Homework 1
COSE215, Spring 2019

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Due: 4/3 (in class)

Problem 1 (10pts) Prove that $(uv)^R = v^R u^R$ for all $u, v \in \Sigma^+$. (Hint: Use induction on the length of v.)

Problem 2 (10pts) Consider the language: $L = \{w00 \mid w \in \{0,1\}^*\}$.

1. (5pts) Design a DFA that accepts L.
2. (5pts) Design an NFA that accepts L.

Problem 3 (10pts) Consider the following language: $L = \{a^m b^n \mid m, n \geq 1\}$.

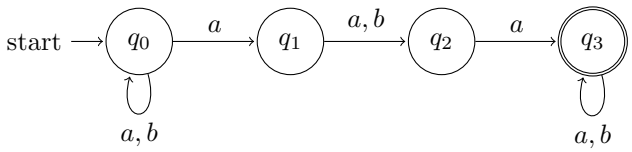
1. (5pts) Design a DFA that accepts L.
2. (5pts) Design an NFA that accepts L.

Problem 4 (10pts) Consider the following language: $L = \{w \in \{0,1\}^* \mid w \text{ ends with } 1001.\}$.

1. (5pts) Design a DFA that accepts L.
2. (5pts) Design an NFA that accepts L.

Problem 5 (10pts) Design an NFA to recognize the strings that represent real numbers. Assume $\Sigma = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, .\}$. For example, the NFA should accept strings such as "1.0", "12.156", and ".01", but must reject strings such as "0.5.1", "12.", and "3".

Problem 6 (20pts) Use subset construction to convert the following NFA to a DFA:



Problem 7 (10pts) Design an ϵ-NFA that accepts the following language:

$$L = \{a^m b^n c^o \mid m, n, o \geq 0\}$$

Problem 8 (20pts) Consider the following transition table of an ϵ-NFA:

	ϵ	a	b	c
p	$\emptyset$	$\{p\}$	$\{q\}$	$\{r\}$
q	$\{p\}$	$\{q\}$	$\{r\}$	$\emptyset$
r	$\{q\}$	$\{r\}$	$\emptyset$	$\{p\}$

where p is the initial state and r is the final state.

1. (10pts) Compute the ϵ-closure(ECLOSE) of each state.
2. (10pts) Convert the automaton to a DFA.