E0 225: Homework 6

Deadline: November 28, 5pm

Instructions

- Academic dishonesty/plagiarism will be dealt with seriously.
- Late submissions are accepted only with prior approval or medical certificate.
- You will get full points for this homework if you solve the first two problems.
- Problem 3 is for *extra credit*. It is a challenging problem and is targeted for motivated participants. As such, we expect only a few students to attempt this problem. While there might not be any immediate benefit in terms of marks for solving this problem, we will take this into consideration towards the final grades for the course. Partial and poorly-written solutions for this problem will *not* be accepted, i.e., "binary" grading will be followed in this case.

1 (3 points) Let $G = (V, E)$ be a directed graph with source $s \in V$, sink $t \in V$. Consider the special case of the maximum flow problem in which every edge has capacity 1. (This is called the *unit-capacity* case.) Prove that a suitable implementation of the Ford-Fulkerson algorithm runs in $O(|E||V|)$ time in this special case.

2 (3 points) Let $G = (V, E)$ be a directed graph, with source $s \in V$, sink $t \in V$, and nonnegative edge capacities $\{c_e\}$. Give a polynomial-time algorithm to decide whether G has a *unique* minimum s-t cut (i.e., an s-t cut of capacity strictly less than that of all other s-t cuts).

3 (Extra credit) Solve Problem 3 from Problem Set in `http://timroughgarden.org/w16/ps/ps1.pdf`

Practice Exercises (not for grading)

Solve the problems in this link for practice `http://timroughgarden.org/w16/e/e1.pdf`