

Algorithms – Homework 8

Graphs I

Due: November 10.

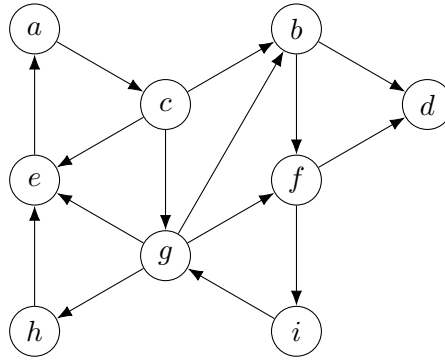


Fig. 1. An example graph.

- 1) For the graph given above in Figure 1, ...
 - a) ...run a BFS starting in vertex a . Show the produced tree.
 - b) ...run a DFS starting in vertex a and identify tree, forward, back, and cross edges.

- 2) Consider a graph $G = (V, E)$ whose edges are marked red or blue. An alternating path is a path whose edges alternate in colour (red, blue, red, ...; or blue, red, blue ...). The alternating distance from vertex u to vertex v is the length of the shortest alternating path from u to v . Determine in linear time the alternating distance from a source vertex s to all vertices.

- 3) In a given directed graph G , a vertex u is *reachable* from a vertex v if there is a directed path from v to u . Give an efficient algorithm to test whether G contains a vertex v such that every vertex u is reachable from v . State the time complexity of your algorithm.