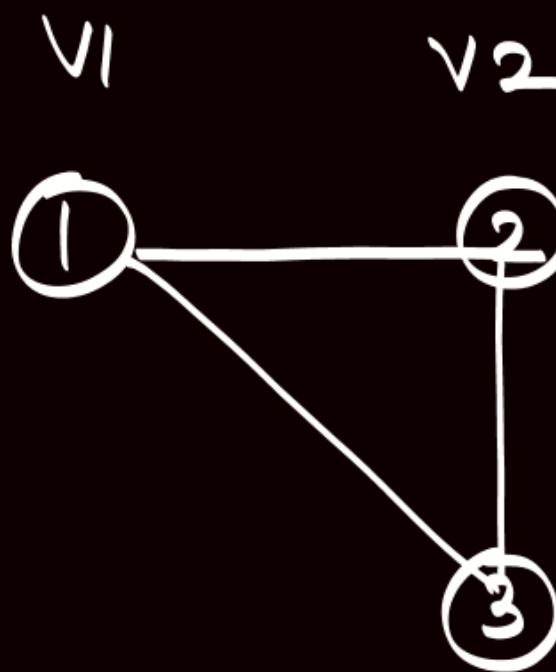
B. P. G. V



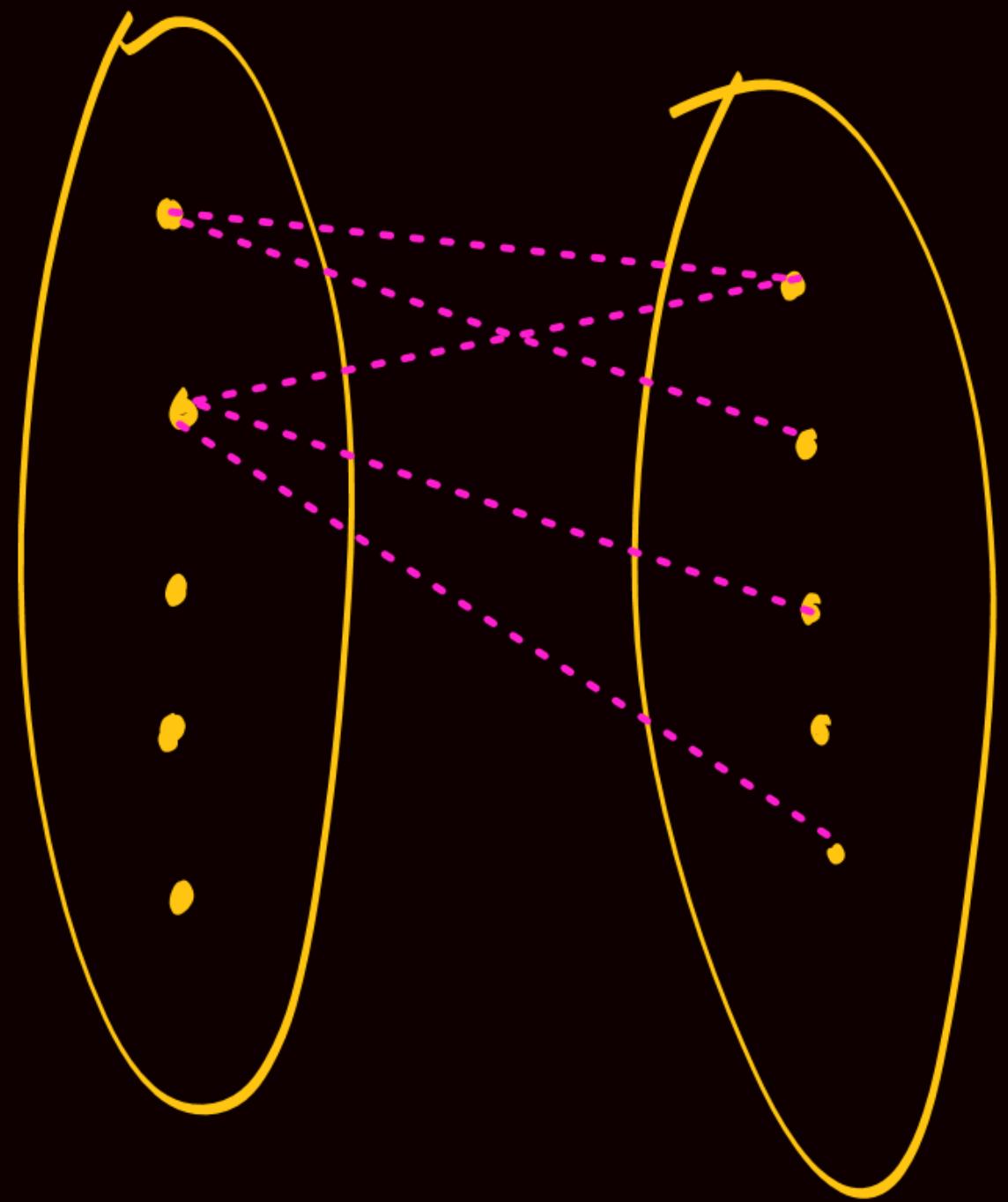
not B.P.G.

