**Graph Definitions**:

A **Graph *G=(V,E)*** is a set of Vertices and a set of Edges, where each edge in E is an unordered pair of elements in V.

A **Directed Graph *G=(V,E)*** is a set of Vertices and a set of Edges, where each edge in E is an *ordered* pair of elements in V. (in other words, edges have direction usually drawn as an arrow)

An edge (u,v) is said to be **incident** on vertices u and v. Vertex u is then **adjacent** to vertex v.

A **subraph** of a graph ***G=(V,E)*** is a graph ***G’=(V’,E’)*** such that V’ is a subset of V and E’ is a subset of E.

A **complete graph** is a graph that has an edge connecting every pair of nodes.

A **path** from vertex *v* to *w* is a sequence of edges $v\_{0 }v\_{1 }, v\_{1}v\_{2}, …,v\_{k-1}v\_{k}$ where v0=v and vk=w. k, the number of edges on the path, is the *length of the path*.

**Connected** - In an undirected graph there is a path from every vertex to every other vertex.

If a graph is not connected, then it can be decomposed into **connected components**, which are maximal connected subgraphs.

A **cycle** is a path of length >=2 from a node to itself. (in an undirected graph, an edge can be used in one direction in a cycle.)

**Tree** – a connected acyclic graph.

A **Weighted Graph** has edges with an additional property, a weight. Weights may be integers or real numbers, representing cost, distance, capacity, or any type of quantity.