CSCI570 - Fall 2019 - HW8

Due Oct 30th 11:59pm

October 24, 2019

1 Graded Questions

1.1 Question 1

True or false: For any flow network G and any maximum flow on G, there is always an edge e such that increasing the capacity of e increases the maximum flow of the network. Justify your answer.

1.2 Question 2

Suppose that you are given a flow network G, and G has edges entering the source s. Let f be a flow in G in which one of the edges (v, s) entering the source has $f(v, s) = 1$. Prove that there must exist another flow f' with $f'(v, s) = 0$ such that $|f| = |f'|$. Give an $O(|E|)$-time algorithm to compute f', given f, and assuming that all edge capacities are integers.

1.3 Question 3

Suppose that you wish to find, among all minimum cuts in a flow network G with integral capacities, one that contains the smallest number of edges. Show how to modify the capacities of G to create a new flow network G' in which any minimum cut in G' is a minimum cut with the smallest number of edges in G.

1.4 Question 4

Solve Kleinberg and Tardos, Chapter 7, Exercise 7.

2 Practice Problems

2.1 Question 1

Solve Kleinberg and Tardos, Chapter 7, Exercise 6.

2.2 Question 2

Solve Kleinberg and Tardos, Chapter 7, Exercise 11.

2.3 Question 3

Solve Kleinberg and Tardos, Chapter 7, Exercise 13.