CS & IT ENGINEERING

Discrete maths
Graph theory

Lecture No. 06

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01 Complement graph

02 Self complement graph

03 Isomorphic graph

04 Hypercube graph

05 Practice

Types of graph

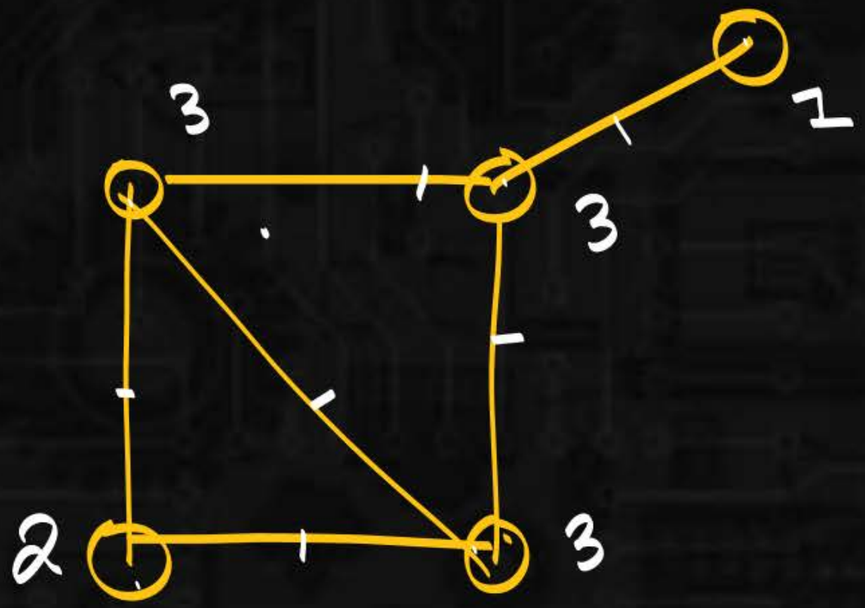
Isomorphic :

Same property.

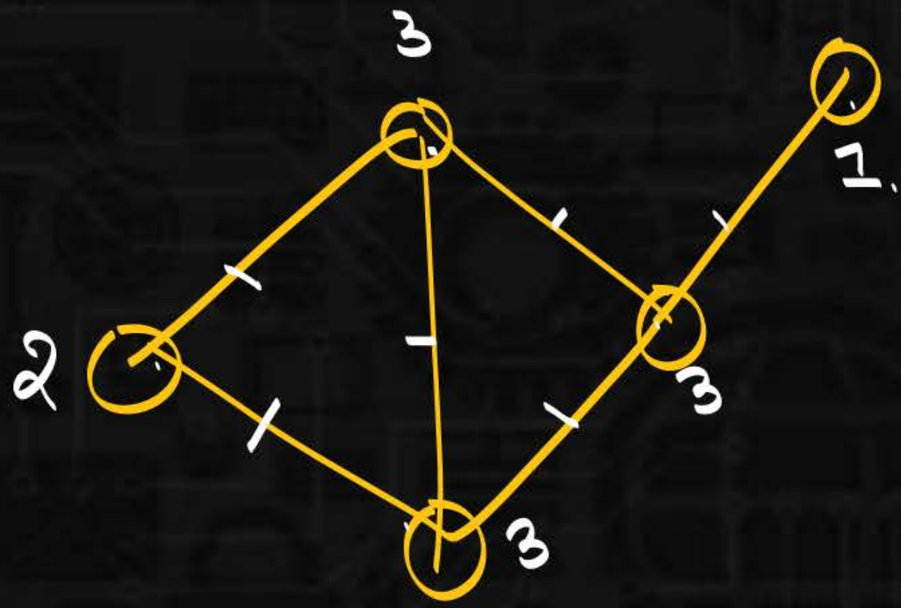
G_1, G_2 are isomorphic to each other when they have same incident property.

→ no. of vertices
→ no. of edges
→ no. of degree sequence

Types of graph



$\begin{cases} n = 5 \\ e = 6 \\ 3\,3\,3\,2\,1 \end{cases}$



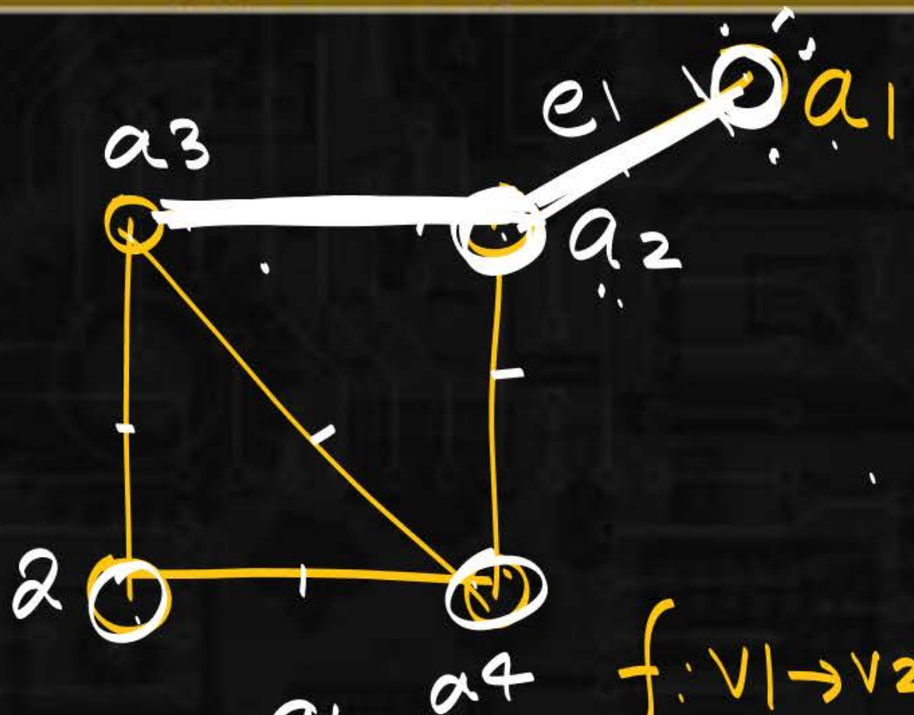
$\begin{cases} n = 5 \\ e = 6 \\ 3\,3\,3\,2\,1 \end{cases}$

