1. **Problem 1**

   Let $L_1 \subset L_2$.

   (a) If L_1 is a regular language, then is L_2 necessarily a regular language?

   > **Solution:**

   (b) If L_2 is a regular language, then is L_1 necessarily a regular language?

   > **Solution:**

2. **Problem 2**

   Consider a regular language L that accepts a string if the 6th to last bit is a 1 (over an alphabet of $\{0, 1\}$.

   (a) Construct an NFA that recognizes L.

   > **Solution:**

   (b) Argue that any DFA which recognizes L must have at least 64 states.

   > **Solution:**

3. **Problem 3**

   Given a DFA for L, provide a formal construction for a DFA that recognizes L*. In other words, provide the 5-tuple that characterizes Kleene(L) = $\{w_1...w_k | k \geq 0$ and each $w_i \in L\}$.

   > **Solution:**

4. **Problem 4**

   Draw a DFA that accepts the regular language represented by the regular expression ((01)*)001.

   > **Solution:**