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 $\text{Kleene}(L) = \{w_1...w_k|k \geq 0 \text{ and each } w_i \in L\}$.
   Solution:

4. **Problem 4**
   Draw a DFA that accepts the regular language represented by the regular expression
   $((01)^*)001$.
   Solution: