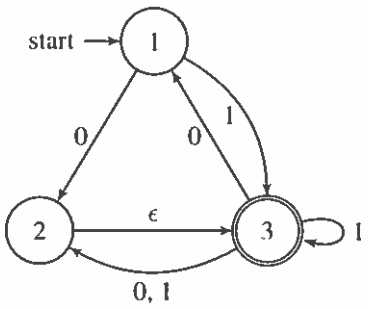
CMSC 303 Introduction to Theory of Computation
Nondeterministic Finite Automata and Regular Expressions
Exercise

1. Formally describe this NFA:



$Q = \{1, 2, 3\}$

$\Sigma = \{0, 1\}$

$\Sigma_\epsilon = \{0, 1, \epsilon\}$

$q_0 = 1$

$F = \{3\}$

δ	0	1	ϵ
1	$\{2\}$	$\{3\}$	$\emptyset$
2	$\emptyset$	$\emptyset$	$\{3\}$
3	$\{1, 3\}$	$\{2, 3\}$	$\emptyset$

2. Convert the NFA below into a DFA.

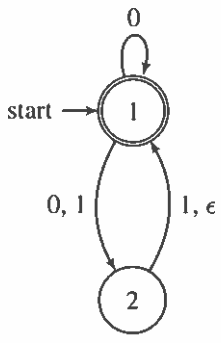
$|Q| = 2$

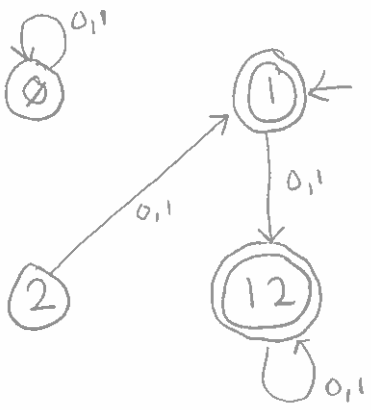
$2^{|Q|} = 2^2 = 4$

$Q' = \{\emptyset, 1, 2, 12\}$

$q_0' = 1$

$F = \{1, 12\}$





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Note: At state 2 on input of 0, You can slide to 1 and then stay at 1.

3. Create the regular expression to represent the language R = {w | w ∈ {0, 1}* and contains the string 001 as a substring}.

$\Sigma^* 001 \Sigma^*$

4. Create the regular expression to represent the language R = {w | w ∈ {0, 1}* and starts with a 1 and has even length}.

$1\,\Sigma(\Sigma^2)^*$

5. Convert the NFA below into a DFA.

$|Q| = 3$

$2^{|Q|} = 2^3 = 8$

$Q' = \{\emptyset, 1, 2, 3, 12, 13, 23, 123\}$

$q_0' = 1$

$F = \{3, 13, 23, 123\}$