(1) Let
\[ L = \{ s \in \{a, b\}^* \mid s \neq \epsilon \text{ and } s \text{ begins and ends with the same symbol} \} \]
which begins
\[ = \{a, b, aa, bb, aaa, aba, \ldots \}. \]

(a) Describe an algorithm for recognizing \( L \) that can be implemented on a Turing machine.

(b) Describe a Turing machine \( M = (Q, \Sigma, \Gamma, \delta, q_0, q_{\text{accept}}, q_{\text{reject}}) \) that implements this algorithm. Make sure you explicitly state the values of \( Q, \Sigma, \Gamma, \delta, q_0, q_{\text{accept}}, q_{\text{reject}} \).

(c) Given the input \( s = aab \), describe all configurations of your algorithm, using the notation on pages 169 and 172 of [Sip]; e.g., the initial configuration is \( q_0aab \).

(d) Given an input of length \( n \), how much time does your Turning machine take, i.e., how many steps?