CS 671 (Fall 2015) — Assignment 5
Due: 12/03/2015

Read Chapters 11 (at least 11.3) and 5 (in particular, 5.5) from the textbook, as well as the paper by Moser and Tardos.

Here is a reminder: for problems assigned from the textbook, it is not appropriate to seek out references as hints for solutions.

(1) Problem 11.6 from the textbook. In the textbook, you are asked to give a lower bound on the conductance. Instead of doing this, you are welcome to directly prove rapid mixing using another technique. (Of course, the conductance technique is also valid.)

(2) Consider the following Markov Chain for card shuffling. In each step, you choose a uniformly random card and move it to the top of the deck. Analyze the mixing time of this chain for a deck of \( n \) cards, using a method of your choice.

(3) You are given an undirected graph \( G \) with maximum degree \( d \). You want to assign a color to each edge of the graph, such that each cycle \( C \) in \( G \) has at least 3 distinct colors. Prove that if you have \( k \geq \alpha \cdot d \) colors (for a constant \( \alpha \) of your choice), then such a coloring is always possible.
Then outline a polynomial-time algorithm for finding such a coloring.

(4) Please take a moment to fill out the course evaluations online, to let me know what to keep and what to change in the future.