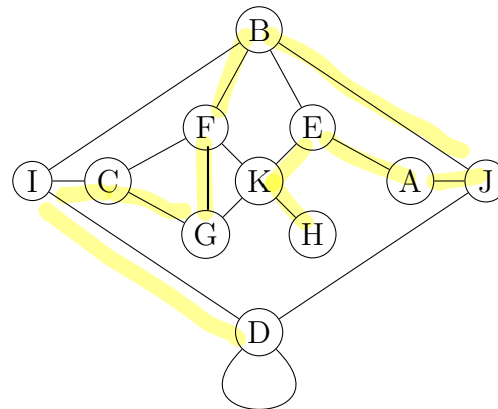
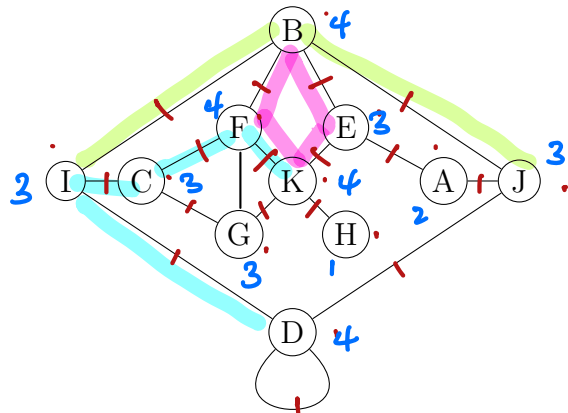


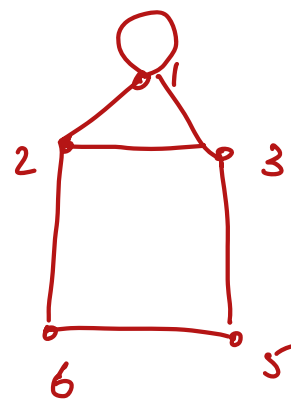
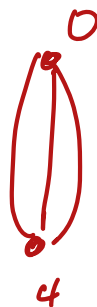
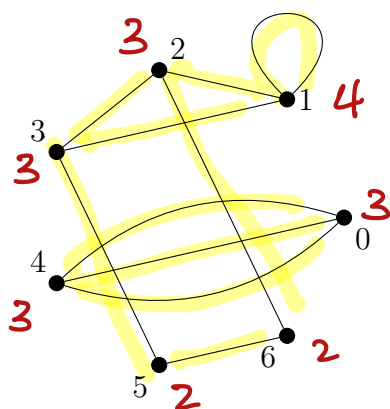
Worksheet 9 (Graph Theory 1): Pieces of Graphs

Group Names: Solutions1. Graph Q is shown below (twice). Answer the questions:

- (a) How many vertices does graph Q have? 11
- (b) How many edges does graph Q have? 17
- (c) Degree of vertex A ? 2
- (d) Degree of vertex H ? 1
- (e) Degree of vertex D ? (remember, loops count twice) 4
- (f) Label each vertex on the right-hand copy of the graph with its degree.
- (g) Which vertex/vertices has/have the largest degree? D, K, B, F
- (h) Find a path from K to D . Draw it on the (left-hand) graph. How many edges does your path have? 4
- (i) What is the length of the shortest path from I to J ? 2
- (j) Find a circuit in the graph and highlight it on the graph. BKEB
- (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.
Vertex H has only one edge leaving it but a circuit has to close up & can't repeat edges
- (m) Create a context for this graph. What might the vertices represent? What might the edges represent?

Vertices are cities, edges are roads

2. Here's a second graph, Graph R.



(a) Explain why this graph is not connected.

There's no path from 4 to 3

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!)

(b) Label each vertex with its degree.

(c) How many edges does graph R have? 10

(d) Using the above graph R and the previous graph Q, fill in the following table:

Graph	sum of the degrees	number of edges
Graph Q	34	17
Graph R	20	10

What do you notice about the relationship between the sum of the degrees and the number of edges?

The sum of the degrees is twice the # of edges.