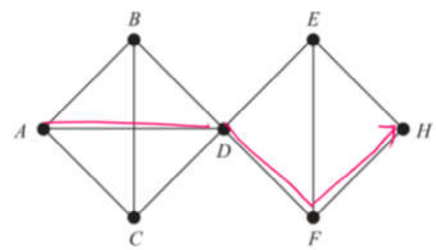
# L-25 Bipartite

Tuesday, April 5, 2022 10:08 AM

**Distance and Diameter**

Consider a connected graph $G$. The *distance* between vertices $u$ and $v$ in $G$, written $d(u, v)$, is the length of the shortest path between $u$ and $v$. The *diameter* of $G$, written $\text{diam}(G)$, is the maximum distance between any two points in G




$d(A, H) : 3$

A — B — D — F — H

A — B — C — D — E — F — H —— Not length / Dia

A — D — F — H

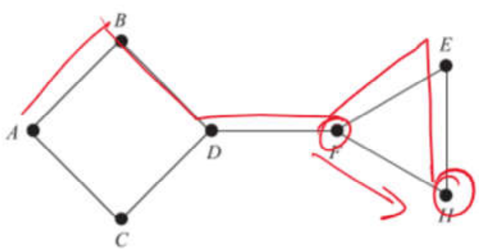
A — D — E — F — H

| | A | B | C | D | E | F | H | Maxi Distance |
|---|---|---|---|---|---|---|---|---|
| A | – | 1 | 1 | 1 | 2 | 2 | 3 | 3 |
| B | 1 | – | 1 | 1 | 2 | 2 | 3 | 3 |

→ Maximum Values

Diameter

$\text{diam}(G) = 3$




Diameter of the graph

(A) 2 (B) 3 (C) 4 (D) 4.5

Max —— Distance

Length

└ Shortest Path

Bipertite Graph :→

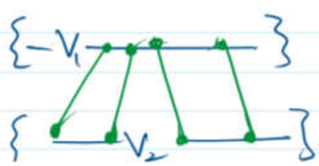
A simple graph $G$ is called *bipartite* if its vertex set $V$ can be partitioned into two disjoint sets $V_1$ and $V_2$ such that every edge in the graph connects a vertex in $V_1$ and a vertex in $V_2$ (so that no edge in $G$ connects either two vertices in $V_1$ or two vertices in $V_2$). When this condition holds, we call the pair $(V_1, V_2)$ a *bipartition* of the vertex set $V$ of $G$.

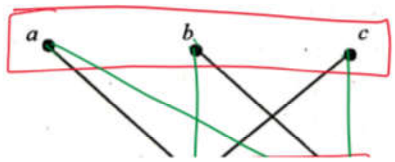
$V_1 \cap V_2 = \phi$

$V_1 \cup V_2 = V$

$V = \{ \text{———} \}$

$\{ — V_1 — \}$ $\{ — V_2 — \}$

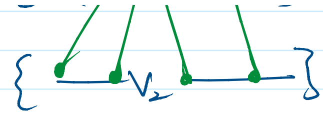


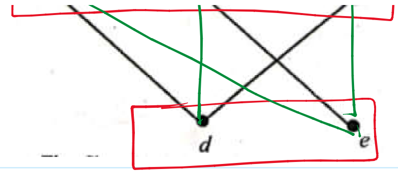




V = 5

a b c d e

$V_1 = \{a\ b\ c\}$




a b c d e

$V_1 = \{a, b, c\}$

$V_2 = \{d, e\}$

## Complete Bipartite Graph

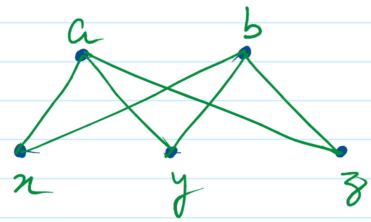
$V_2$ Bipartite graph is said to be complete if every vertex in A ($V_1$) is joined to every vertex in B. If is denote by $k_{m,n}$. Where $m$, $n$ are number of vertices in sets A ($V_1$) and B ($V_2$) respectively.

$K_{m,n}$

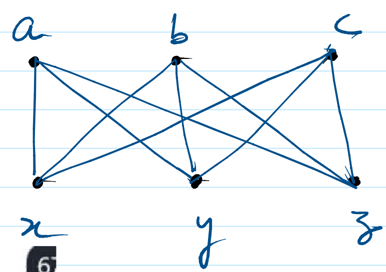
$m = n(V_1)$

$n = n(V_2)$

$\underline{\underline{K_{2,3}}}$

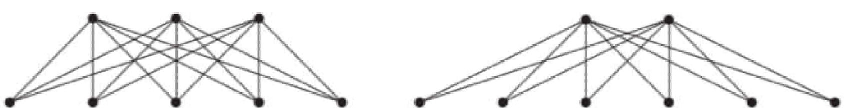



$\underline{\underline{K_{3,3}}}$




**Complete Bipartite Graphs** A **complete bipartite graph** $K_{m,n}$ is a graph that has its vertex set partitioned into two subsets of $m$ and $n$ vertices, respectively with an edge between two vertices if and only if one vertex is in the first subset and the other vertex is in the second subset. The complete bipartite graphs $K_{2,3}$, $K_{3,3}$, $K_{3,5}$, and $K_{2,6}$ are displayed in Figure 9.

$K_{2,3}$ $K_{3,3}$



$K_{3,5}$ $K_{2,6}$