CompSci 162
Spring 2023 Lecture 4.2:
Non-Deterministic Finite Automata
Question 18: Introducing NFAs

- Some think of NFAs as “proof of concept” DFA
- Give an NFA: $\Sigma = \{a, b\}$
  third-to-last character in the string is a $b$.
- Ex: $aaabaa \in \mathcal{L}$ but $aabb \notin \mathcal{L}$.

DFA $\delta : Q \times \Sigma \rightarrow Q$
NFA: $\delta : Q \times \Sigma \rightarrow 2^Q$ (go to some subset)
Question 19

Give an equivalent DFA to this:

$q_1 \quad b \quad q_2 \quad a, b \quad q_3 \quad a, b \quad q_4$

$a, b \quad \text{"Subset Construction"}$

$\{q_1, q_2\}$

$\{q_1, q_2\}$

$\{q_1, q_2, q_3\}$

$\{q_1, q_2, q_3\}$

$\{q_1, q_2, q_3, q_4\}$
Question 20

Do you accept or reject the following claims?

- DFA-Acceptable $\subseteq$ NFA-Acceptable
  Kinda trivial.
  all range on $\delta$ singleton

- NFA-Acceptable $\subseteq$ DFA-Acceptable
  Subset construction
Question 21

Give an NFA. \( \Sigma = \{a\} \).
Want: \( \{a^n | n = 2k \text{ or } n = 3j \text{ for some } k, j \in \mathbb{N}\} \)
Also, could you do a DFA?

\( \varepsilon \): epsilon is you can follow this transition w/o consuming any input
Question 22

Given RegEx, draw NFA for same language

▶ Any char $x \in \Sigma$ is valid, as is $\emptyset$:

▶ $u \cup v$ is valid when $u, v$ are:
Question 22

Given RegEx, draw NFA for same language

- $uv$ is valid when $u, v$ are:

- $(u)^*$ is valid when $u$ is: