Due February 15

1. Convert the NFA in Slide 91 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).

2. Problem 1.32

3. Use the Pumping Lemma to show that the following languages are not regular:
   (a) \{0^n1^m0^n | n, m \geq 0\};
   (b) \{a^ib^i | i < 3j\}
   (c) \{w\#u | w, u \in \{0, 1\}^* and |w| > |u|\};
   (d) \{x_1\#x_2\#x_3 | x_1, x_2, x_3 \in \{a, b\}^* and either x_2 = x_2^R or x_2 = x_3^R\}.

4. Let \(A\) be the language consisting of those strings \(w\) in \(\{0, 1, \#\}^*\) such that either \(w\) starts with 0 or \(w = u\#u\) for some \(u \in \{0, 1\}^*\). \(A\) is not regular. In a Pumping Lemma proof of this, you are given \(p\) and you choose \(s\). For each of the following possible choices of \(s\), state whether or not the choice is a good one. If the choice is bad, provide the decomposition that allows the string to be pumped.
   (a) \(s = 0^p1^p\#0^p1^p\);
   (b) \(s = 1^p0^p\#1^p0^p\);
   (c) \(s = (10)^p\#(10)^p\).

5. Read the discussion of minimum pumping length given in Problem 1.55 of the text (third US edition) and then give the minimum pumping length for the following languages. Justify your answers.
   (a) \(0^*1^*0^*\);
   (b) \(\{0^n1^m | n + m \text{ is even}\}\);
   (c) \(\{a, ba, aba\}\).

6. Problem 1.54. (3rd edition)