Homework 3

*Posted: October 24, 2015*  
*Due: November 9, 2015*

1. Prove that the language \( \{ x \in \{0, 1\}^* \mid x = x^R \} \) is not regular.  
   Hint: concentrate on the word 0\(^p\)10\(^p\).

2. Let \( A \) be an alphabet with \( n \) symbols and let \( Q \) be a set with \( m \) elements. How many deterministic automata of the form \((A, Q, \delta, q_0, F)\) exist?

3. Prove or disprove:
   
   (a) If \( L \) is a regular language and \( K \subseteq L \), then \( K \) is regular.
   
   (b) Every non-regular language is infinite.
   
   (c) If \( L_1 \) and \( L_2 \) are non-regular languages, then \( L_1 \cap L_2 \) is non-regular.

4. Let \( L \) be a regular language, \( L \subseteq \{0, 1\}^* \). Prove that the set of all words in \( L \) that begin with 01 is regular.

5. Compute the minimal dfa for the regular language \( \{a\}^*\{b\}^* \).