Write every problem on a separate sheet of paper, write *legibly*, and write your name, your student ID, this Homework # and the problem # on top of each page.

The description of your proofs should be as *clear* as possible (which does not mean *long* – in fact, typically, good clear explanations are also short.)

Make sure you are familiar with the collaboration policy, and read the overview in the class homepage theory.cs.stanford.edu/∼trevisan/cs154.

Recall that our late policy is that late homework is not accepted (however the lowest homework grade is dropped).

Refer to the class home page for instructions on how to submit the homework.

Homework 8

Due on Thursday, March 15, 2012, 9:30am

1. (3 points) Prove that the Acceptance problem for NFA (A_{NFA}) is **NL**-complete.

2. We discussed the CLIQUE problem in class, where $(G, k) \in$ CLIQUE if and only if G contains a k-clique.

   Let MAX-CLIQUE be the set of pairs (G, k) such that the largest clique in G has exactly k nodes in it.

   Let #MAX-CLIQUE be the set of (G, ℓ) such that ℓ is the number of largest cliques in G (that is, ℓ is the number of sets S of vertices such that S is a clique in G and there is no clique in G of size $> |S|$).

   (a) (2 points) Show that MAX-CLIQUE and #MAX-CLIQUE are in **PSPACE**.

   (b) (1 points) Explain why the following argument fails to show that MAX-CLIQUE $\in$ **coNP**: To show that $\langle G, k\rangle \notin$ MAX-CLIQUE, it suffices to demonstrate the existence of a larger clique in G of size greater than k, so the **NP** algorithm for $\overline{\text{MAX-CLIQUE}}$ just guesses the larger clique.

3. (optional) Ask any questions on Piazza that you might have leading up to the final. Good luck studying for this and the rest of your classes!