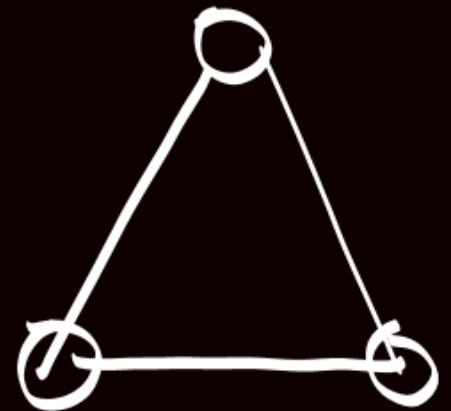


X.



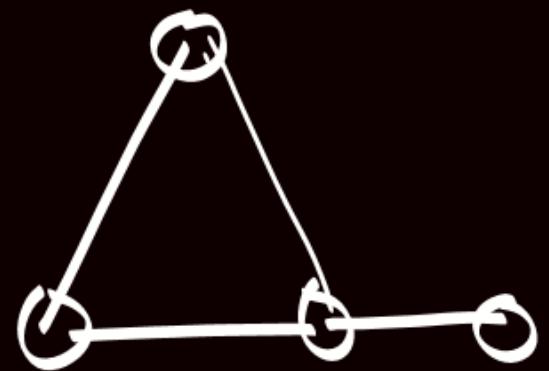
X.



