Data Structures and Algorithms

Exercises Week 8

1. Using the example graph on the lecture slide titled "Terminology":
   (a) give the degree of each node
   (b) write the vertex set and the edge set
   (c) list all the simple cycles that begin and end with vertex B
   (d) list all the simple cycles that begin and end with vertex A
   (e) how long is the longest simple path in the graph (i.e. how many edges in the longest path)?
   (f) find a path that traverses each edge once only
   (g) how many answers are there to exercise 6?
2. Work through the VisuAlgo page on Graph Structures, available at
   https://visualgo.net/en/graphds?slide=1
3. Work through the VisuAlgo page on Graph Traversals, available at
   https://visualgo.net/en/dfsbfs?slide=1
4. When applied to a graph G(V,E), what is the meaning of each of the following terms
   - adjacent vertices
   - connected component
   - spanning sub-graph
   - spanning tree
5. Draw the (undirected) graph given by the following incidence matrix.

	A	B	C	D	E	F
A		x	x	x		
B	x				x	
C	x				x	x
D	x					x
E		x	x			x
F			x	x	x	

6. Apply the algorithm for depth-first traversal to the graph in part 5. Start at node A. At each node visited, consider the outgoing edges in alphabetical order of the opposite node label. Your answer should show the classification of the edges.

7. Apply the algorithm for breadth-first traversal to the graph in part 5. Start at node A. At each node visited, consider the outgoing edges in alphabetical order of the opposite node label. Your answer should show the state of the queue, at each step, and the classification of the edges.