CS46, Swarthmore College, Spring 2018
Lab 2 (due Wednesday 7 February)
Name: YOUR NAME HERE

Part 1: Automata Tutor

There is nothing to write in the LaTeX document for the first part of this assignment. Submit your solutions online. If you are using a late day for this part, you must hand write your solutions or typeset your solutions in LaTeX and/or graphviz dot notation. Hand written late solutions must be delivered to my office before 8am Friday to count as one late day.

Part 2: Written homework

1. Write a concise English description of the language recognized by DFA M_1.

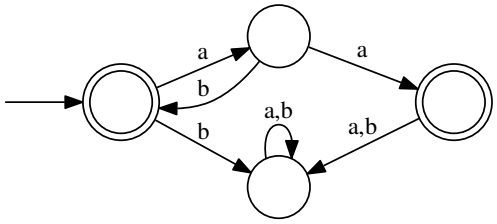

Figure 1: DFA M_1

2. Write a concise English description of the language recognized by DFA M_2.

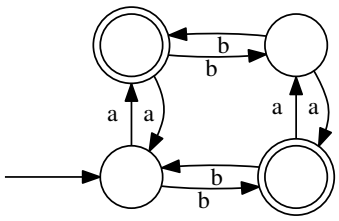

Figure 2: DFA M_2

3. Write a concise English description of the language recognized by NFA M_3.

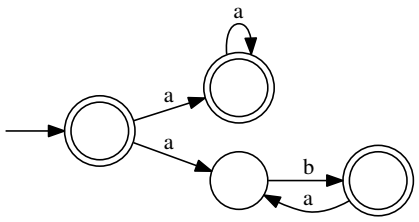

Figure 3: NFA M_3

4. We have shown in class, or the book has shown that the set of regular languages are closed under union, intersection, concatenation, and star.

   (a) Show via direct proof that the set of regular languages is closed under complement. Begin by assuming a language A is regular. Describe how to construct a machine that recognizes $\overline{A}$. Define all elements of your machine $M = (Q, \Sigma, \delta, q_0, F)$ and indicate if your constructed machine is a DFA or a NFA.

   (b) Show that if A and B are regular then $A \setminus B = \{w | w \in A \text{ and } w \notin B\}$ is regular. To do this, define set subtraction $A \setminus B$ in terms of union, intersection, concatenation, star, and/or complement, and apply previous closure results. You do not need to provide a description of a machine.