1. Prove or disprove: the language $X(L) = \{w \in L \mid wy \notin L \text{ for any } y \neq \epsilon\}$ is regular for *every* regular language L.

2. Write regular expressions for the following languages:

   (a) $\{w \in \{0, 1, 2\}^* \mid w \text{ contains the substring 01 }\}$.

   (b) $\{w \in \{0, 1, 2\}^* \mid w \text{ does not have the substring 01 and w has the substring 10}\}$.

3. Use the pumping lemma to prove in detail that the language $\{a^n b^m \mid 2n < m\}$ is not regular.