

CMPS 101

Fall 2009

Homework Assignment 6

1. (1 Point) p.547: 22.3-1
Make a 3-by-3 chart with row and column labels WHITE, GRAY, and BLACK. In each cell (i, j) , indicate whether, at any point during a depth-first search of a directed graph, there can be an edge from a vertex of color i to a vertex of color j . For each possible edge, indicate what types it can be.
2. (1 Point) p.547: 22.3-2
Show how depth-first search works on the graph of Figure 22.6 (p.548). Assume that the **for** loop of lines 5-7 of the DFS procedure considers the vertices in alphabetical order, and assume that each adjacency list is ordered alphabetically. Show the discover and finishing times for each vertex, and show the classification of each edge.
3. (1 Point) p.548: 22.3-9
Modify the pseudocode for depth-first search so that it prints out every edge in the directed graph together with its type. (Hint: use the result stated in the last paragraph of page 546.)
4. (1 Point) p.549: 22.3-11
Show that a depth-first search of an undirected graph G can be used to identify the connected components of G , and that the depth-first forest contains as many trees as G has connected components. More precisely, show how to modify depth-first search so that each vertex v is assigned an integer label $cc[v]$ between 1 and k , where k is the number of connected components of G , such that $cc[u] = cc[v]$ if and only if u and v are in the same connected component.