CS 312: Algorithms
Homework 5

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Instructions

Complete all problems and submit by the beginning of class on Tuesday, March 12. You may work together with other students, but *your written work must be your own.* I highly encourage you to attempt the problems first on your own, especially the simpler ones.

Please make sure to:

- Write your name on your submission

- Write the name of all students with whom you collaborated

- Cite any sources you used other than the textbook or course notes.

Problems

- (10 points) Chapter 4, Exercise 2. You may use the following fact (from Exercise 8): if G has distinct edge costs, then the minimum spanning tree is unique.

Before doing the next two exercises, read about the Cycle Property starting on the lower half of page 147 in the book. You will need to use the Cycle Property in both problems.

- (10 points) Chapter 4, Exercise 9.

- (10 points + 2 extra credit) Chapter 4, Exercise 10. You may assume that edge costs are distinct in this exercise.

  - (5 points) Complete part (a)

  - (5 points) (Slight modification of part (b) from the book). Suppose T is no longer the minimum-cost spanning tree. Give a linear-time algorithm (time $O(|E|)$) to find a spanning tree with smaller cost. Justify why your algorithm is correct.

  - (2 points extra credit) (Part (b) from the book). Prove that your algorithm to find a tree of smaller cost actually finds the new minimum-cost spanning tree.

- How much time did you spend on this homework?