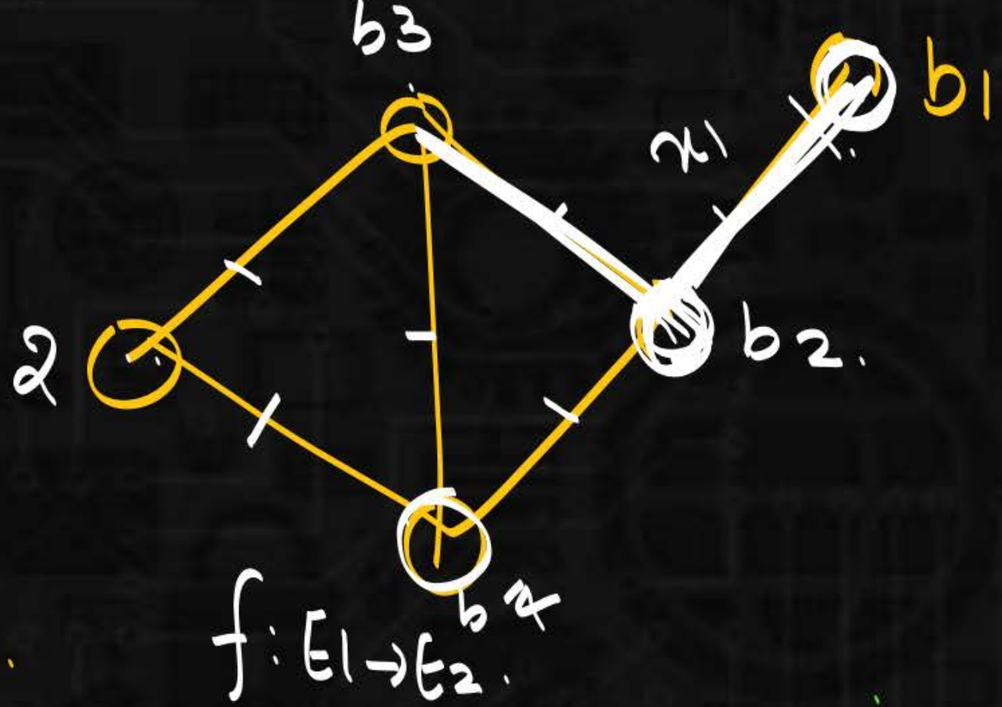
Isomorphic

↓

1 Graph but diff repstn.

Types of graph





a1
a2 ← a3
a4

$f: V_1 \to V_2$.

$\begin{cases} a_1 \to b_1 \\ a_2 \to b_2 \\ a_3 \to b_3 \\ \vdots \end{cases}$

$f: E_1 \to E_2$.

$(a_1, a_2) \to (b_1, b_2)$

$(a_2 a_3) \to (b_2, b_3)$

b2 ← b1, b3, b4.

G_1, G_2 are isomorphic to each other.

$f: G_1 \to G_2$ are 1:1 correspondance.

$f: V_1 \to V_2$.

$f: E_1 \to E_2$

$f: \psi_1 \to \psi_2$.

Function

1:1 correspondance

$f : A \rightarrow B$

id → name

1 → Ram

2 → Shyam

$f(x) = x + 1$ (1:1 c)

$1 \longrightarrow 2$

$2 \longrightarrow 3$

$a \longrightarrow a+1$

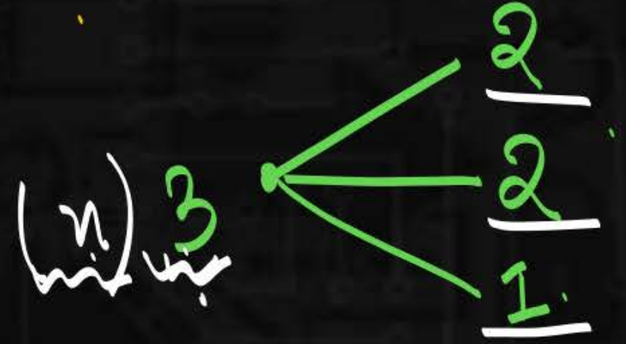
$b \longrightarrow b+1$

Types of graph

$n = 6$

$e = 5$

3 2 2 1 1 1



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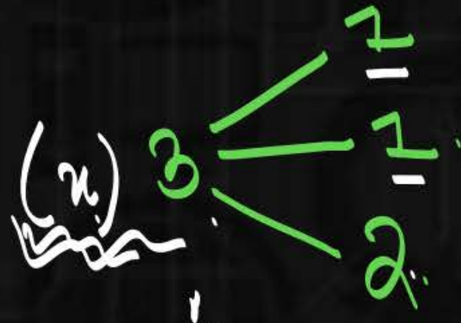
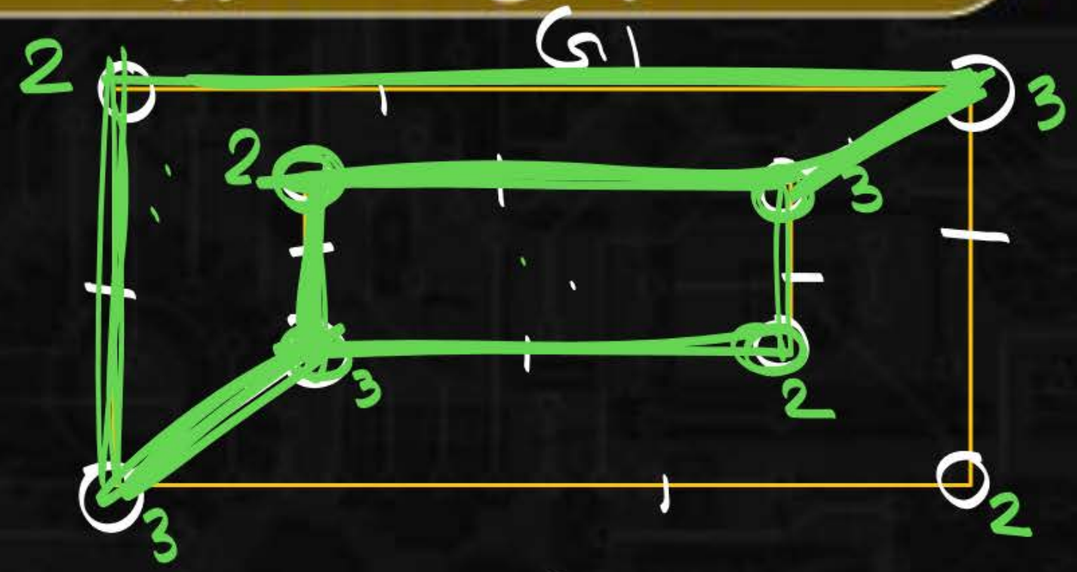