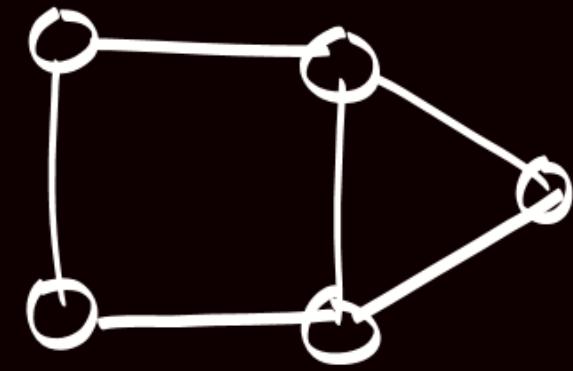


C_3

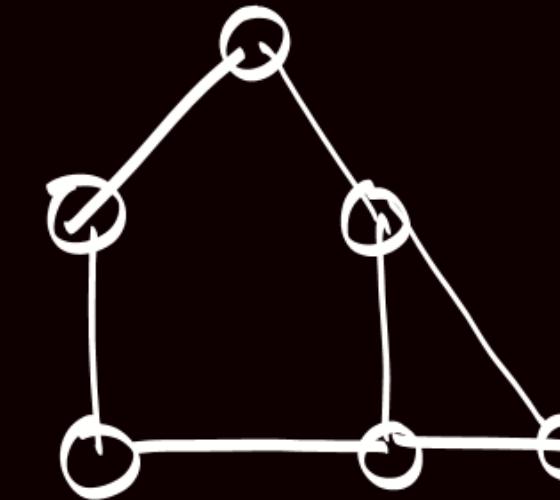
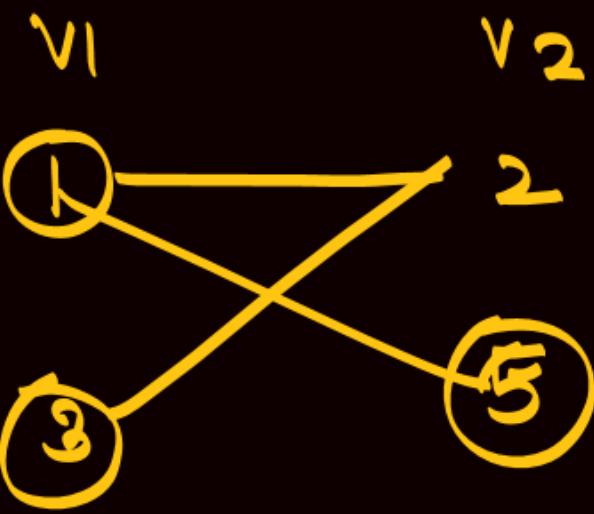
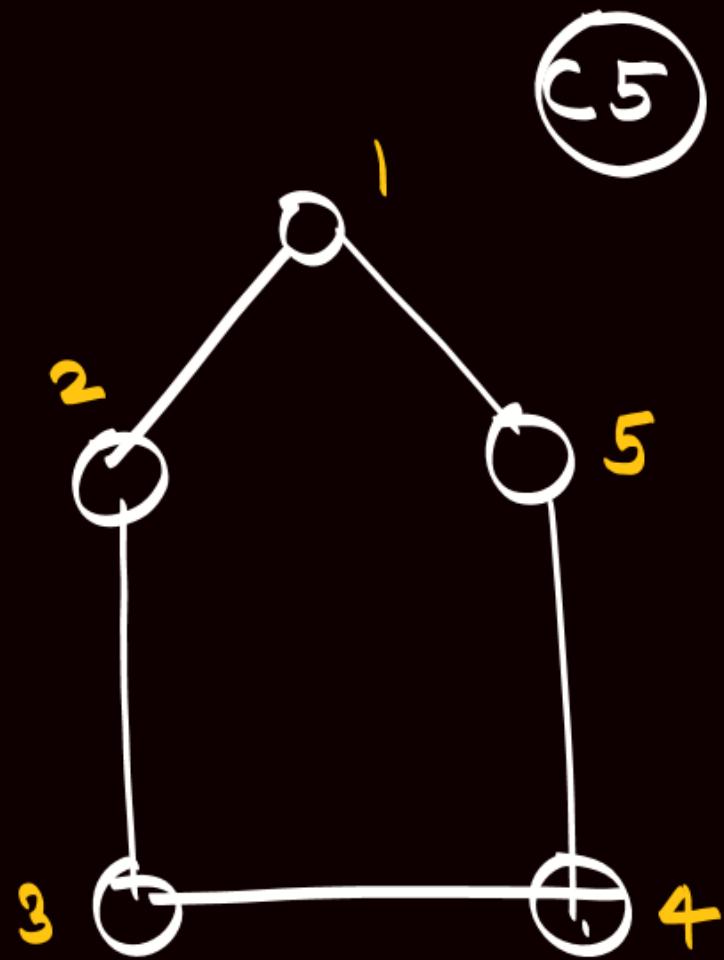
not B.P.G.



not B.P.G.

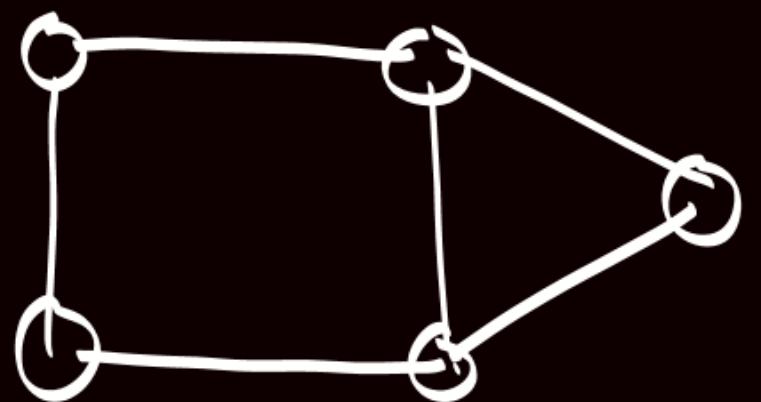


not B.P.G.

