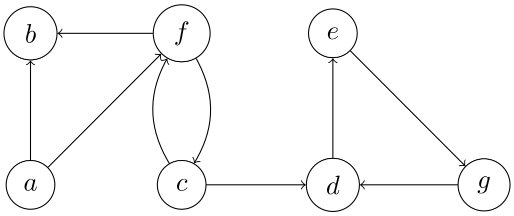
DSC 40B - Discussion 07

Problem 1.

Consider a *breadth*-first search on the graph shown in the figure, starting with node *c*.



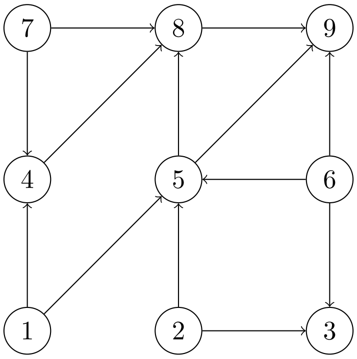
a) Suppose you call bfs_shortest_paths(graph, 'c') on the graph above. This function returns dictionaries distance and predecessor. Write down the contents of these dictionaries as they are when the function exits.

```
def bfs_shortest_paths(graph, source):
    status = {node:'undiscovered' for node in graph.nodes}
    distance= {node:float('inf') for node in graph.nodes}
    predecessor = {node: None for node in graph.nodes}
    status[source] = 'pending'
    distance[source]=0
    pending = deque([source])
    # while there are still pending nodes
    while pending:
        u = pending.popleft()
        for v in graph.neighbors(u):
            # explore edge (u,v)
            if status[v] == 'undiscovered':
                status[v]='pending'
                distance[v]=distance[u]+1
                predecessor[v]=u
                # append to right
                pending.append(v)
        status[u]='visited'
    return predecessor, distance
```

b) Mark the BFS trees produced on executing BFS on this graph.

Problem 2.

Consider the following directed graph.



a) Run Full_DFS on the graph above. Make a bold arrow from node u to node v if u is the predecessor of node v in DFS. Use the convention that nodes are processed in ascending order by label.

b) Fill in the table below so that it contains the start and finish times of each node after a Full_DFS is performed on the above graph. Assume node 1 as the source for the first DFS call. Begin your start times with 1.

Node	Start	Finish
1		
2		
3		
4		
5		

Node	Start	Finish
6		
7		
8		
9		

Problem 3.

Given an undirected graph G=(V,E), give an algorithm to find if the graph is disconnected.