Lecture 5

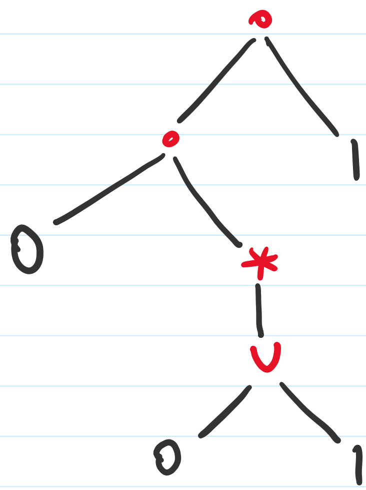
Thursday, May 16, 2019 7:52 PM

Last time:

- NFA ≡ DFA (Subset Construction)
- Reg Expressions ≡ FA (≡ DFA ≡ NFA)

(1) Reg Expr ⇒ NFA

$0\,(0 \cup 1)^{*}\,1$

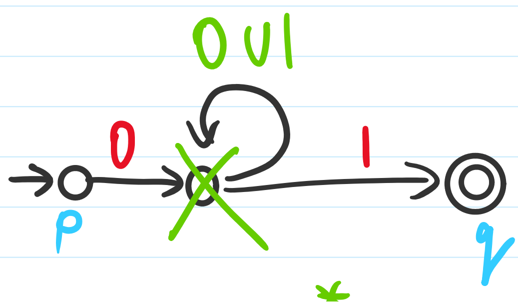


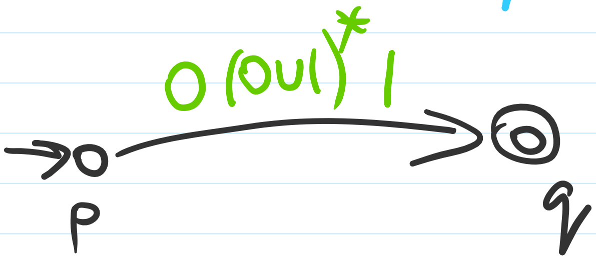
algorithm:

Construct NFA for the leaves, then go up the tree, constructing NFA for all other nodes. Output the root NFA.

(2) FA ⇒ Reg Expression

Ex.

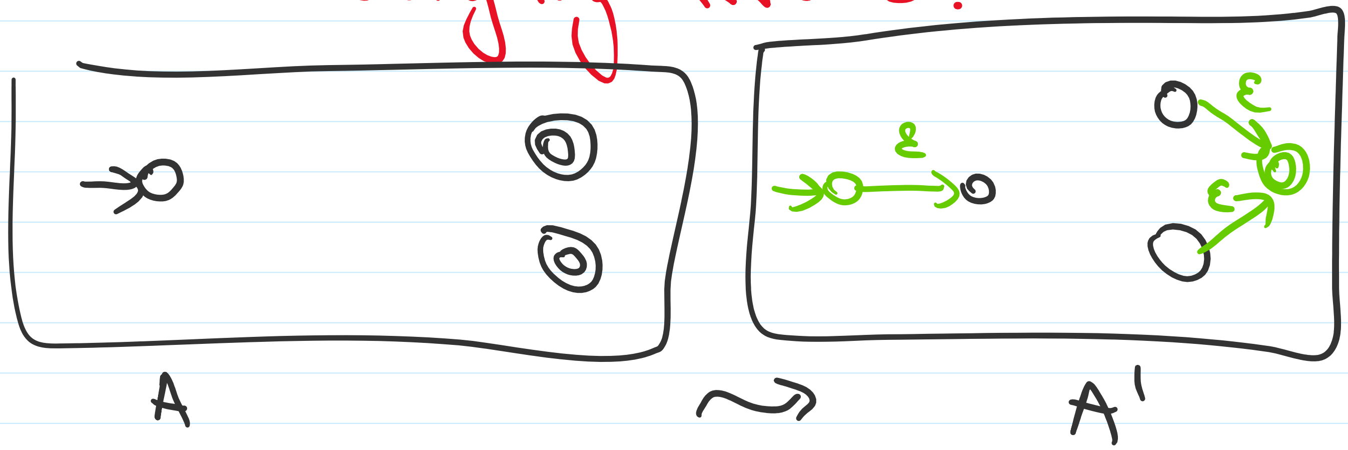




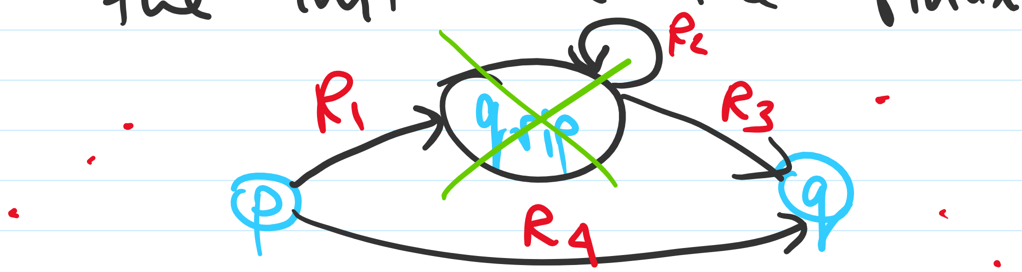
$0(0\cup 1)^*1$

Need:

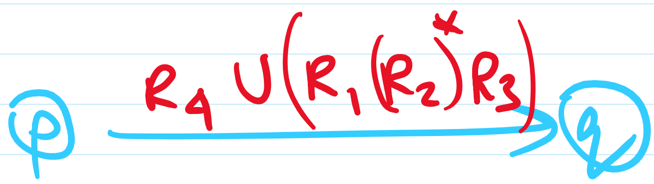
- FA has init state with no incoming arrows
- FA has exactly one final state, which has no outgoing arrows.

