

## CMPS 101

### Homework Assignment 7

1. p.610: 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. p.612: 22.3-10  
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 609, and the result of problem 22.3-5.)
3. p.612: 22.3-12  
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.