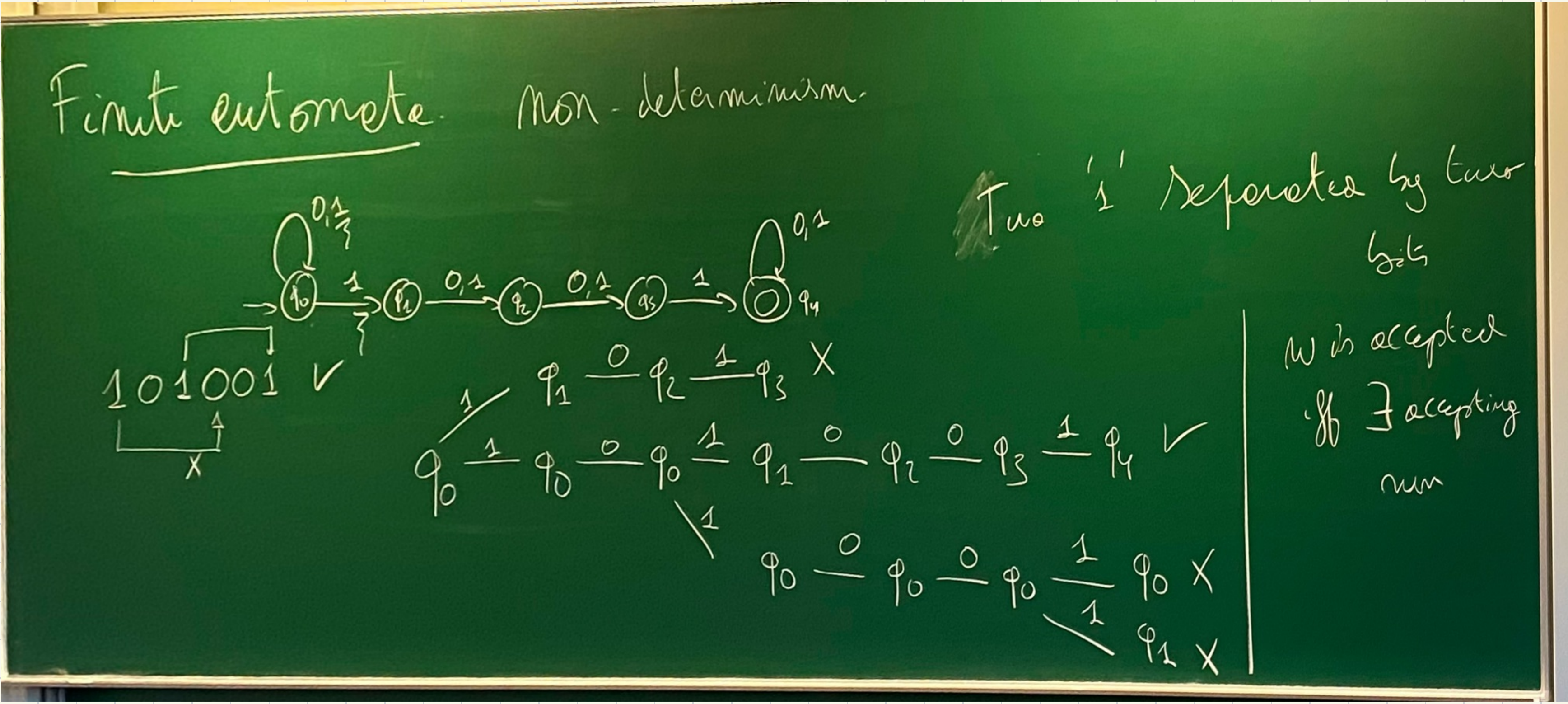
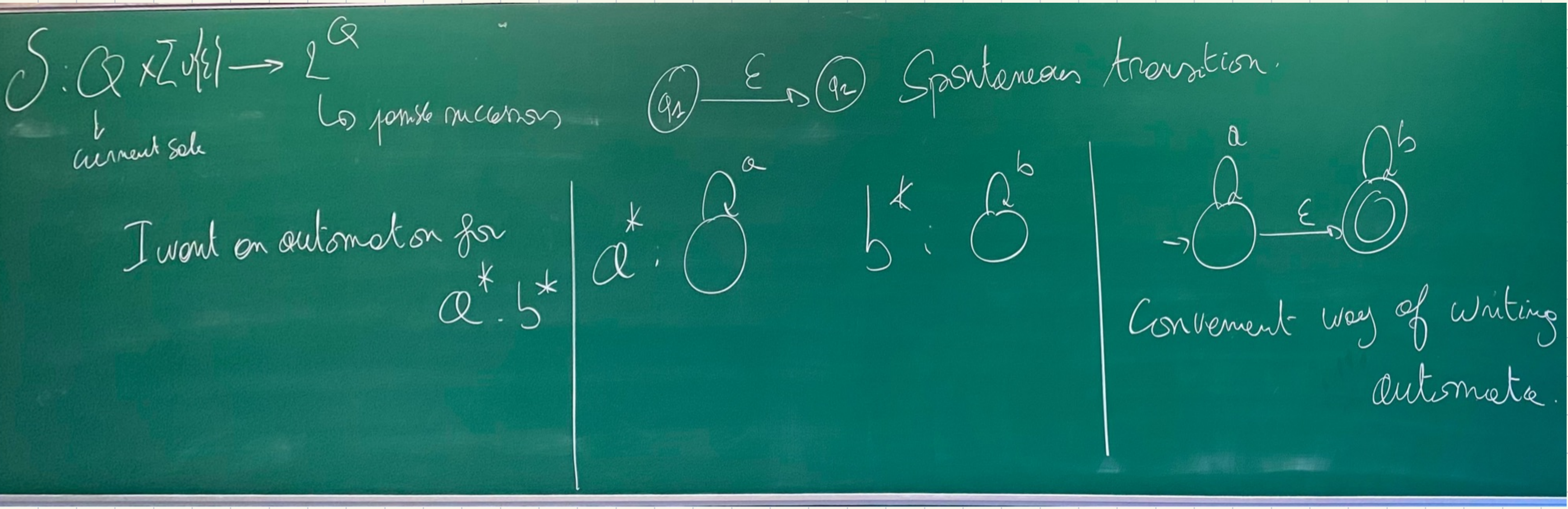
Sept, 23rd

