

Problem Set 3

This problem set is due on **Thursday September 22th, by 5:00pm.**

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.

1. Let L be the set of all strings whose length is a perfect square. Show that L is not regular.
2. Show that for any positive integer m , there exists a language A_m such that:
 - There is a DFA with m states which recognizes A_m .
 - No DFA with less than m states recognizes A_m .
3. Let B be a regular language. Prove that there exist two strings x and y so that:
 - $y \neq \epsilon$
 - x and $x \circ y$ are indistinguishable with respects to B .
4. Define C to be all strings consisting of some positive number of 0's, followed by some string twice, followed again by some positive number of 0. For example 1100 is not in C , since it does not start with at least one 0. However 0001011010000000 is in C since it is three 0's, followed by 101 twice, followed by seven 0's. Prove that C is not regular.