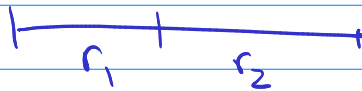


$$r ::= \epsilon \mid w \mid r_1 + r_2 \mid r_1 \cdot r_2 \mid r^*$$



$$r^+ = r \cdot r^*$$

$$\Sigma = \{a \ b \ c \ \dots\}$$

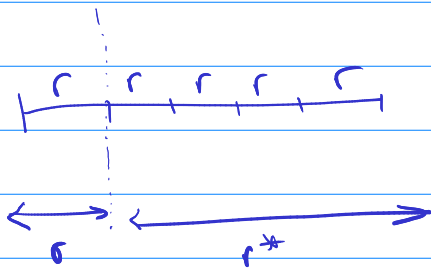
$$\Sigma^*$$

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

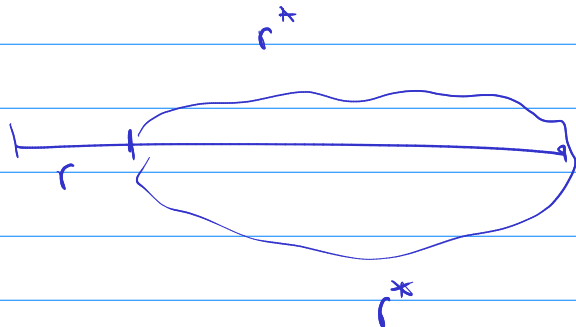
$$\Sigma^* r \Sigma^*$$

$$r^+ = \Sigma^+ r \cdot r^+$$



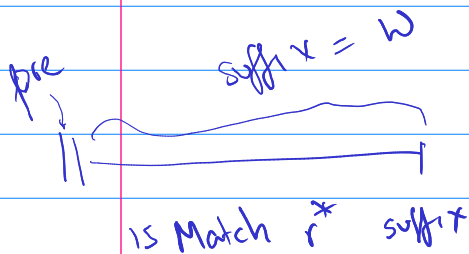


$$r^* = \varepsilon + r \cdot r^*$$



$$r \cdot r \neq r^*$$

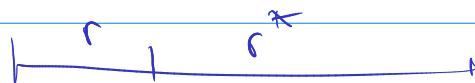
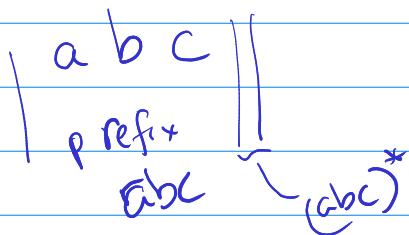
$$a \cdot a \quad a^*$$



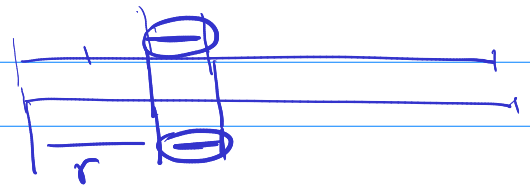
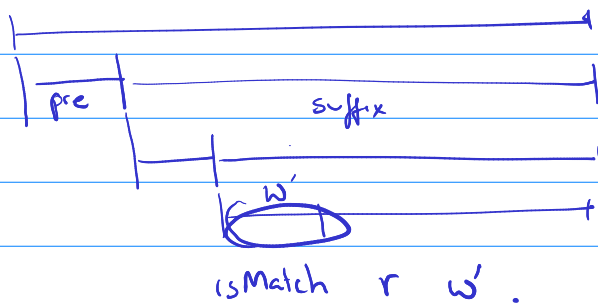
$$\text{isMatch } r^* \quad w$$

$$abc^u$$

$$(abc)^*$$



w r^*



w matches r^*

$$w = w_1 w_2 w_3$$



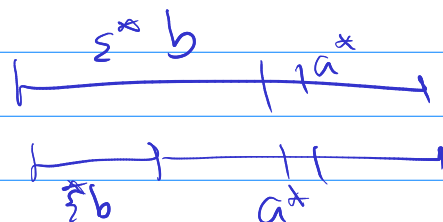
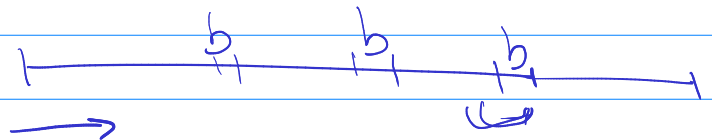
$(abc)^*$