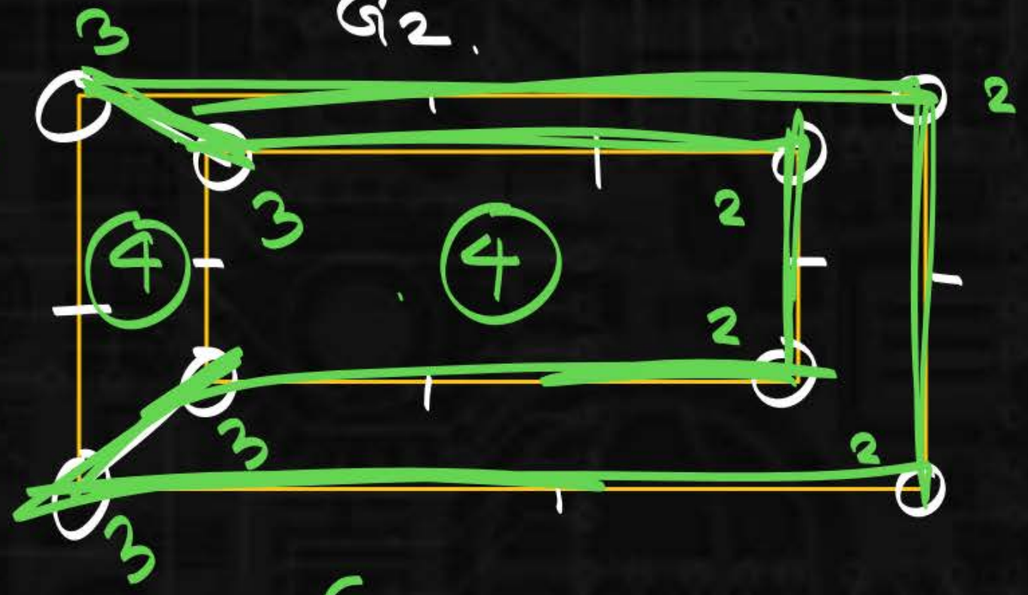
Types of graph



$n = 8$

$e = 10$

3 3 3 3 2 2 2 2



$n = 8$

$e = 10$

3 3 3 3 2 2 2 2

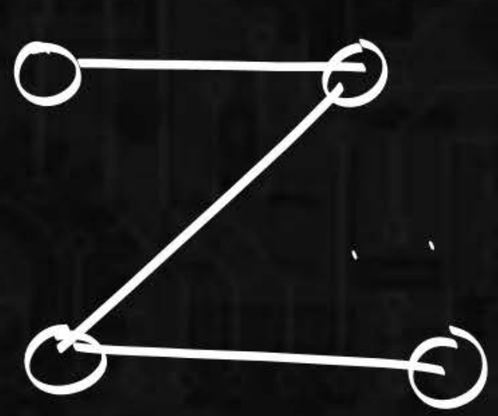
Types of graph

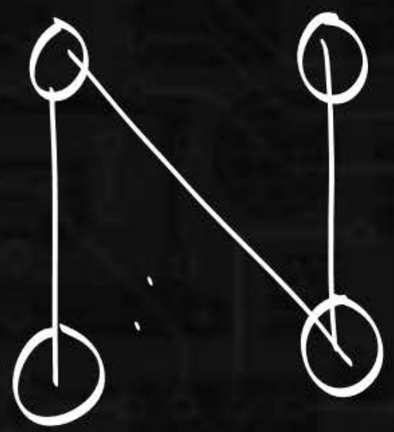
→ if 2 Graphs are isomorphic then they will have

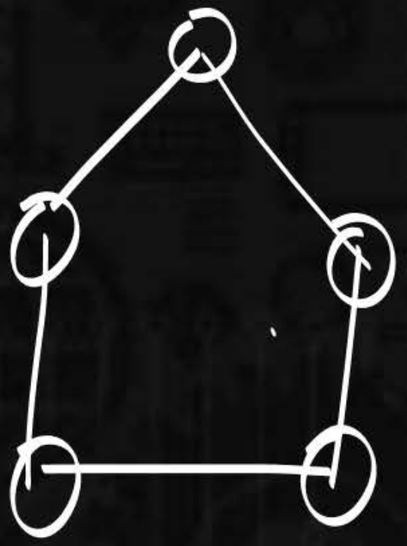
- same no. of vertices
- no. of edges
- degree sequence