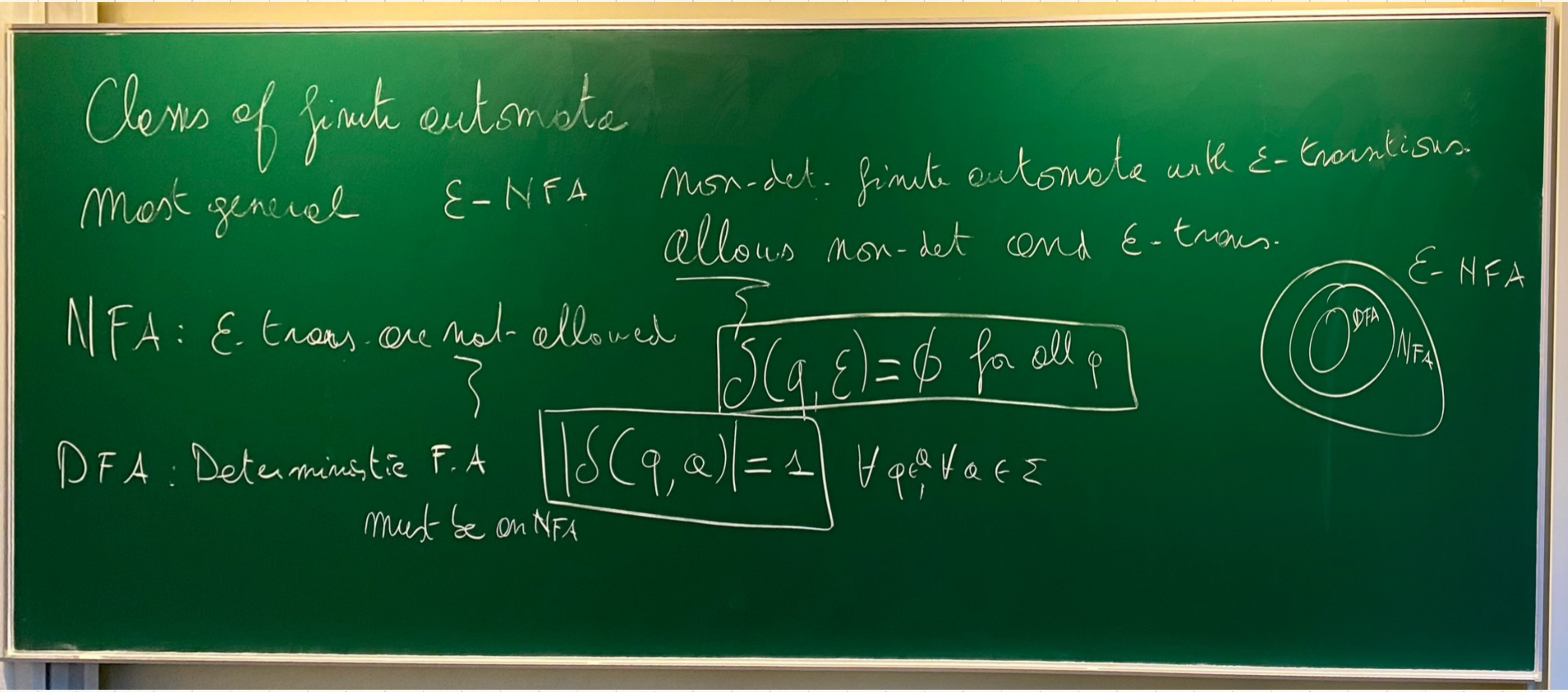
Non-determinism in FAs



Spontaneous transitions



3 classes of F.A.

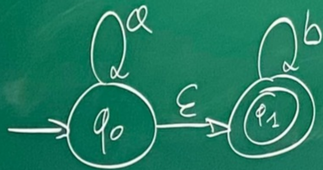


Semantics of FA

How to define "accepted language"?

We need a notion of "configuration" = snapshot of the current state of the FA reading a word.

$\langle q, w \rangle$ $\quad q \in Q \to$ current state
$\quad\quad\quad\quad w \in \Sigma^* \to$ remaining input.



