COLORADO MESA UNIVERSITY

Assignment 5

By Drake Cullen

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1 Chapter 3, Question 1)

Topological sorting is an ordering of vertices in the manner that for every directed edge u v, the vertex u comes before v in the ordering. In figure 3.10, there are a total of 6 unique topological orderings. We know that f will always be the last node, a is always the first node, c relies on b, and e relies on d. Here are the 6 topological orderings:

$$a, b, c, d, e, f$$
$$a, b, d, c, e, f$$
$$a, b, d, e, c, f$$
$$a, d, e, b, c, f$$
$$a, d, b, e, c, f$$
$$a, d, b, c, e, f$$

2 Chapter 3, Question 2)

In class we learned that a graph contains a cycle if the graph contains a backward edge. The DFS algorithm can be run on the graph to perform edge classification. A backward edge will appear if there is a connection from a node to its ancestor.

Algorithm 1 DFS_Cycle(graph, vertex, visited, parent)

```
// return true if a cycle (backward edge) is found
visited[vertex] = true
for neighbor in adj[vertex] do
  if neighbor not in visited then
    if DFS_Cycle(graph, neighbor, visited, vertex then
      return true
    end if
  else
    if neighbor not equal to parent then
      return true
    end if
  end if
end for
return false
```

3 Chapter 3, Question 3)