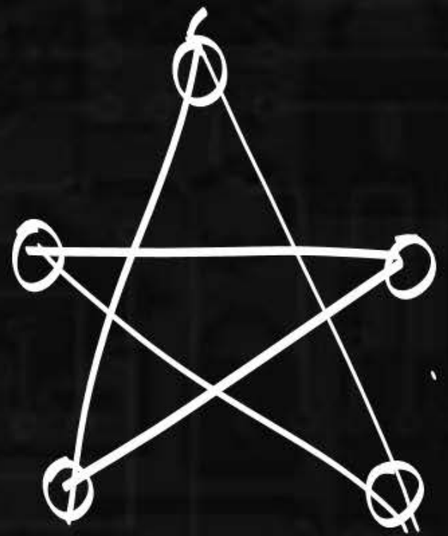
vice versa need not be True

Types of graph





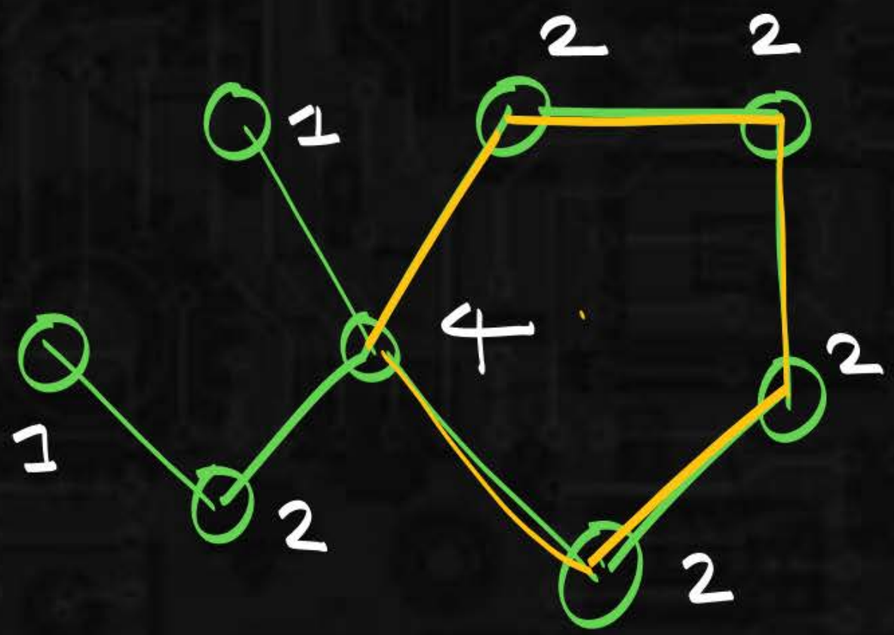




Self complement :

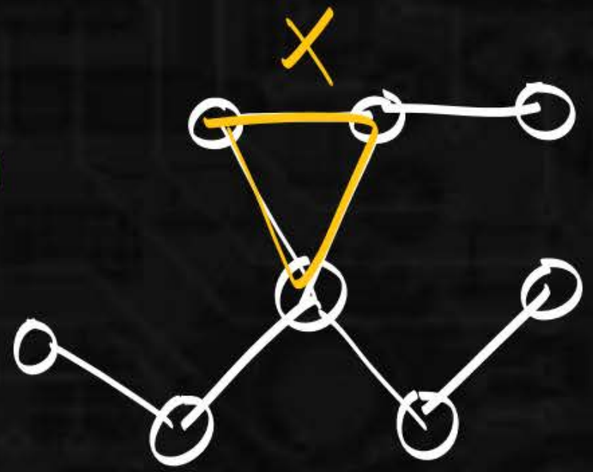
if Graph is isomorphic to its own complement

Types of graph

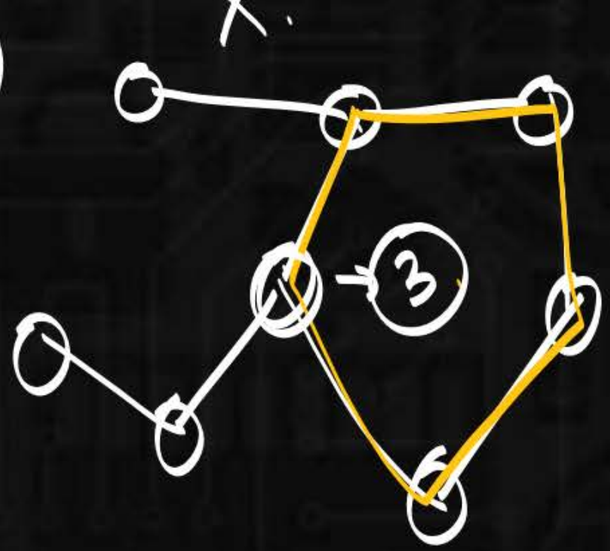


cyclelength → 5

A)

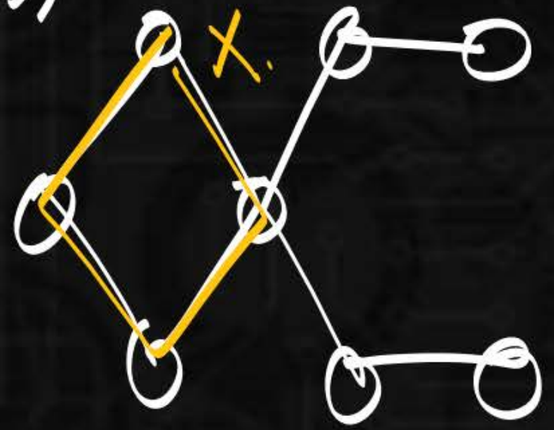


B)