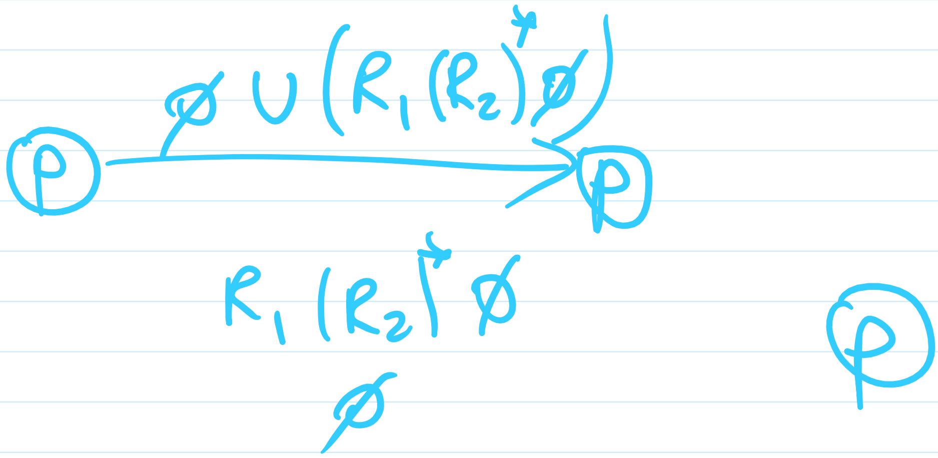


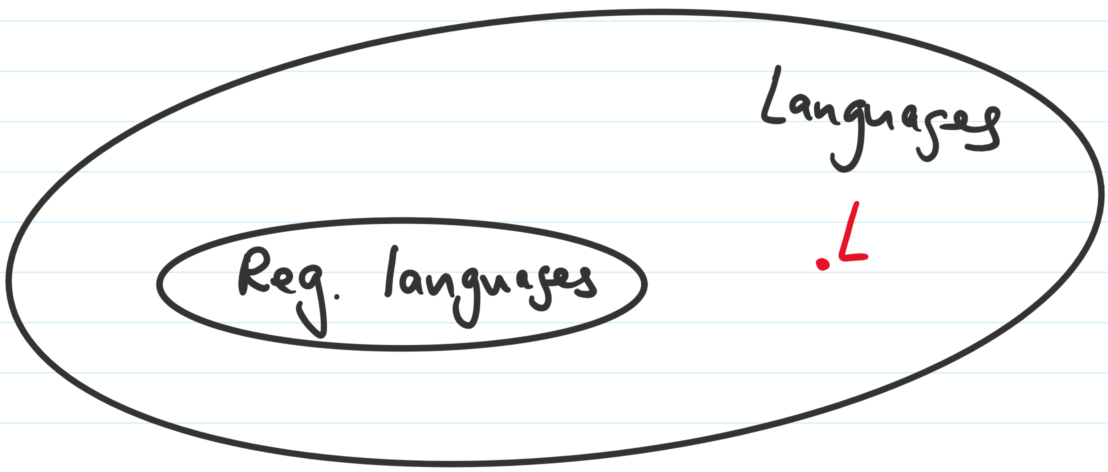
Rip out all states except the init & the final states.



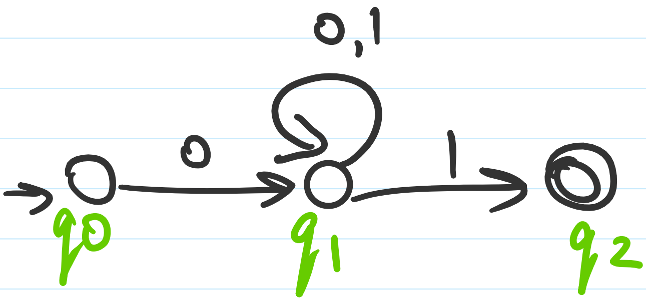
$\forall$ p,q (p could be q)





