1. Text exercise 9 of Chapter 18.

2. Design a standard (1-tape, deterministic) \( \text{TM} \) \( M \) with input alphabet \( \{0,1\} \) and tape alphabet \( \{0,1,B\} \) such that for any input string \( \omega \), \( M \) computes \( a = |\omega| \mod 2 \) and halts in the configuration \( q_f B a B \).
   
   (a) Present \( M \) as a transition diagram.
   
   (b) Show the computation of \( M \) on input \( \lambda \).
   
   (c) Show the computation of \( M \) on input \( 01 \).
   
   (d) Show the computation of \( M \) on input \( 10011 \).

3. Give informal, but clear, constructions to show that the given class of languages is closed under concatenation (product).
   
   (a) The recursive languages.
   
   (b) The recursively enumerable (r.e.) languages.

4. Prove that if \( L \) is an \( \text{RE} \) language over 0,1 then \( L \) is m–1 reducible to \( L_H \). Here \( L_H \) is the “Halting Problem” language, i.e., \( L_H = \{R(M)\omega \mid M \text{ halts on input } \omega\} \).