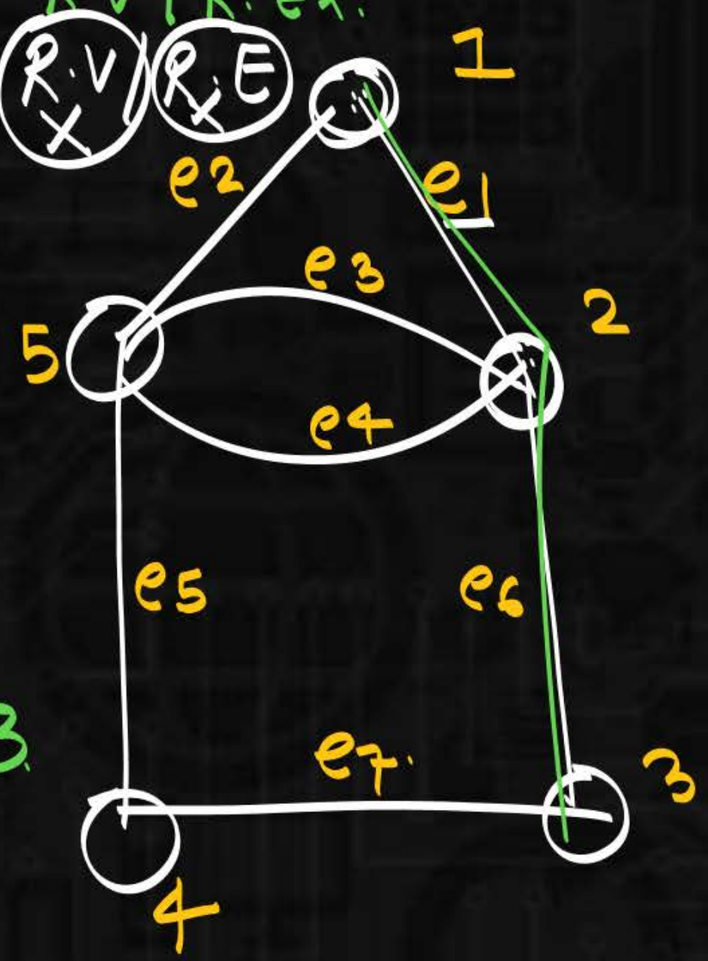
C)

D)



Types of graph

walk R.V | R.E.
Trail R.V | R.Ex.
Path → R.V, R.E



walk: (R.V / R.E)

alternating sequences of vertices & edges.

1 e_1 2 e_3 5 e_3 2 e_6 3

Trail: (R.V | R.E)

1 e_1 2 e_3 5 e_4 2 e_6 3

Path: (R.V | R.E)

1 e_1 2 e_6 3

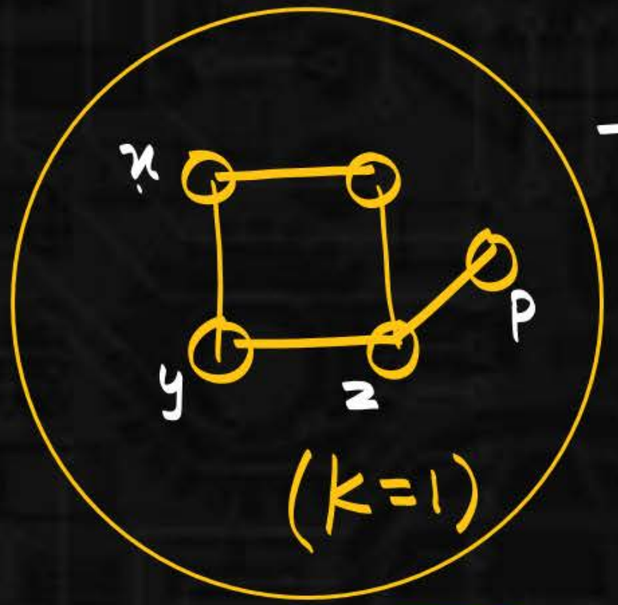
Types of graph

Graph

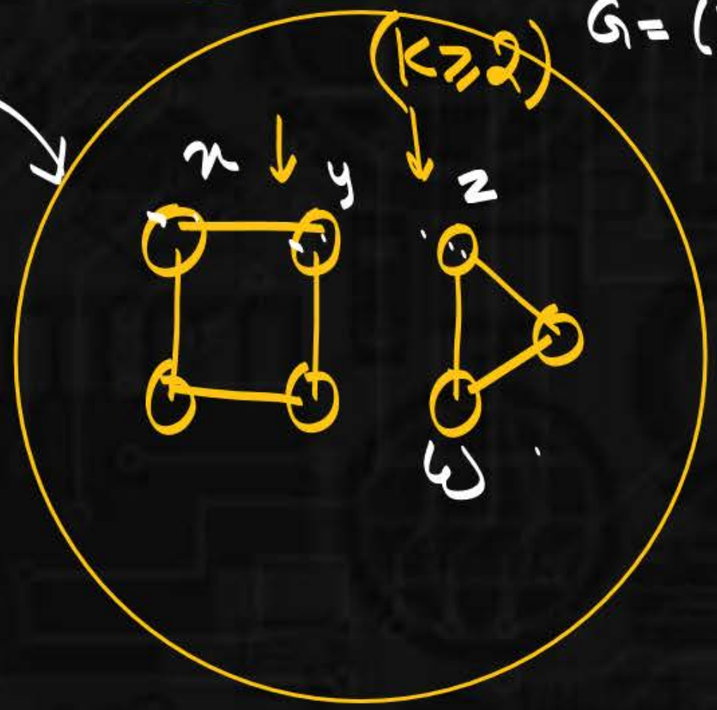
→ connected. ($k=1$)

→ For atleast 2 vertices path is not available. ($k \geq 2$)

→ disconnected:



→ Path is available betn all pair of vertices.



$G = (V, E)$

$|V| = 7$.

Types of graph

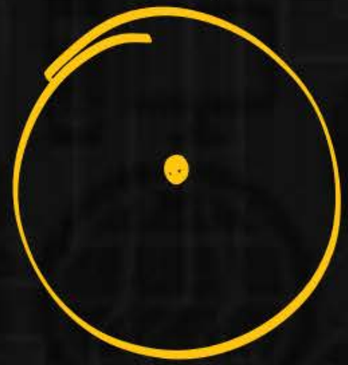
$k=2$

Disconnected.

$k=2$

Disconnected.

