Problem Set 9

This problem set is due on **Friday Apr 16, by 4:00pm.**

Use the CS172 drop box.

Write **your name and your student ID number** on your solution. Write legibly. 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.) Be sure to be familiar with the collaboration policy, and read the overview in the class homepage `www.cs.berkeley.edu/~luca/cs172`.

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1. Show that **NL** is closed under star.
2. Sipser problem 8.8. Prove that the Acceptance problem for NFA is **NL**-complete. In addition, prove that the Acceptance problem for DFA is in **L**.
3. (a) Show that $MAX\text{-}CLIQUE \in \mathbf{PSPACE}$.

   (b) Explain why the following argument fails to show that $MAX\text{-}CLIQUE \in \mathbf{coNP}$: To show that $\langle G, k\rangle \notin MAX\text{-}CLIQUE$, it suffices to demonstrate the existence of a larger clique in G of size greater than k, so the **NP** algorithm for $\overline{MAX\text{-}CLIQUE}$ just guesses the larger clique.
4. Sipser problem 8.18 ($DFACHAIN \in \mathbf{PSPACE}$).