CS 312: Algorithms **Fall 2018**

Homework 2

Your Name: _____

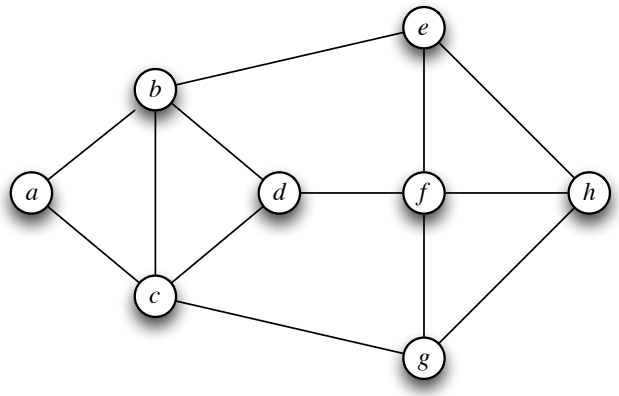
Collaborators and sources: _____

You may work in groups, but you must write solutions yourself. List collaborators on your submission.

If you are asked to design an algorithm, please provide: (a) either pseudocode or a precise English description of the algorithm, (b) an explanation of the intuition for the algorithm, (c) a proof of correctness, (d) the running time of your algorithm and (e) justification for your running time analysis.

Submission instructions. This assignment is due by noon on Thursday, Feb 15 in Gradescope (as a pdf file). Please review the course policies on the course home page about Gradescope submissions.

1. **(5 points) Gradescope submission.**
   - The solutions are either typed or written neatly (with ample white-space and no scratching out, etc.).
   - The submission is a pdf.
   - The **Gradescope scanning recommendations** (see their website, which will recommend specific scanning apps) are followed to ensure the scan is high quality.
   - The pages are marked correctly during the gradescope submission.
2. **(10 points)** K&T Chapter 2 Exercise 4. For each adjacent pair in your ordering, give a brief justification of why the first function is big-O of the second function. For example, if your ordering is g_2, g_1, g_3, you would need to justify two facts: (1) g_2 is $O(g_1)$ and (2) g_1 is $O(g_3)$. Remember that you can use facts about big-O that were proved in class or in the book. Each justification should be precise, but does not need to be a completely formal proof (e.g., you do not need to demonstrate the exact constants c and n_0 in the Big-O defnition).
3. **(10 points)** K&T Chapter 2 Exercise 6
4. **(10 points) Graphs, BFS, DFS.** *(Work independently; we will cover DFS on Monday.)* Answer the following short questions about the undirected graph below.



   (a) What is the distance from h to b?

(b) Suppose a BFS is performed starting at node a. How many layers will the BFS tree have? (Note: count L_0 as a layer.)

(c) Which nodes are in L_2?

(d) Suppose a DFS is performed starting at node a, and assume that neighbors of a node are considered in alphabetical order. List the nodes in the order they are discovered by the DFS.

5. **(0 points).** How long did it take you to complete this assignment?