

EE4033:
Homework #4 (due in class December 17, 2019)

Instructions: Submit your solution **10 minutes before** the class begins.

Collaboration policy: You can discuss the problem with other students, but you must obtain and write the final solution by yourself. Please specify all of your collaborators (name and student id) for each problem. If you solve some problems by yourself, please also specify “no collaborators”. Homeworks without collaborator specification will not be graded.

Exercises:

1. Exercise 23.1-11.
Given a graph G and a minimum spanning tree T , suppose that we decrease the weight of one of the edges not in T . Give an algorithm for finding the minimum spanning tree in the modified graph.
2. Exercise 23.2-7.
Suppose that a graph G has a minimum spanning tree already computed. How quickly can we update the minimum spanning tree if we add a new vertex and incident edges to G ?
3. Problem 23-4.
4. Exercise 24.1-6.
Suppose that a weighted, directed graph $G = (V, E)$ has a negative-weight cycle. Give an efficient algorithm to list the vertices of one such cycle. Prove that your algorithm is correct.
5. Exercise 24.2-4.
Give an efficient algorithm to count the total number of paths in a directed acyclic graph. Analyze your algorithm.
6. Exercise 24.4-1.
7. Problem 24-3. [Hint: $\log a*b = \log a + \log b$]
8. Exercise 25.2-1.
9. Exercise 25.3-4.
10. (DIY Problem) For this problem, you are asked to design a problem set related to Chapter(s) 23, 24, and/or 25 and give a sample solution to your problem set. Grading on this problem will be based upon the quality of the designed problem as well as the correctness of your sample solution.