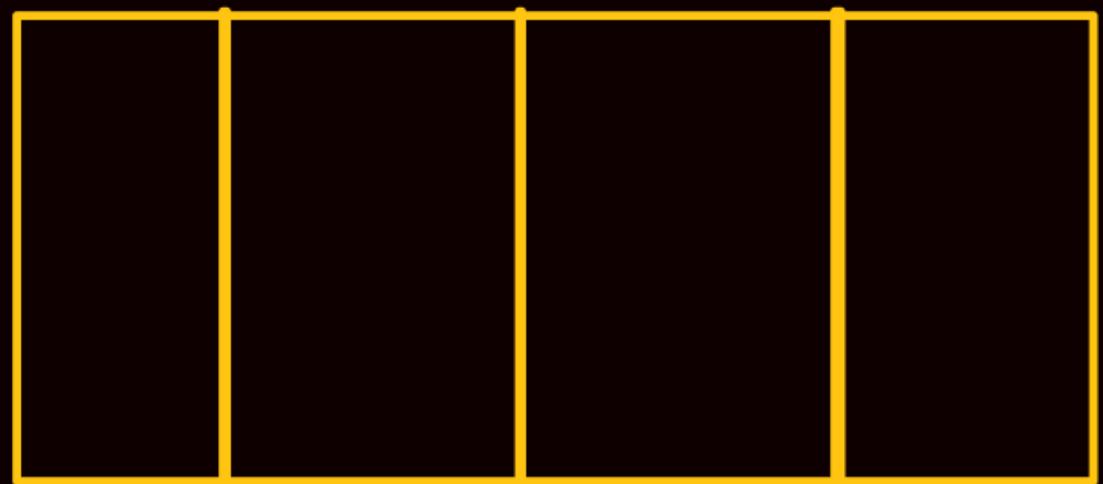


not B.P.G.

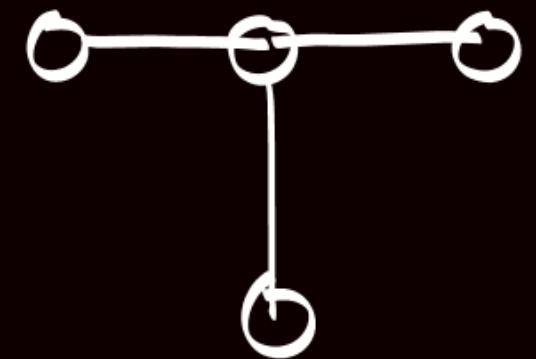
Thm: Bipartite Graph does not contains odd length cycle.



