

## DFA to RE

If a language is regular, then it is described by a regular expression.

DFA / NFA  $\rightarrow$  RE



Properties of GNFA

(1) transition  $\xrightarrow{a, b}$  block of alphabets

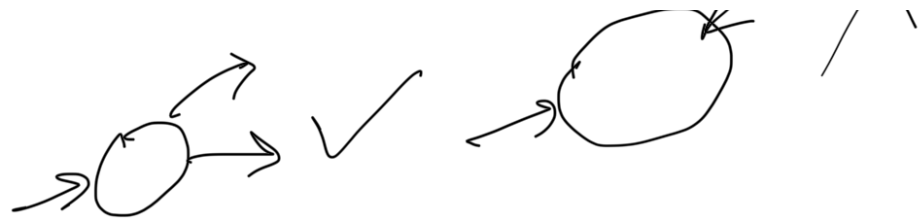
block of alphabets

- $b$  ✓
- $ab$  ✓
- $aba$  ✓
- $aa$  ✓
- $ab^*$  ✓
- $a$  ✓

} RE

(2) One start state.  
No incoming arrows towards start state.

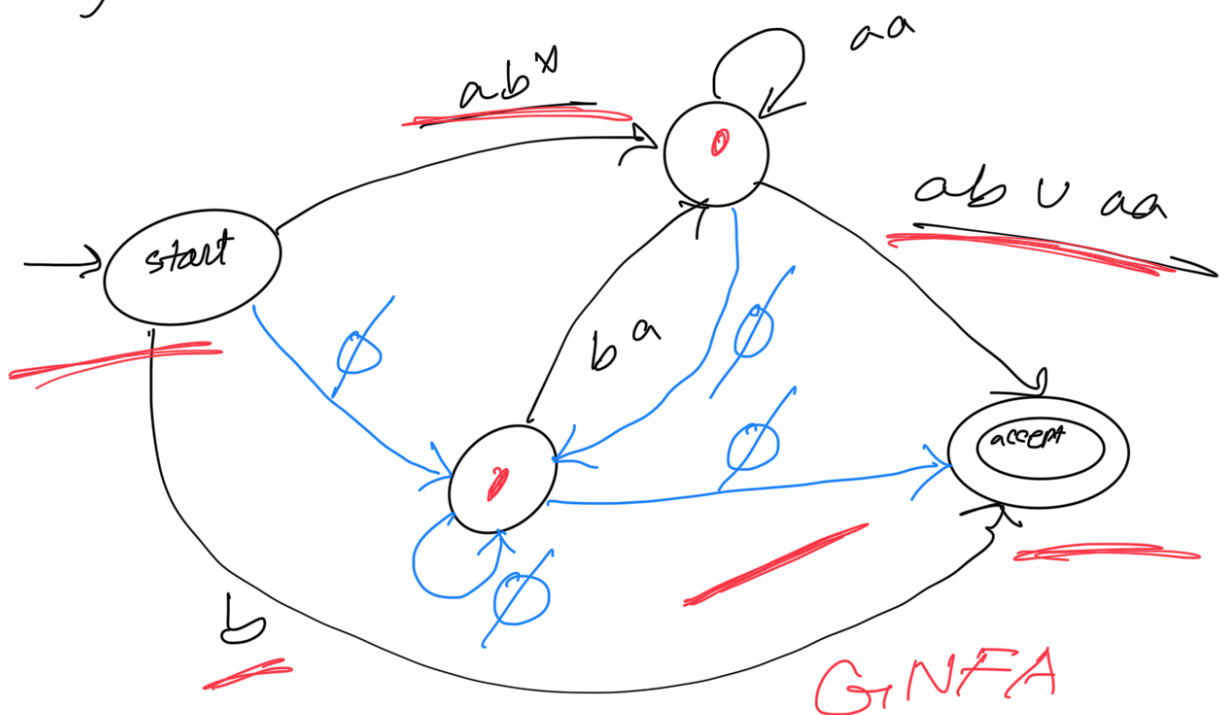


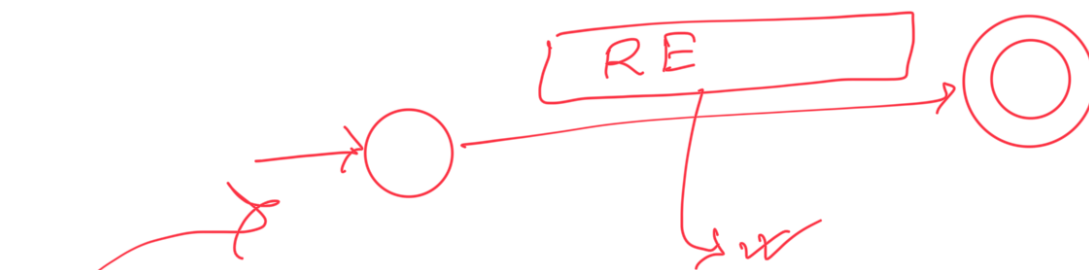
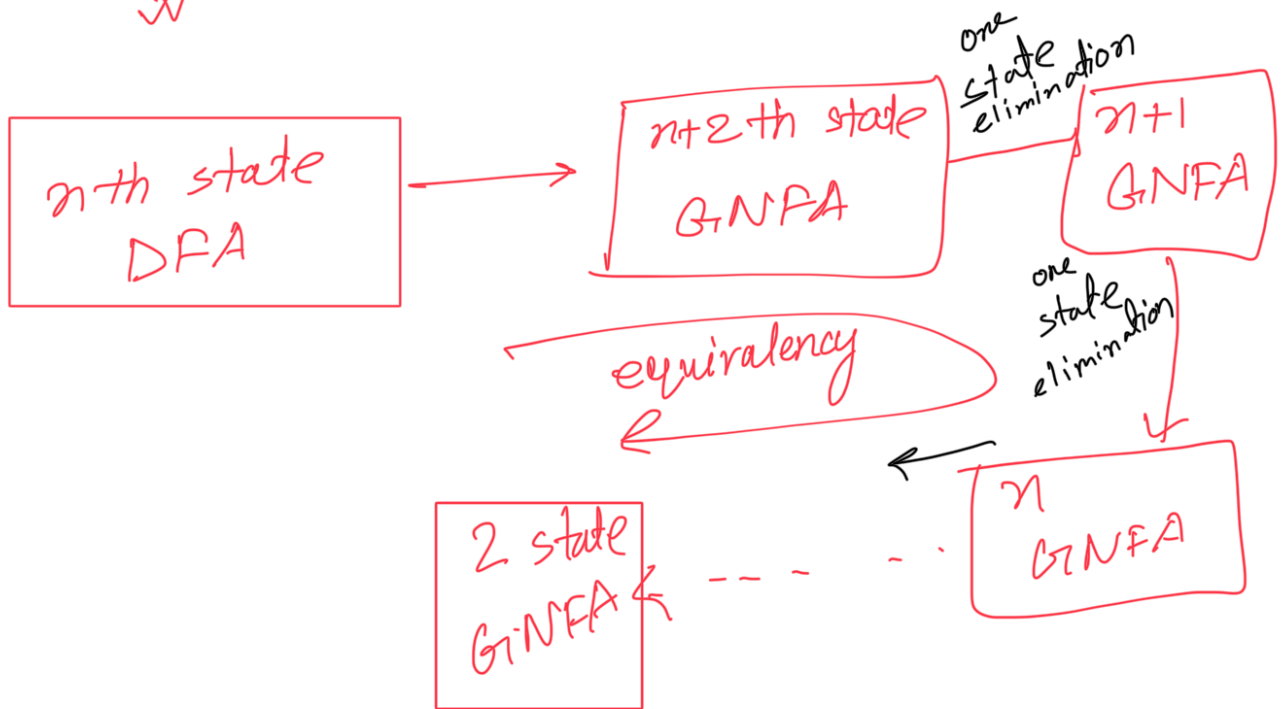
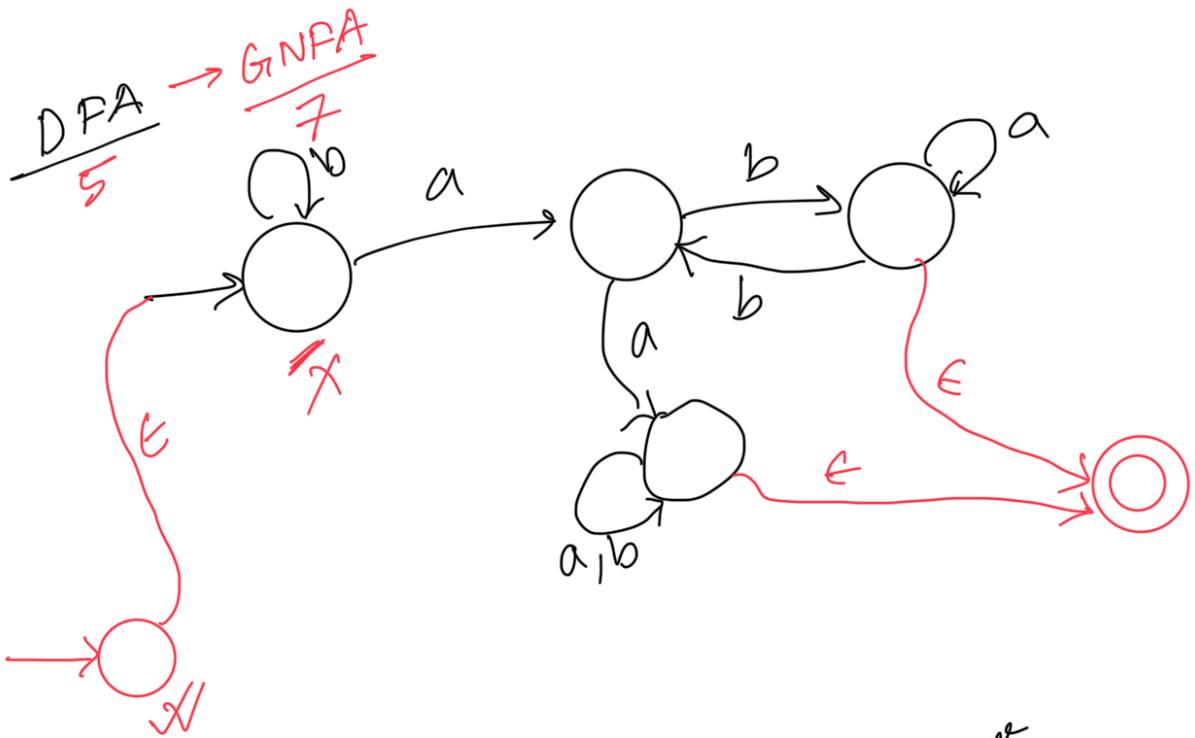


