Algorithm Analysis Homework 8

May 16 (Due next Tuesday class)

1. To find strongly connected components of a directed graph G, Kosaraju's double DFS algorithm starts a DFS from a vertex in a sink component, and to do so the algorithm first computes finish times with respect to DFS(G^T).

   (a) Can we find a vertex in a sink component with DFS(G) instead? For example, for a DAG, if we perform a DFS, then the vertex with the smallest finish time is a sink. So, we could hypothesize that the vertex with the smallest finish time with respect to DFS(G) is in a sink component. Verify the hypothesis by performing DFS on the graph in Fig. 7.

   (b) Can we find a vertex in a source component using a DFS? Recall that the vertex with the largest finish time is a source vertex for a DAG. Now, is the vertex with the largest finish time in a source component of a directed graph? Verify this by performing DFSs on the graph in Fig. 7 starting with

      (i) vertex a in the source component,

      (ii) vertex e in the sink component,

      (iii) vertex h in a component that is neither source nor sink.

   (c) Explain why Kosaraju's algorithm first computes finish times with respect to DFS(G^T).