COMP170 Fall 2017, Homework 1 - Due Tuesday, September 19 in class

Submitting your homework:
You need to submit EACH problem separately, i.e. you are making 5 submissions, since each problem will be graded by a different TA. 
So start a new piece of paper for each problem, and make sure it has your NAME, HW1 and the problem number on it!

Problem 1

![DFA for Problem 1](image.png)

Figure 1: DFA for Problem 1.

Give a concise description of the language $L$ that is recognized by the DFA in Figure 1.

Problem 2

a) Construct a DFA to recognize the language of all binary strings that contain at least one instance of the substring 100
b) Construct a DFA to recognize the language of all binary strings that contain at least one instance of the substring 10110

Problem 3

Suppose that $L_1$ is a language accepted by a DFA and $L_2$ is language accepted by a DFA. Prove or Disprove: $L_1 \cap L_2$ is accepted by a DFA.

Problem 4

In certain programming languages, comments appear between delimiters such as /# and #/. Let $L$ be the language of all valid delimited comment strings. A member of $L$ must begin with /# and end with #/ but have no intervening #/. For simplicity, we’ll say that the alphabet is $\{a, b, /, #\}$. Give a DFA that recognizes $L$.

Problem 5

Prove that for every $k > 1$, a language $A_k \subseteq \{0, 1\}^*$ exists that can be recognized by a DFA with $k$ states, but not by one with $(k - 1)$ states.