Due February 14

1. Using the method from class, give an NFA that recognizes $L_2^*$, where $L_2$ is the language from Exercise 3(b) of Homework 2.

2. Give regular expressions for the following languages:
   (a) $\{w \in \{0, 1\}^* | w$ ends with either 110 or 01\}
   (b) $\{w \in \{0, 1\}^* | w$ starts with a 1 and has even length\}
   (c) $\{w \in \{0, 1\}^* | w$ has length at least 3 and the third symbol from the right in $w$ is a 1\}.
   (d) $\{w \in \{0, 1\}^* | w$ does not end with 110 and does not end with 01\}.

3. Convert the regular expression $(a \cup b)^*c$ into an NFA using the method from class (which is the same as the method from the book and is different from the method in JFLAP).

4. Let $N$ be the following NFA:

   ![NFA Diagram]

   Convert $N$ into a regular expression using the method from class (which is the same as the method in the book, and is not the same as the method in JFLAP).

5. Problem 1.31
6. (a) Let $M$ be the NFA given in the solution to Problem 3(b) on Homework 2. Give an NFA $N$ with three states and no $\varepsilon$-transitions that recognizes the same language.

(b) Generalize what you did in Part (a) of this problem by proving the following theorem:

**Theorem:** If $M$ is an NFA, then there is an NFA $N$ with the following properties

1. $N$ has the same number of states as $M$.
2. $N$ has no $\varepsilon$-transitions.
3. $L(N) = L(M)$. 