Practice Problems

1. Consider the language

   \[ L = \{ w \in \{0, 1\}^* \mid w \text{ contains two 1's such that there are even number of 0's between these two 1's} \} \]

Write a regular expression for \( L \). Construct an NFA that accept \( L \).

2. Let \( \Sigma = \{0, 1\} \) be the input alphabet, and \( \Delta = \{\epsilon, 1\} \) be the output alphabet. Construct Mealy and Moore machines that count the occurrences of “01” in unary. For example, on input 101101, your machine should output 11.

3. Write a regular expression for the language \( L = \{ w \in \{0, 1\}^* \mid w \text{ is divisible by 3} \} \).
   
   a. Construct a DFA for \( L \).
   
   b. Turn the DFA into a GNFA.
   
   c. Find a regular expression for \( L \) from the GNFA.

4. Let \( L \) be a regular language, prove that \( \overline{L} \) is regular.