

In the previous problems you were using visual graphs of problems.

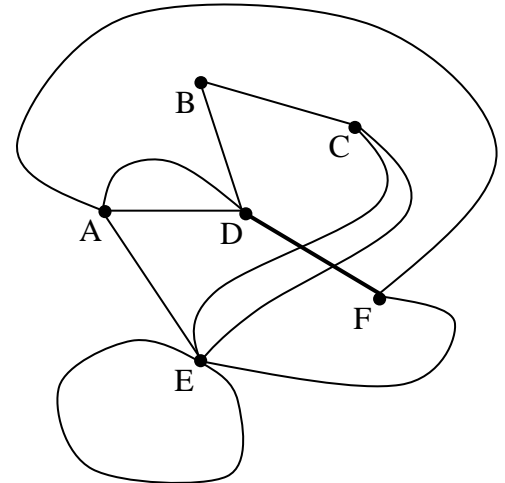
Now we need to define some common terms that will be helpful.

**VERTICES** are the points on the graph and the lines connecting the vertices are called **EDGES**.

1. The **DEGREE** of a vertex is defined by the number of edges that have that vertex as an endpoint. Find the degree of each vertex.

Vertex	Degree
A	4
B	
C	

Vertex	Degree
D	
E	
F	



2. Two vertices are **ADJACENT**, if they are connected by an edge.

- List all of the vertices adjacent to vertex A: \_\_\_\_\_
- List all of the vertices adjacent to vertex B: \_\_\_\_\_
- List all of the vertices adjacent to vertex C: \_\_\_\_\_

- d. Create an **Adjacency Matrix** of the graph.

	A	B	C	D	E	F
A	<div style="display: flex; align-items: center; justify-content: center; height: 100px;"> <span style="font-size: 4em; margin-right: 10px;">[</span> </div>					
B						
C						
D						
E						
F						

3. A **LOOP** occurs when an edge has both endpoints being the same vertex.

- List any vertices that have a loop: \_\_\_\_\_

4. **MULTIPLE EDGES** occur when 2 adjacent vertices have more than one edge connecting the same 2 vertices.

- List any pair of adjacent vertices that have multiple edges: \_\_\_\_\_

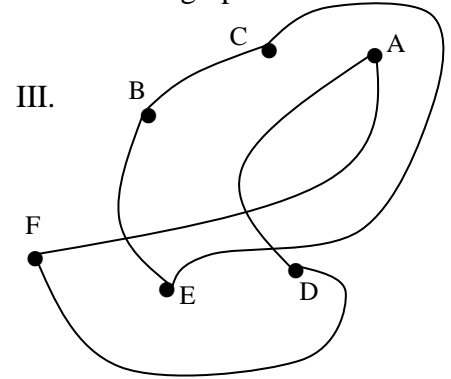
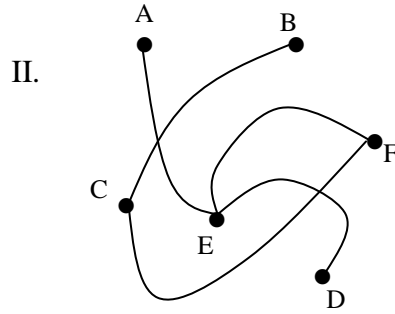
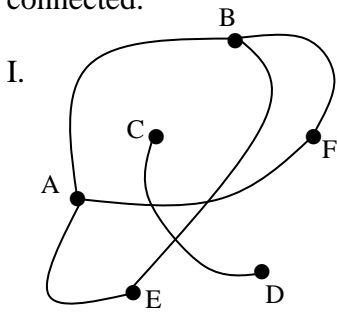
5. A **WALK** is a route you can take from one point to another and you can use multiple edges

- List all of the 2 step walks starting from vertex B (a 2 step walk uses 2 edges).

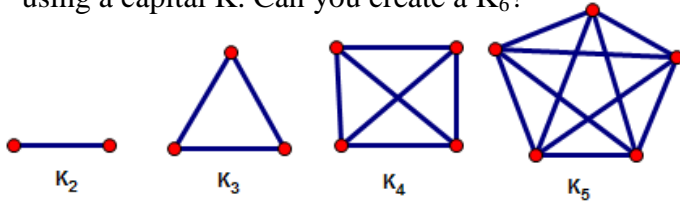
*BDB, BDA,* \_\_\_\_\_

6. Square the Adjacency Matrix using your calculator and show your answer below. See if the row representing vertex B sums to the same number of walks in #5.

7. A graph is **CONNECTED** if at least one path exists between any two points. Circle the graphs below that are connected.



8. A complete graph is a graph in which all vertices are adjacent to one another and they are usually denoted using a capital K. Can you create a  $K_6$ ?

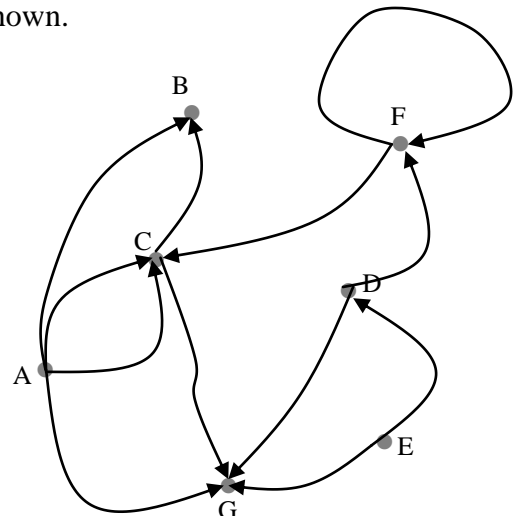


Graph	# of Vertices	# of Edges
$K_2$	2	1
$K_3$	3	3
$K_4$		
$K_5$		
⋮	⋮	⋮
$K_{15}$		

9. A directional graph is sometimes referred to as a **DI-GRAPH**. A di-graph is one with edges that are one directional (similar to a one way street). The vertices of di-graphs have an **INDEGREE** and an **OUTDEGREE**. The indegree is simply the number of edges coming into the vertex and the outdegree is the number of edges leaving the vertex. A vertex that only has edges coming in to the vertex is called a **RECIEVER**. A vertex that only has outgoing edges is called a **TRANSMITTER**.

A. List the indegree and outdegree of each vertex in the graph shown.

Vertex	Indegree	Outdegree	Total Degree
A	0	4	4
B			
C			
D			
E			
F			
G			



B. List all of the vertices that are TRANSMITTERS: \_\_\_\_\_

c. List all of the vertices that are RECIEVERS: \_\_\_\_\_