Homework 3

Due: Tuesday, 2/14/17 at 9:00pm
Reading: 1.3, 1.4

1. Give regular expressions generating each of the following languages.
   (a) \{w : w does not end in \textit{ba}\} over the alphabet \{a, b\}.
   (b) \{xy | x has an even number of 1s and y has an even number of 0s\}, over the alphabet \{0, 1\}.
   (c) \{w | w does not contain two consecutive Cs\} over the alphabet \{A, B, C\}.

2. Problem 1.21(b) in the text (NFA to Regular Expression conversion)

3. Prove that the following languages are not regular.
   (a) \(L_1 = \{ab^n c^{2n} | n \geq 0\}\) over the alphabet \(\Sigma = \{a, b, c\}\).
   (b) \(L_2 = \{x+y=z | x, y, z \text{ are binary representations of integers, and } z \text{ is the sum of } x \text{ and } y\}\) over the alphabet \(\Sigma = \{0, 1, +, =\}\)
   (for example the strings 1+1=10 and 101+10=111 are in the language, while the strings 1+10=100 and ++1 are not in the language).

4. Define the language \(L = \{a^n s | n \geq 0, s \in \{b, c\}^*\}\), and if \(n\) is odd then \(s\) has twice as many \(c\)'s as \(b\)'s\) over the alphabet \(\Sigma = \{a, b, c\}\).
   (a) Prove that \(L\) is not regular.
   (b) Prove that that \(L\) satisfies the pumping lemma.