$|abc|abc|abc|abc|$

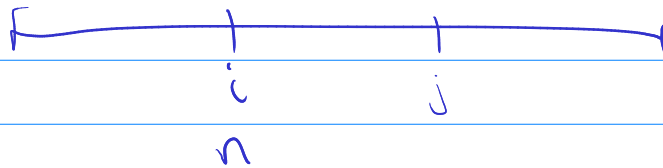
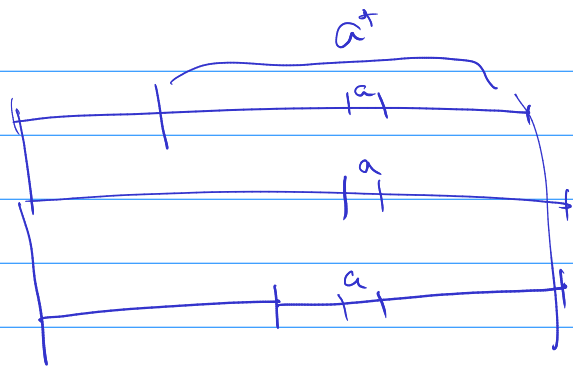
$|abc|abc|abc|abc|$

r_1 r_2
 $(\Sigma^* b) a^*$

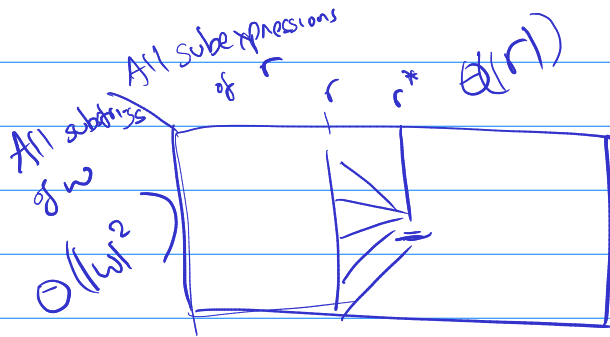
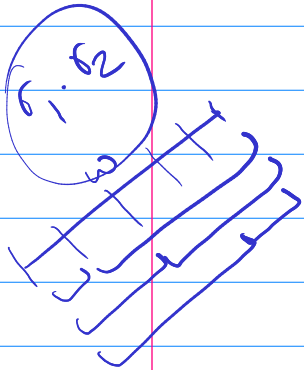
This is
 the last b
 in the string