$(q_0, aab), (q_0, ab), (q_0, b), (q_1, b), (q_1, \varepsilon)$

initial config

$q_1 \in F$ accepting

$\varepsilon \to$ must be empty

accepting config

input aab

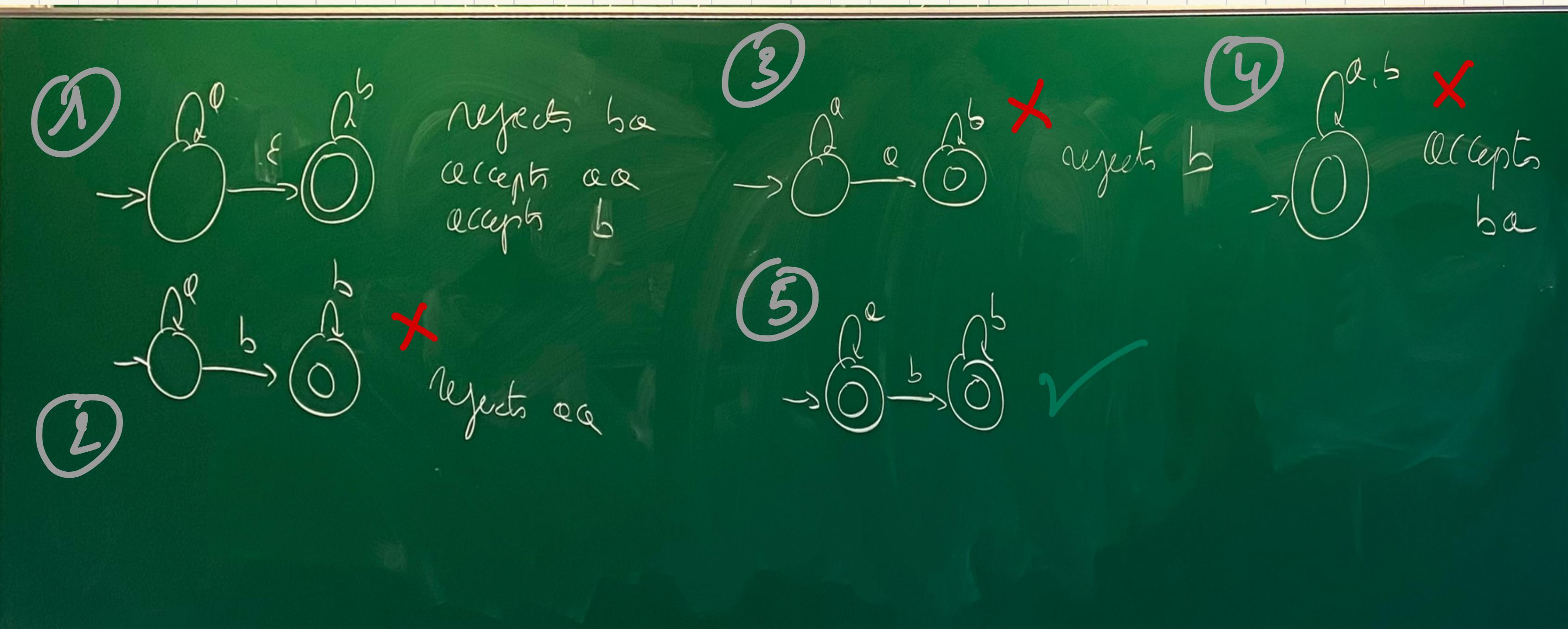
$\delta(q_0, a) = \{q_0\}$

$\delta(q_0, \varepsilon) = \{q_1\}$

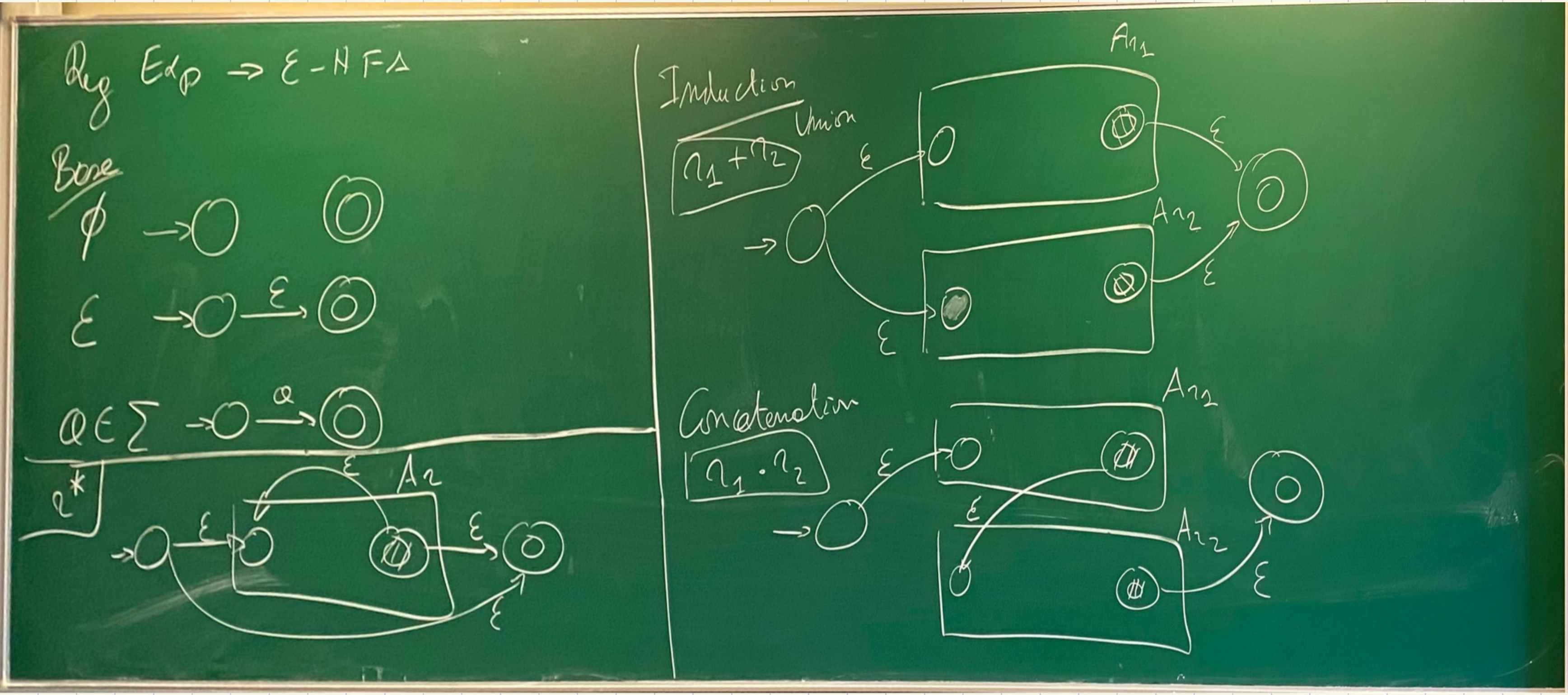
$(q_0, aab), (q_1, aab)$ ✗ $\quad \delta(q_1, a) = \phi$

