CSC 225 FALL 2014
ALGORITHMS AND DATA STRUCTURES I
ASSIGNMENT 5
UNIVERSITY OF VICTORIA

1. Let G be a graph whose vertices are integers 1 through 8, and let the adjacent vertices of each vertex be given by the table below:

vertex	Adjacent vertices
1	$(2, 3, 4)$
2	$(1, 3, 4)$
3	$(1, 2, 4)$
4	$(1, 2, 3, 6)$
5	$(6, 7, 8)$
6	$(4, 5, 7)$
7	$(5, 6, 8)$
8	$(5, 7)$

Assume that, in a traversal of G, the adjacent vertices of a given vertex are returned in the same order as they are listed in the above table.

(a) Draw G

(b) Order the vertices as they are visited in a DFS traversal starting at vertex 1.

(c) Order the vertices as they are visited in a BFS traversal starting at vertex 1.

2. For the graph G in Problem 1, draw its adjacency-lists representation and adjacency matrix representation.

3. Show that every connected graph has a vertex whose removal (including all adjacent edges) will not disconnect the graph and design a DFS-based algorithm that finds such a vertex.

4. Let $F = (V, E)$ be a forest with n vertices and k connected components. Prove that the number of edges in $F = n - k$.

5. Design an algorithm to determine whether a digraph has a unique topological ordering.