

CSCI 2300: Introduction to Algorithms Homework 1

(Due Sep 28 before the class)

Name:

RIN:

Section Number:

Instructions: To solve these problems, you are allowed to consult your classmates, as well as the class textbook (Algorithms by Dasgupta, Papadimitriou, and Vazirani, which we will call DPV) and notes, but no other sources. We encourage you to collaborate with other students, while respecting the collaboration policy. Please write the names of all the other students you collaborated with on the homework. Everyone must write up their assignments separately. Staple your homework, and write your section number on it.

Please write clearly and concisely, and use rigorous, formal arguments. If you are asked to provide an algorithm the best thing to do is to provide a clear description in English (for example: Use BFS, but with the following small change..., or Run BFS two times as follows...), but you may also write some short pseudocode similar to the pseudocode in the DPV text. Homework is due at the beginning of lecture, and homework turned in later will be considered late and will use up one of your late days. Emailed copies will not be accepted.

(1) DPV Problem 3.8 (a) and (b).

(2) DPV Problem 3.16.

(3) You are given a DAG $G = (V, E)$ and a source node $s \in V$ such that every node in G is reachable from s . Give an algorithm to answer the following question: Does there exist an edge $e \in E$ such that if this edge is removed, then there is no longer a path from s to every node? In other words, is there an edge such that its removal disconnects s from a part of the graph? Your algorithm should run in linear time.

(4) DPV Problem 3.22. Hint: For all problems in the homework, but this one especially, try to use one of the algorithms we talked about in class as a subroutine instead of inventing your own.

(5) DPV Problem 4.13.