Getting rid of non-determinism

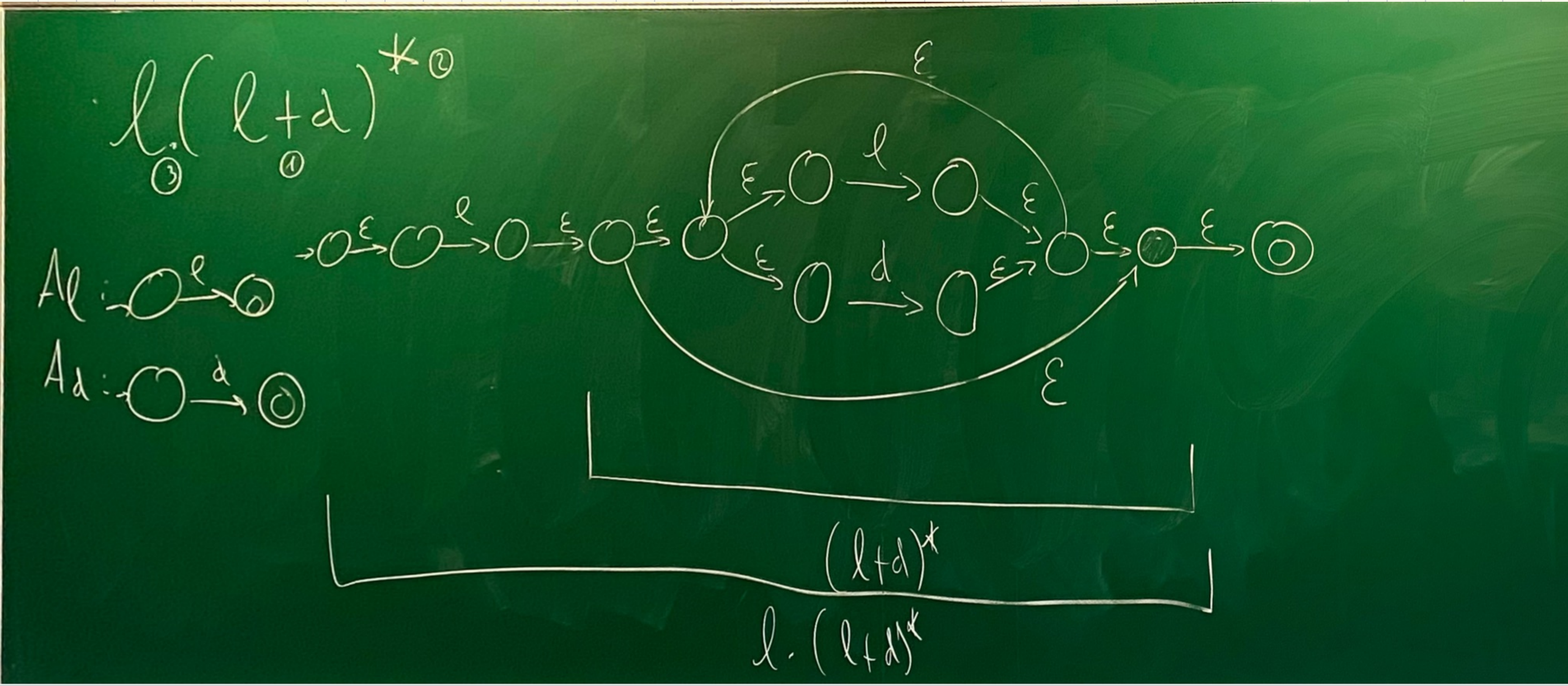
Some intuitions: let's try to remove non-determinism in automaton (1)



