CS 321: Homework #2

Due: Monday Oct 9 at 9am, on Canvas

Homeworks should be typed. You can describe a DFA by giving its transition table (don’t forget to indicate start state and accept states), or by drawing a state diagram. You can easily draw state diagrams using this web-based tool: http://madebyevan.com/fsms/.

1. Convert the following NFA into an equivalent DFA. Name each DFA state to indicate which set of NFA states it corresponds to. Also remove all unreachable states.

![Diagram](image)

2. Below are two DFAs, $M_1$ and $M_2$. Give a DFA that accepts all strings that are in either $L(M_1)$ or $L(M_2)$, but not both.

![Diagram](image)

3. An interesting way to think about the guess-and-check nature of nondeterminism is to pretend that the guesses are given as part of the input:

   (a) Consider the alphabet $\Sigma = \{0, 1, \overline{0}, \overline{1}\}$. Draw an NFA for the following language:

   $$\{w \in \Sigma^* \mid w \text{ contains exactly one character from } \{\overline{0}, \overline{1}\}, \text{ and } w \text{ is a binary encoding of a multiple of 3, if you ignore the bars over characters}\}$$

   (b) Construct an NFA for the following language:

   $$\{w \in \{0, 1\}^* \mid \text{there is a way to flip exactly 1 bit in } w \text{ to get a multiple of 3}\}$$

   For example, 1011 should be accepted since flipping the second bit gives 1111, which is a multiple of 3. 1010 should not be accepted, since none of \{0010, 0110, 1000, 1011\} are a multiple of 3.