$k=2$



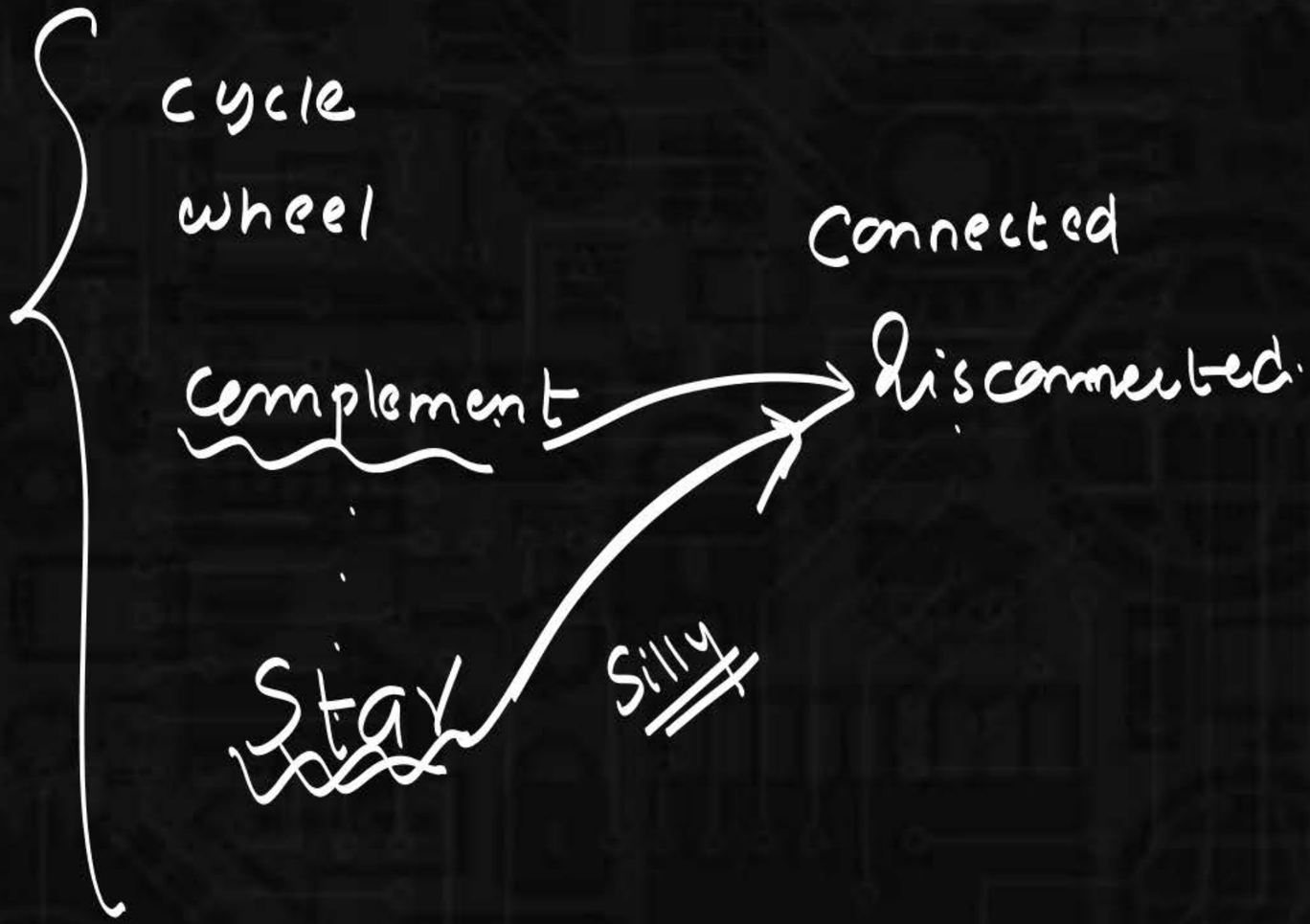
$(k=1)$

Types of graph

Disconnected graph contains connected subparts.

component (k)

Types of graph

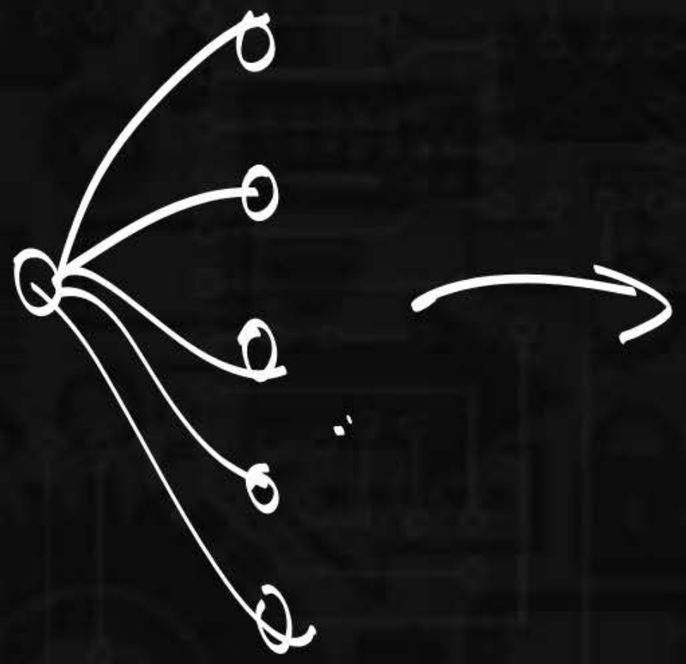


Types of graph

Consider a Star Graph of 6 vertices, what will be total edges in the complement of the graph.