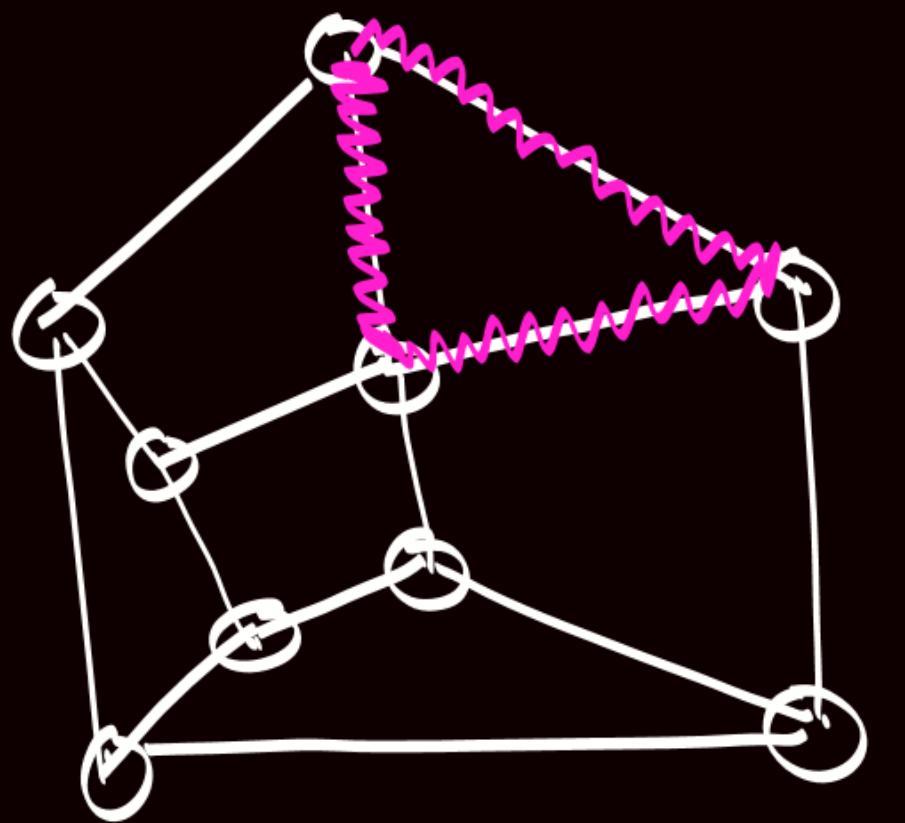
ODLC ✓
B.P.G. ✗

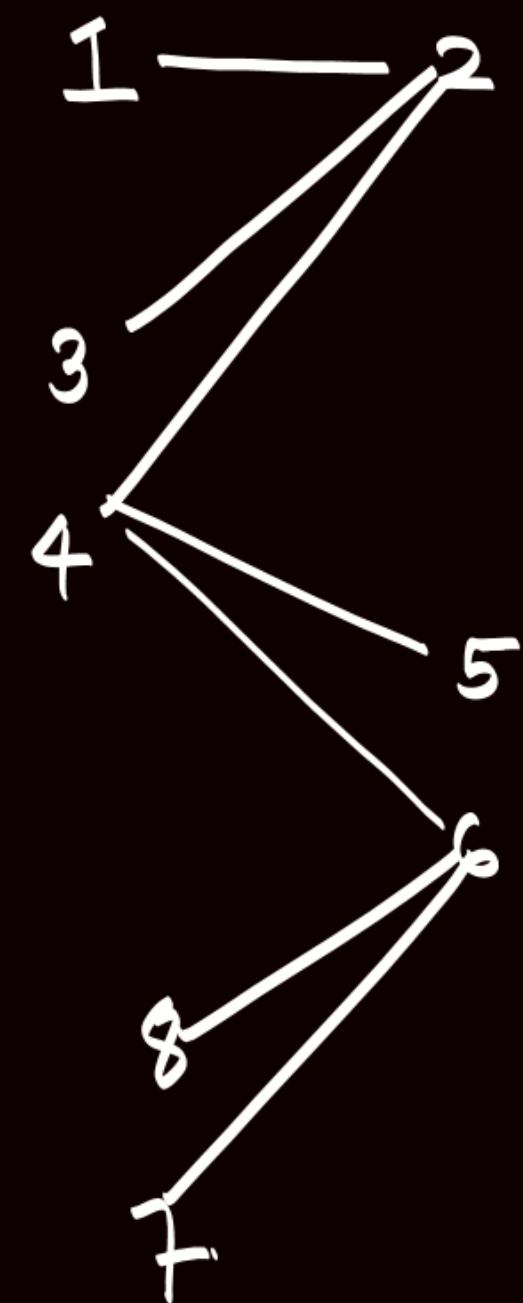
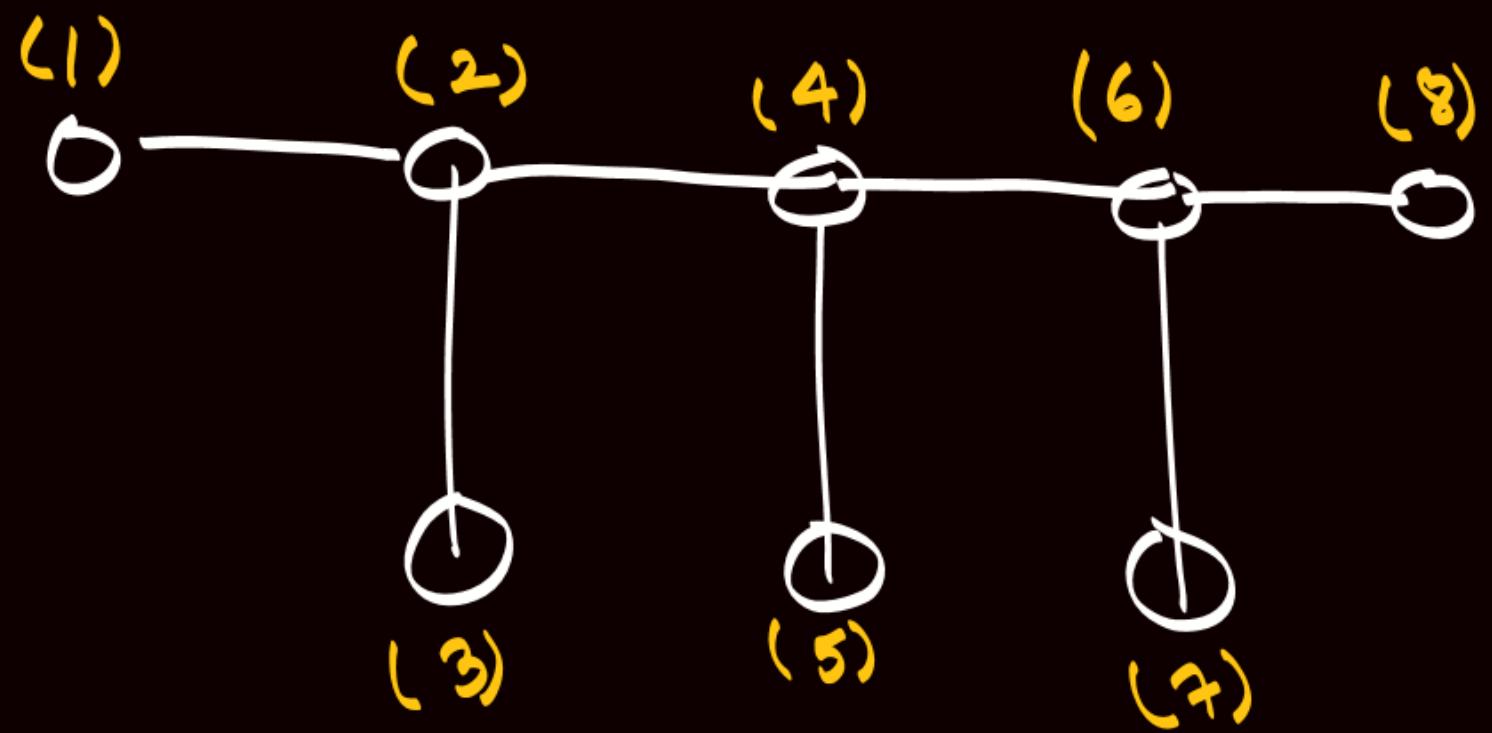