$$(\Sigma^* b) a^*$$

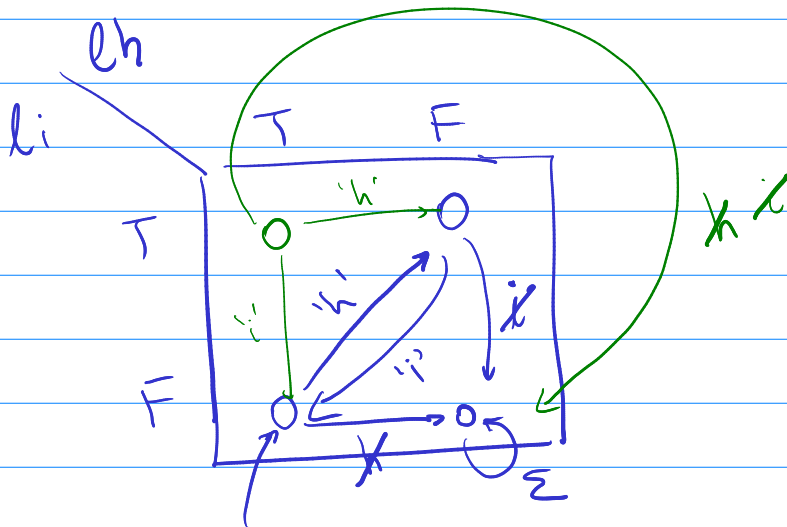


$$\Theta(n^2)$$



$$\Theta(|w|)$$

$$\Theta(|r||w|^3)$$



State machine
Automaton

Board games

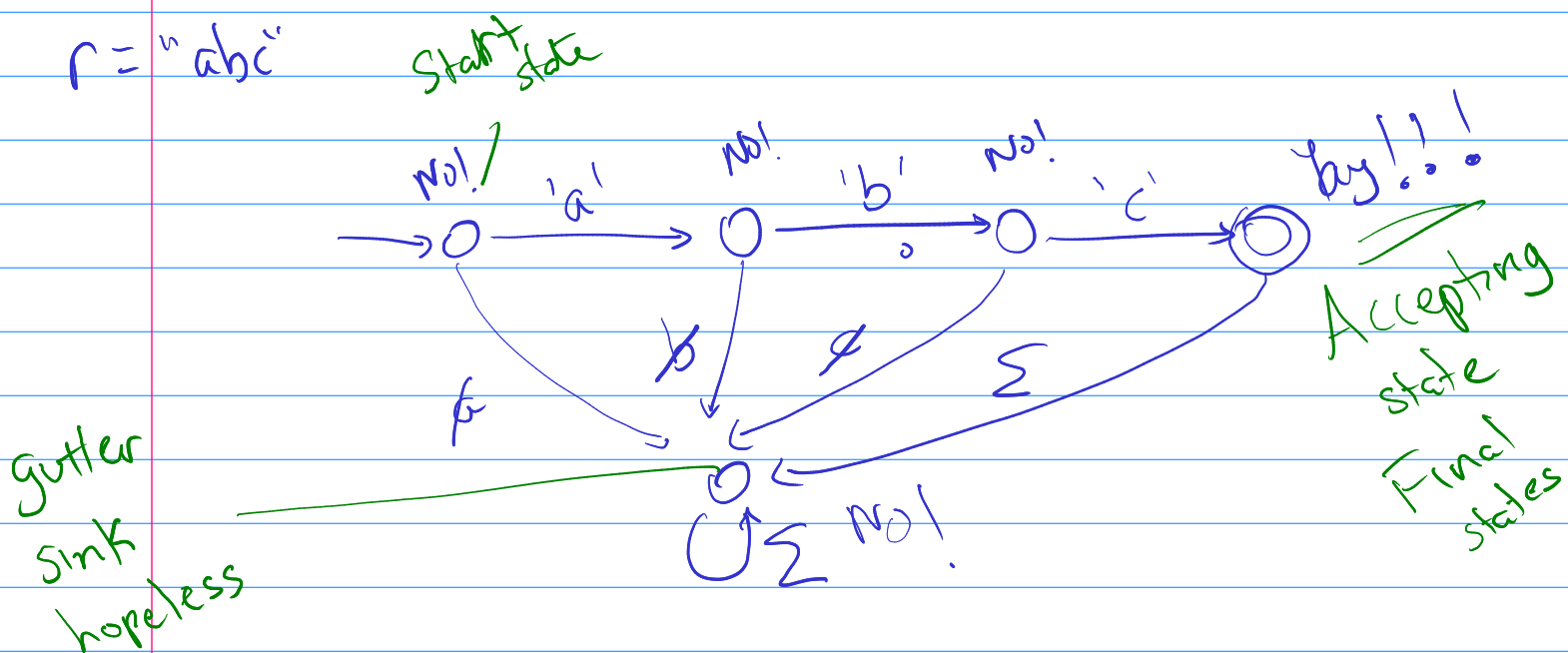
Construct board
game

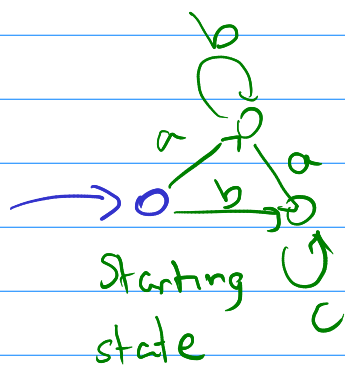
State

Q1: Do you see that the program that we wrote is the same thing as this board game?

Q2: Imagine I gave you the board game but hid the program.

Can you substantially recover the program?