$n = 6$

$K_{1,5}$



Types of graph

$n = 6$

$e(G) + e(\bar{G}) = \frac{n(n-1)}{2}$

$\downarrow$

$5 + x = \frac{6 \cdot 5}{2}$

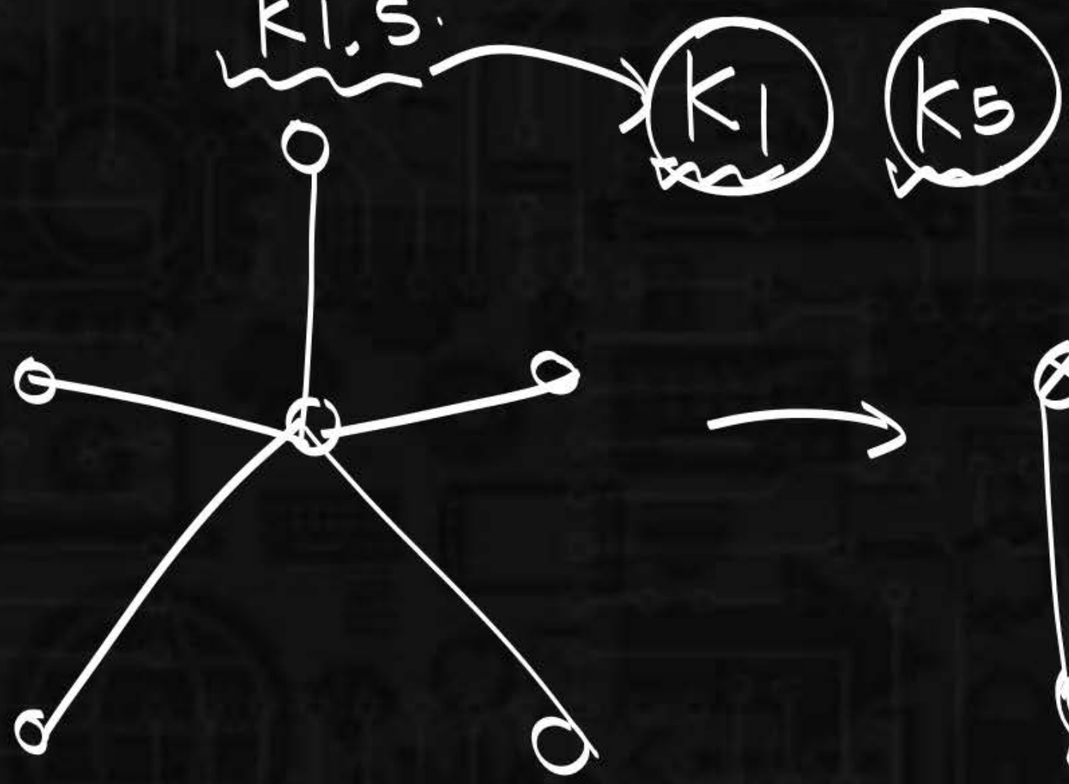
$x = 15 - 5$

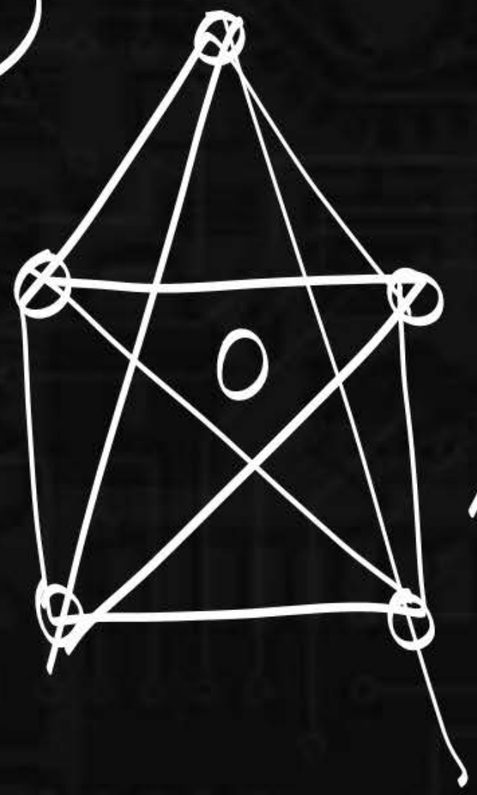
$x = 10$

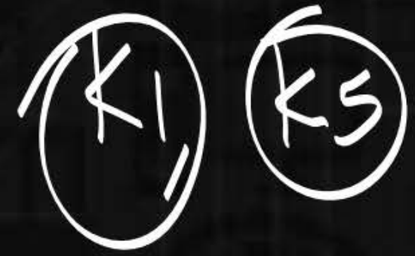
$\bar{G}$

$n = 6$

$k_{1,5}$







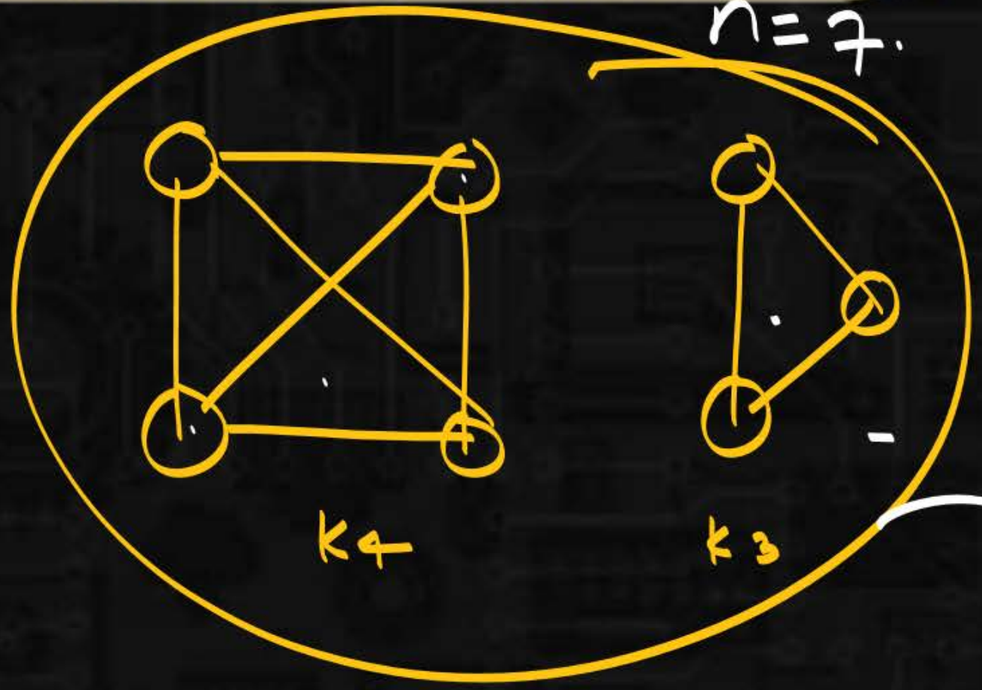
Types of graph

if G is connected then $\bar{G}$ will be connected (: false)

