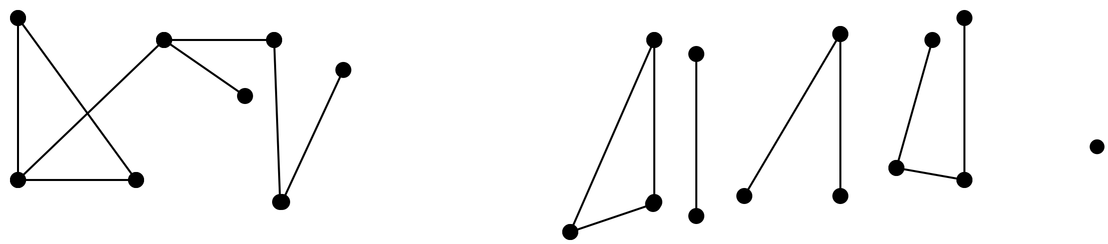
CONNECTED AND DISCONNECTED GRAPHS

An undirected graph G is said to be a **connected graph** if every two distinct vertices of the graph can be connected by a path in G, and otherwise a **disconnected graph.**

Out of the two graphs below which is connected and which is disconnected?



Graph G Graph H

Figure 1.21

G is connected. H is disconnected as there is no path from the isolated vertex to any other vertices.

A disconnected graph is the union of two or more connected subgraphs, each pair of which has no vertices in common. These connected subgraphs are called **"connected components of the graph".** The number of connected components of H is 5.

Recall that **length of a path** in a graph **without** weights is the number of edges of the path. The **length** of a path in a **weighted graph** is the sum of the weights of the edges of the path. The question "What is the shortest path between two given vertices?" means "what is the path of least length between two given vertices?"

For a connected graph,(Note that the graph here is an undirected graph) the **distance** between its two vertices u and v is defined as the length of the shortest path between them, and is denoted by dist(u,v). The distance preserves following rules:

1. Non – negativity : dist(u,v) ≥ 0
2. Symmetry : dist(u,v) = dist (v,u)
3. Triangle inequality : dist(u,v) $\leq$ dist(u,w) + dist(w,v)

The **diameter** of a connected graph G is the maximum distance between any two vertices. It is denoted by diam(G).

CONNECTEDNESS IN DIGRAPHS

A digraph G is said to be a **strongly connected graph** if for every two distinct vertices (say u and v) of the graph there is a path in G from u to v **and** there is a path in G from v to u.

A digraph G is said to be a **weakly connected graph** if every two distinct vertices of the **underlying undirected graph** can be connected by a path.

A digraph G is said to be a **disconnected graph** if the **underlying undirected graph** is disconnected.