Homework Assignment 3

1. Convert the regular expression \((a^* + \epsilon) \cdot b^*)\) into an NFA using the method from class. Present the answer as a state diagram.

2. Convert the following NFA into a regular expression using the method from class. Write the conversion step-by-step, enunciating which state you are compressing at each step.

   ![NFA Diagram]

3. Problem 1.31.

4. Convert the NFA in Exercise 2 into an equivalent NFA without epsilon transitions. Present the answer as a state diagram.

5. Which of the following languages is regular? If the language is regular, then give a state diagram DFA, a state diagram NFA, or a regular expression. If the language is not regular, prove that fact using the Pumping Lemma.
   (a) \(L_1 = \{0^n 1^m \mid m \geq 0 \land n \geq 0 \land n < m\}\)
   (b) \(L_2 = \{w \mid w \in \{a, b\}^* \land w \text{ has twice as many } a\text{'s as } b\text{'s}\}\)