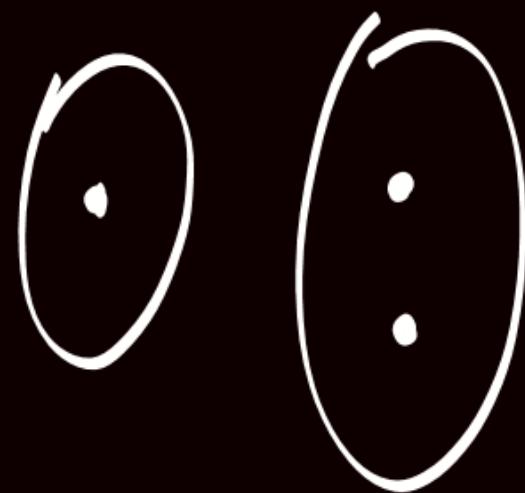
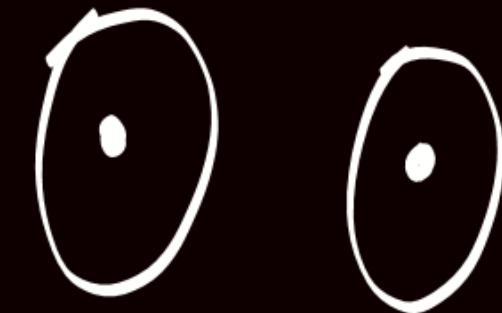
ODLC ✗
B.P.G. ✓



ODLC ✗
B.P.G. ✓



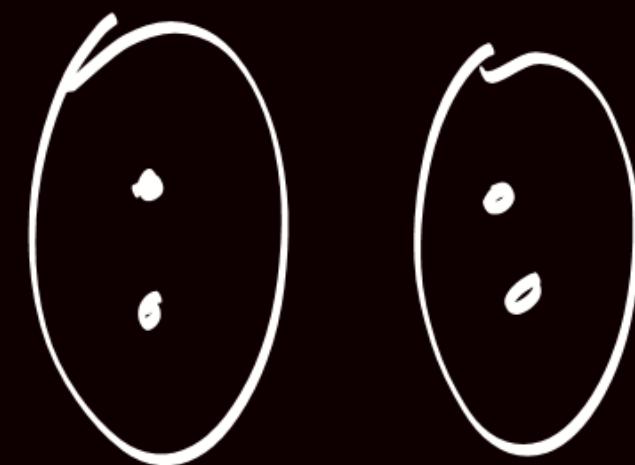
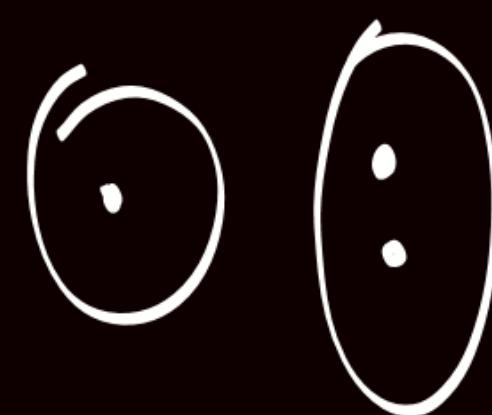




isolated vertex:

Degree 0 vertex

2 or more isolated vertices will always be B.P.G.



THANK - YOU