From Reg. Expressions to ε-NFA

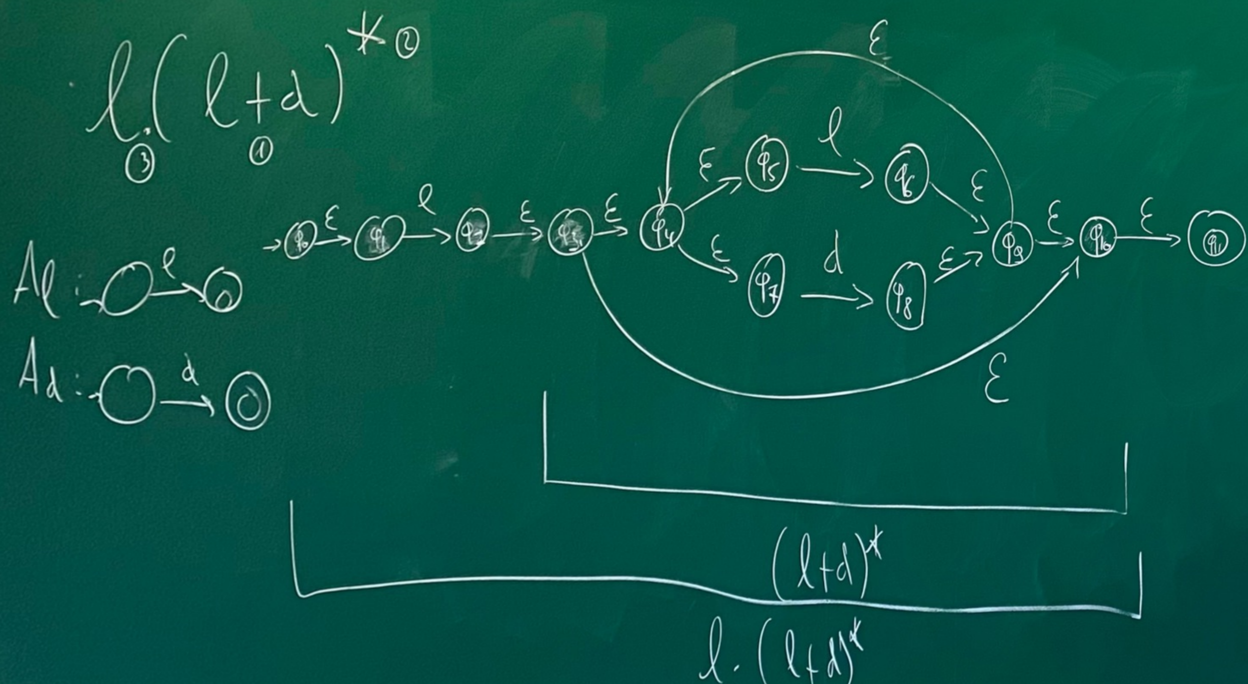


Example



The ε- closure

Eclosure (q) = all the states that we can reach from q by reading ε's only. (0 or more)



Example

$Eclosure(q_6)$
$= \{q_9, q_{10}, q_4, q_5, q_7, q_{11}, q_6\}$

Removing non-determinism

Let's get an intuition of the construction

States of the DFA = sets of states of the NFA