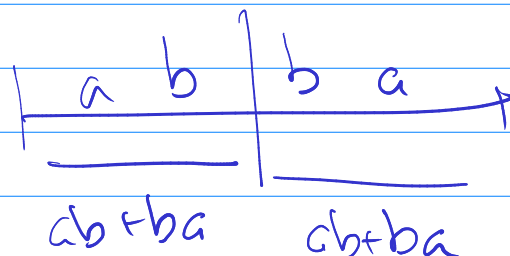




Accepting state

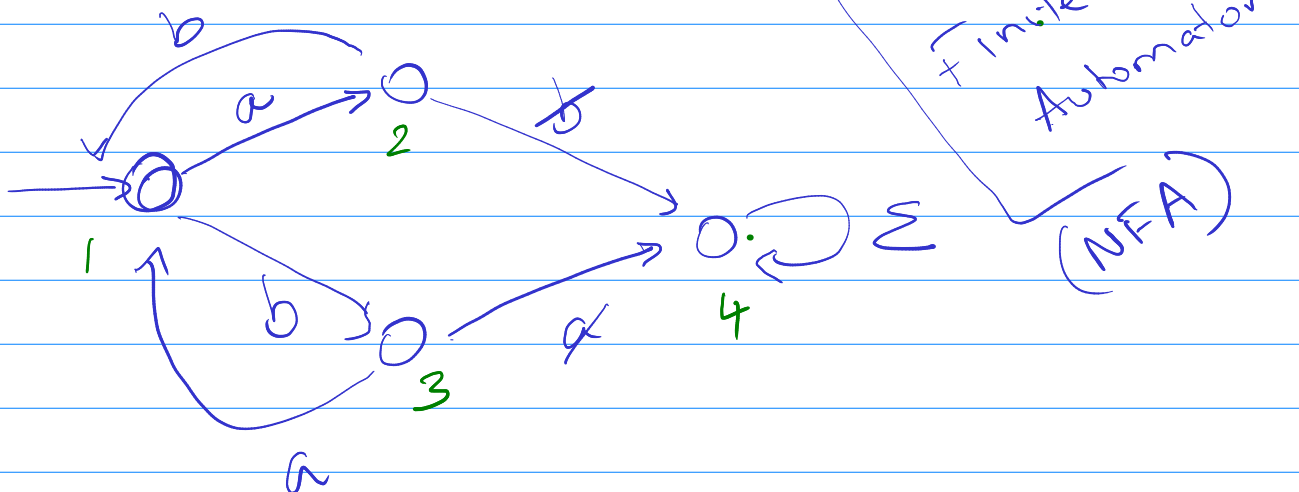
$$r = (ab+ba)^*$$

$$w = \underline{abba}$$

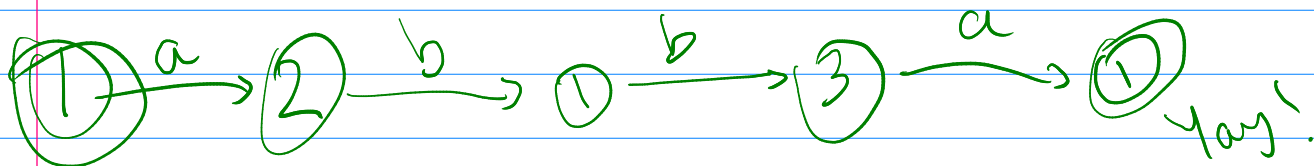


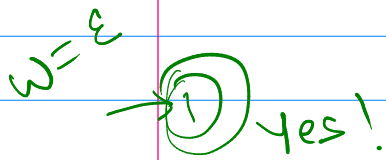
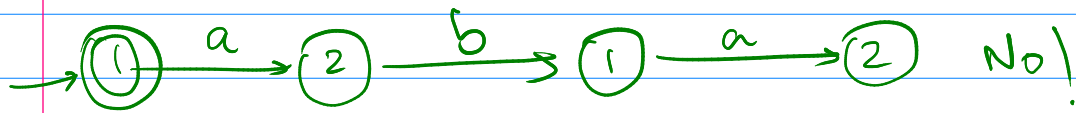
$$w = aba \neq r$$

$$w = abbb$$



$$w = abba$$





let build NFA (r : regex) : nfa =

match r with

| ...

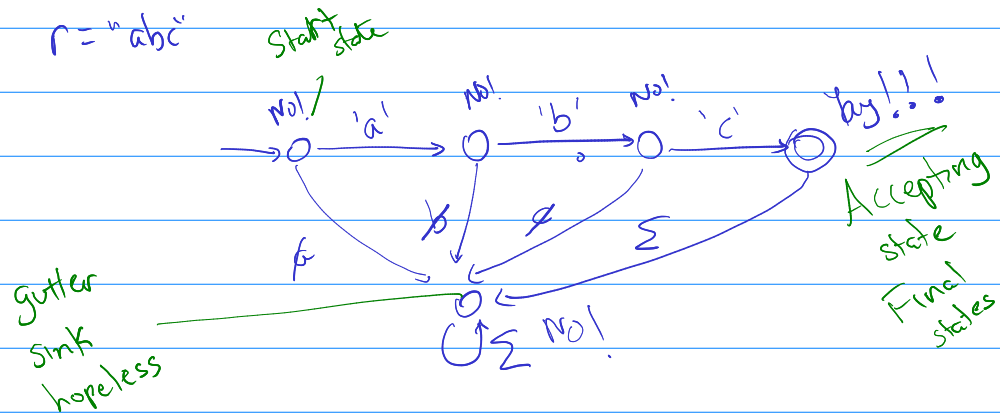
| ...

| ...

$r = 1$



$r = abc$



$r = \epsilon$