Thm: if G is disconnected then $\bar{G}$ will be connected (: True)

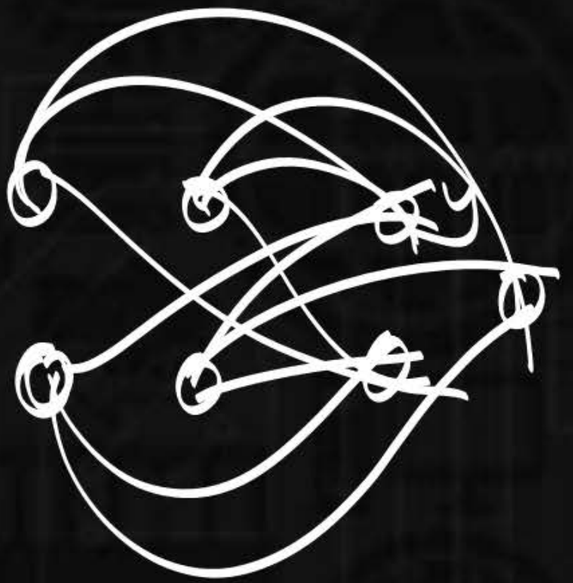
Types of graph

$n = 7$.

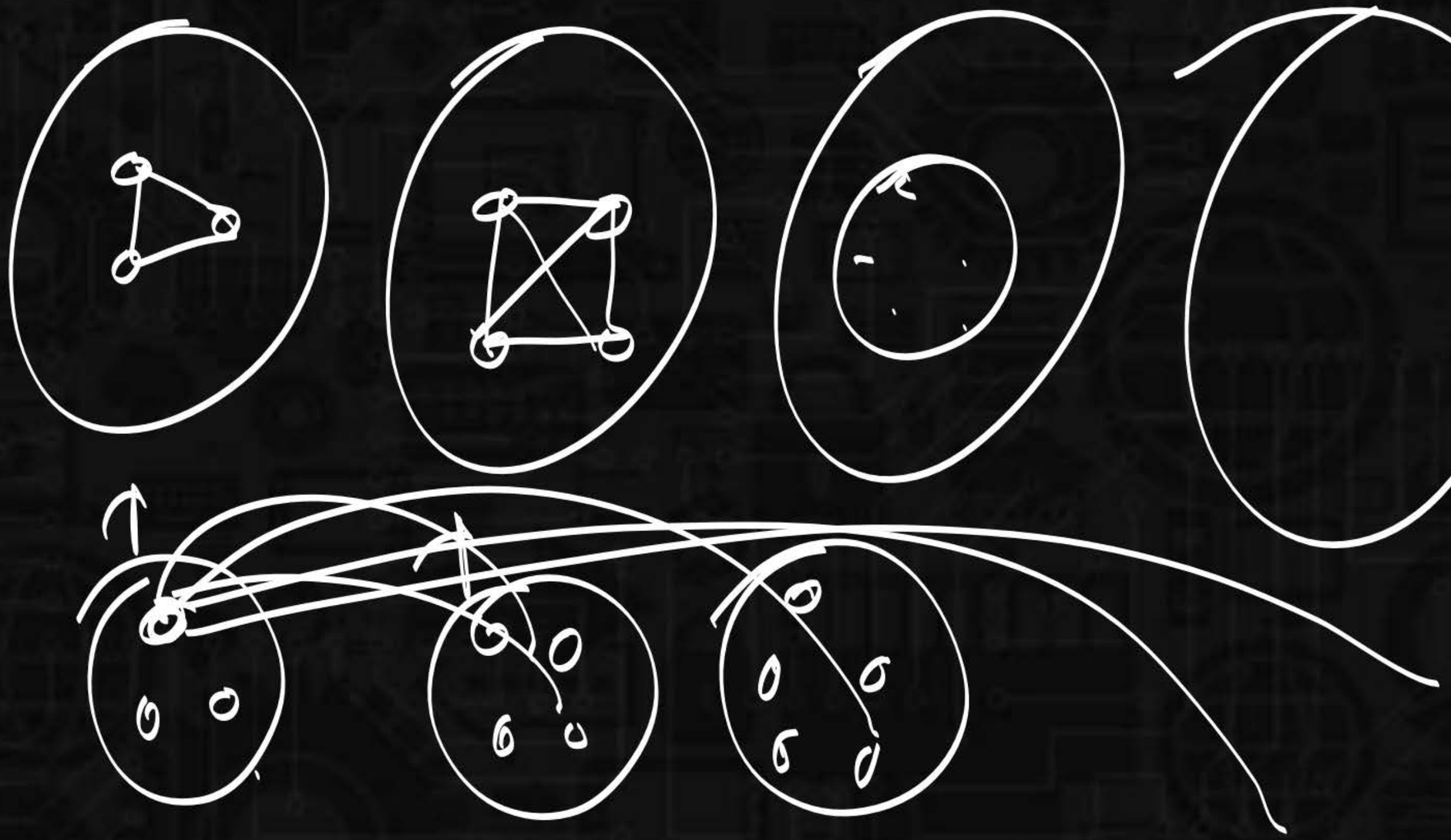


$G \rightarrow$ disconnected.

$\rightarrow \bar{G}$ connected.



Types of graph




THANK YOU GW
SOLDIERS !