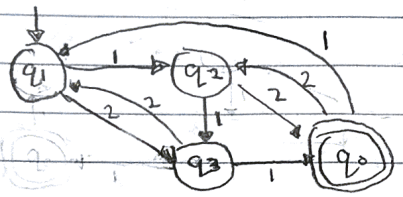
Homework 1

1. DFA $M = (\{q_0, q_1, q_2, q_3\}, \{1, 2\}, \delta, q_1, \{q_0\})$

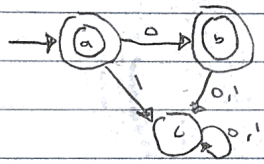
$\delta =$	1	2
q_0	q_1	q_2
q_1	q_2	q_3
q_2	q_3	q_0
q_3	q_0	q_1



This machine represents the language of strings with odd amount of one's and end with 12, 21, 111, or 22.

2. $M = (\{a, b, c\}, \{0, 1\}, \delta, a, \{a, b\})$ where $\delta =$

	0	1
a	b	c
b	c	c
c	c	c



3. Let A_1 and A_2 be languages recognized by DFAs $M_1 = (Q_1, \Sigma, \delta_1, s_1, F_1)$ and $M_2 = (Q_2, \Sigma, \delta_2, s_2, F_2)$ respectively $L(M_1) = A_1$ and $L(M_2) = A_2$.

Construct DFA $M = (Q, \Sigma, \delta, s, F)$ where

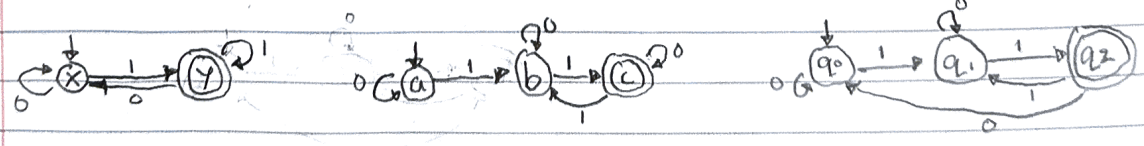
$Q = Q_1 \times Q_2 = \{(q_1, q_2) \mid q_1 \in Q_1 \text{ and } q_2 \in Q_2\}$

$s = (s_1, s_2)$

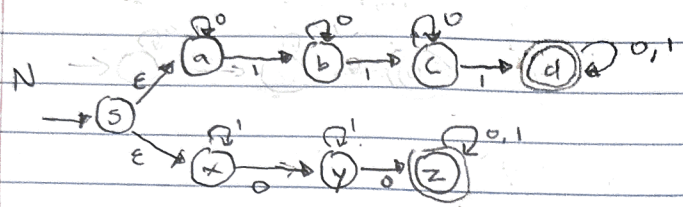
$F = (F_1 \times Q_2) \cap (F_2 \times Q_1) = \{(F_1, F_2) \in Q \mid F_1 \in Q_1 \text{ and } F_2 \in Q_2$

$\delta((q_1, q_2), a) = (\delta_1(q_1, a), \delta_2(q_2, a))$ for any $q_1 \in Q_1$, $q_2 \in Q_2$, $a \in \Sigma$

By construction of M, $L(M) = A_1 \cap A_2$, it establishes regularity of $A_1 \cap A_2$

4. 

5. NFA that recognizes binary strings with at least two zeros or at least three ones.



6. $N = (\{s, a, b, c, d, x, y, z\}, \{0, 1\}, \delta, s, \{d, z\})$

where $\delta =$

	0	1	ε
s	∅	∅	{a, x}
a	{a}	{b}	∅
b	{b}	{c}	∅
c	{c}	{d}	∅
d	{d}	{d}	∅
x	{y}	{x}	∅
y	{z}	{y}	∅
z	{z}	{z}	∅

Citations: work done by myself. Used class notes as a reference for help.