1. Using the union construction and two of the DFAs from Exercise 1 of Homework 1, give a DFA that recognizes the language

\( \{ w \in \{0,1\}^* | w \text{ contains at least two 0's or contains 110 as a substring} \} \).

(Your answer must be a DFA obtained using the construction from Theorem 1.25 and not just an NFA.)

Solution:
2. Using the intersection construction and two of the DFAs from Exercise 1, give a DFA that recognizes the language

\[ \{ w \in \{0,1\}^* | w \text{ contains at least two 0's and contains 110 as a substring} \}. \]

Solution:
3. (a) Give an NFA with four states that recognizes $L_1 = \{w \in \{0, 1\}^* | w$ contains 110 as a substring $\}$. 
(You can actually give a DFA with four states that recognizes this language. Your NFA should be “simpler” than this DFA in the sense that it does not have any cycles except for self-loops.)

Solution:

![Diagram of NFA for L_1](image)

(b) Give an NFA with two states that recognizes the language $L_2 = 0^*12^* \cup 0^*2^*$. 

Solution:

![Diagram of NFA for L_2](image)

4. Convert the NFA given in Figure 1.27 of the textbook into a DFA. Show only the reachable states of the DFA.

Solution:
5. Using the method from class, give an NFA that recognizes $L_1 \cup L_2$, where $L_1$ and $L_2$ are the languages from Exercise 3.

Solution:

![NFA Diagram]

6. Using the method from class, give an NFA that recognizes $L_1 \circ L_2$, where $L_1$ and $L_2$ are the languages from Exercise 3.

Solution:

![NFA Diagram]