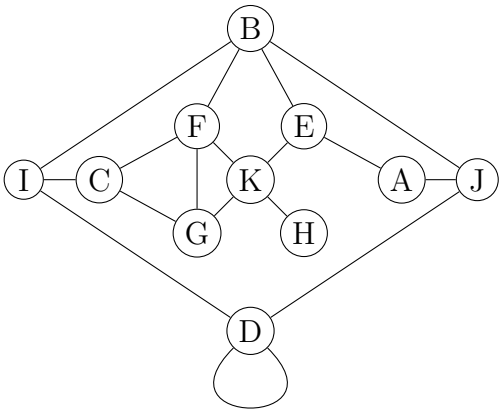
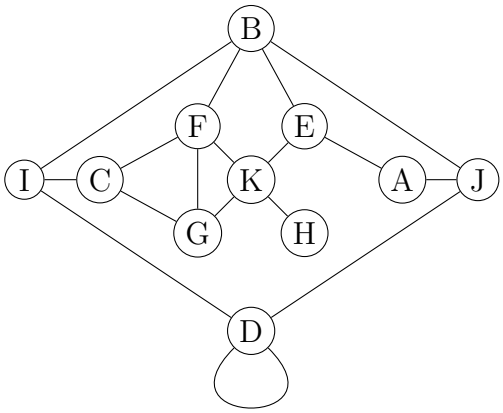
Worksheet 9 (Graph Theory 1): Pieces of Graphs

1. Graph **Q** is shown below (twice). Answer the questions:





(a) How many vertices does graph **Q** have? _____

(b) How many edges does graph **Q** have? _____

(c) Degree of vertex A? _____

(d) Degree of vertex H? _____

(e) Degree of vertex D? (remember, loops count twice) _____

(f) Label each vertex on the right-hand copy of the graph with its degree.

(g) Which vertex/vertices has/have the largest degree? _____

(h) Find a path from K to D. Draw it on the (left-hand) graph. How many edges does your path have? _____

(i) What is the length of the shortest path from I to J? _____Write the path here: _____

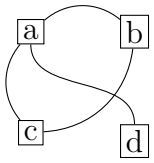
(j) Find a circuit in the graph and highlight it on the graph. Write the circuit here: _____

(k) Find a path that visits every vertex exactly once. Highlight it on the right-hand copy of the graph.

(l) Explain why you can't find a circuit that passes through every vertex of the graph.

(m) Create a context for this graph. What might the vertices represent? What might the edges represent?

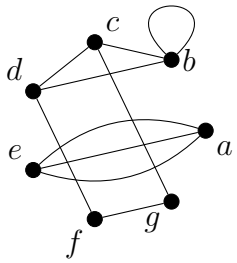
2. Here's a small graph, Graph **T**. To the right, represent it as a table (technically, as an "adjacency matrix"), by writing **1** in the spot in the row/column intersection if there's an edge between the row-vertex and column-vertex and 0 otherwise. For example, since there is an edge from vertex a to vertex d, we put a 1 in the first row, fourth column.



	a	b	c	d
a				1
b				
c				
d				

Find a circuit in the graph. List the vertices in the circuit: _____

3. Here's another graph, Graph **R**.



(a) Explain why this graph is not connected.

(b) A *connected component* is a piece of a graph that *is* connected. To the right of the graph, draw the two connected components of graph R separately, with no crossing edges. (You will need to change the position of the vertices and edges!)

(c) Label each vertex with its degree.

(d) How many edges does graph R have? _____

4. Using our previous graphs, fill in the following table:

Graph	sum of the degrees	number of edges
Graph Q		
Graph T		
Graph R		

Fill in the blank: The sum of all the degrees of the vertices of a graph is _____the number of edges of the graph.