

COSC 545, Spring 2012: Problem Set #1

Due: Wed., 2/1, at the beginning of class (hand in hard copy).

Covers: Lectures 1 to 4.

Collaboration: You may collaborate with classmates. Every student must write up his or her own answers and list collaborators. No sources outside of the assigned textbook may be consulted.

Pre-Assignment: Review the class web site for rules on formatting your problem set, collaboration, late submissions, and academic integrity.

Problems

1. Provide a high-level argument that regular languages are closed under *intersection* ($A \cap B = \{w \mid w \in A \wedge w \in B\}$) and *complement* ($\bar{A} = \{w \mid w \notin A\}$). Arguing in words is fine. You *do not* need to provide formal automata definitions.
2. 1.31, from Sipser.
3. 1.32, from Sipser. To receive full credit, provide a formal definition of the automaton; i.e., define the elements of the 5-tuple, $(Q, \Sigma, \delta, q_0, F)$, for any automaton used by your proof.
4. 1.38, from Sipser.
5. Prove that language $A = \{w\#y \mid w, y \in \{a, b\}^*, w \neq y\}$ is *not* regular. (Hint: For the solution I have in mind, you will find it useful to use what you proved in problem 1 about intersection and complement.)
6. Give a CFG generating the language of binary strings with twice as many 0's as 1's.
7. 2.44, from Sipser. You do not have to provide a formal automaton definition.