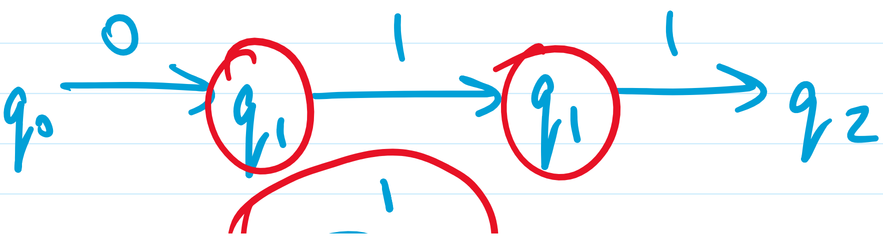


Ex. Non-reg. language $L = \{0^n 1^n \mid n \geq 0\}$

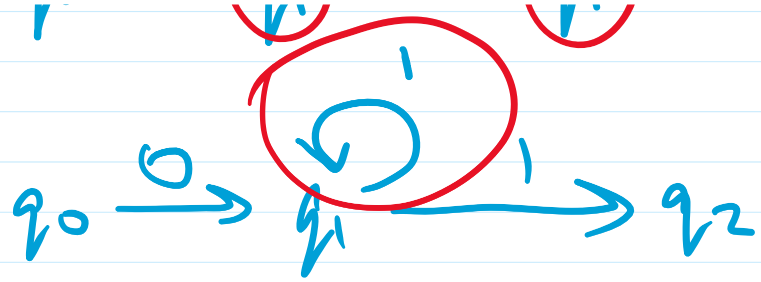


Consider a string $011 = w \in L$

$w = xyz$



accepting comput.



Also accepts : 01

$0\,1111\,1$

$0(1)^i 1$, $i \geq 0$

$w = x\,y\,z \in L$

s.t. $\forall i \geq 0$, $x\,y^i z \in L$

Suppose $L = \{0^n 1^n \mid n \geq 0\}$ is reg.

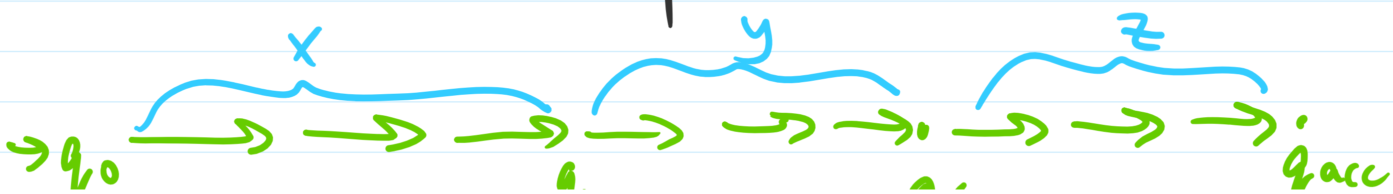
$\Rightarrow \exists$ DFA for L

on p states $(p \in \mathbb{N})$

Consider $w \in L$, $|w| >> p$

then when DFA accepts w

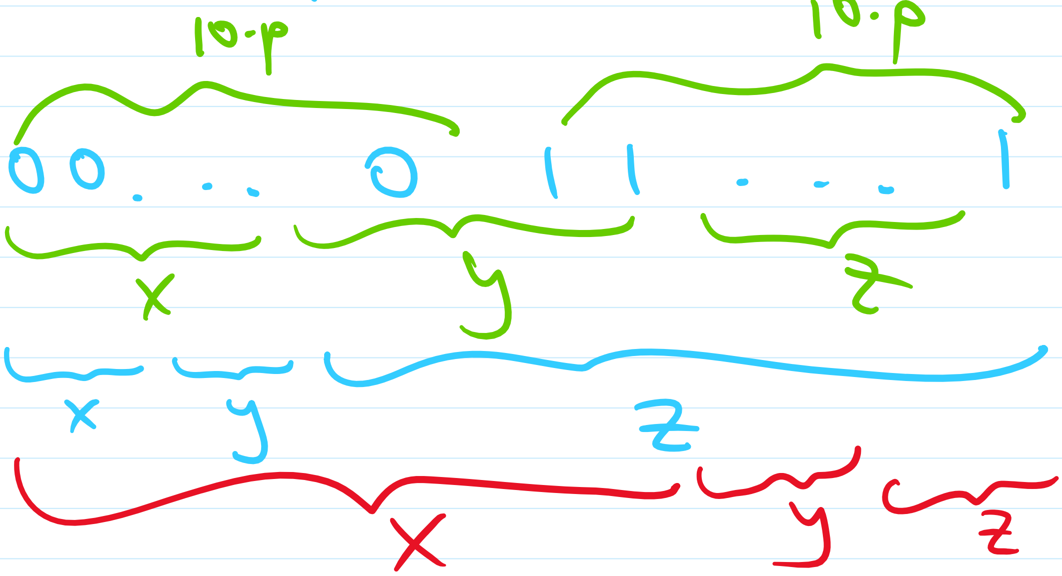
it must repeat a state



$$\to q_0 \to \to \to q \to \to \to q \to \to \to q_{acc}$$

I conclude: $\forall i \geq 0, \quad x y^i z \in L$.

$w = 0^{10 \cdot p} \, 1^{10 \cdot p}$



Pumping Lemma

L acc by DFA on p states.

$\forall \; w \in L, \; |w| \geq p$

$w = xyz$ s.t.

(1) $y \neq \varepsilon$

(2) $|xy| \leq p$

(3) $\forall i \geq 0, \quad x y^i z \in L$.

(3) $\forall i \geq 0$, $xy^iz \in L$.