Home Work #11
DUE: See Canvas
(upload portrait-mode PDF on Canvas)

☞ Handwritten assignments will not be accepted.

Start your assignment with the following text provided you can honestly agree with it.

- I certify that every answer in this assignment is the result of my own work; that I have neither copied off the Internet nor from any one else's work; and I have not shared my answers or attempts at answers with anyone else.

1. Consider the directed graph $G = (V, E)$ defined by the following adjacency list:

vertex	*Adj[vertex]*
a	$< b, f >$
b	$< c, f >$
c	$< g >$
d	$< c >$
e	$< d >$
f	$< e >$
g	$< f >$

   Draw the graph with d/f values (discovery and finish times) inside each vertex — following the style we used in the example worked out in class.

   Make DFS pick the vertices in alphabetical order and make DFS-VISIT pick the elements of the adjacency list in the order given above.

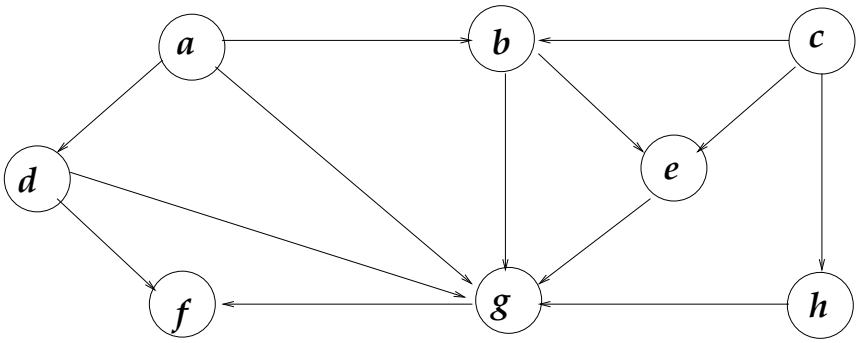
2. A directed graph $G = (V, E)$ contains an edge (u, v). The following is known about an execution of DFS(G) on G: $d[v] = 312$, $f[u] = 622$, and $f[v] = 1064$. Does G contain a cycle? Prove your answer.

3. Show a directed graph $G = (V, E)$ in which there is a path from vertex u to vertex v of length 4 ($u, v \in V$), u is discovered before v in a depth-first search of G and yet v is not a descendant of u in the depth-first forest produced.

   (a) Draw your graph. Inside each vertex, indicate the d/f values produced by DFS following the style we used in the example worked out in class. Also draw the depth-first forest produced.

   (b) Is this a counter-example to the White-Path Theorem? Explain.

4. (a) Redraw the following DAG with the vertices laid out linearly from left to right and all edges pointing right (the edges may cross each other).



   (b) Argue that every DAG can be drawn in the above manner.

   (c) How many edges can a DAG have?
   Hint: Use part (b) of this question.