1 Determine the equivalence classes of $\equiv_L$ for each of the following regular languages $L$ over the binary alphabet:
   
   a. $L = \{w : w$ begins with a 1 and ends with a 0$\}$
   b. $L = \{w : w$ contains at least three 1s$\}$
   c. $L = \{w : w$ does not contain 000 as a substring$\}$

2 Determine the equivalence classes of $\equiv_L$ for each of the following nonregular languages $L$ over the binary alphabet:
   
   a. $L = \{w : w$ is a palindrome$\}$
   b. $L = \{0^n1^n : n \geq 0\}$

3 Use the Myhill-Nerode theorem to prove that the following languages are non-regular:
   
   a. $L = \{0^n1^n2^n : n = 0, 1, 2, 3, \ldots\}$
   b. $L = \{www : w \in \{0, 1\}^*\}$
   c. $L = \{0^{2n} : n = 0, 1, 2, 3, \ldots\}$

4 Construct the smallest possible DFA for each of the following languages, using the Myhill-Nerode theorem to prove that your DFA is indeed the smallest possible:
   
   a. $L = \{\epsilon\}$
   b. $L = \{w : w$ ends with 00$\}$
   c. the language $L$ of binary strings that contain a pair of 1s separated by an even number of symbols.