- ③ One accepting state  
No outgoing arrows from accepting state.



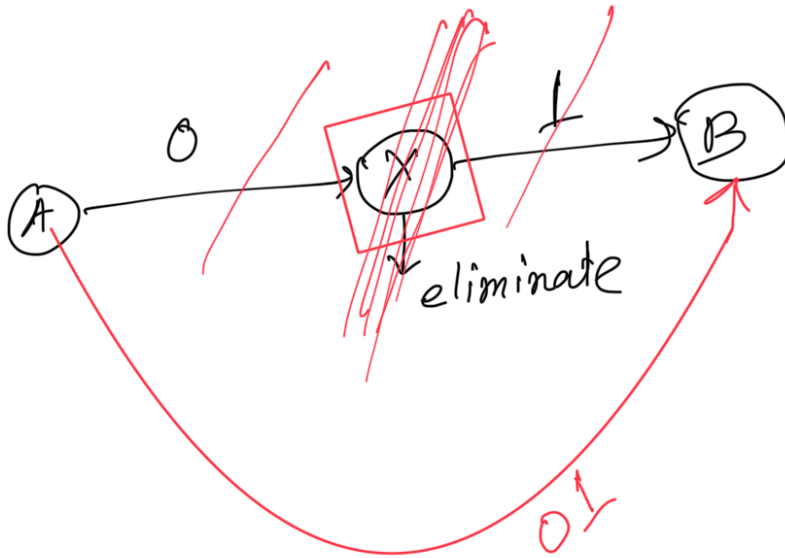
- \* ④ Except for the start and accept states, one arrow goes from every state to every other state and also from each state to itself.





3 DFA  $\rightarrow$  5  $\leq$  GNFA  $\rightarrow$  9  $\leq$  GNFA  $\downarrow$  3  $\leq$  GNFA

2's GNFH ←



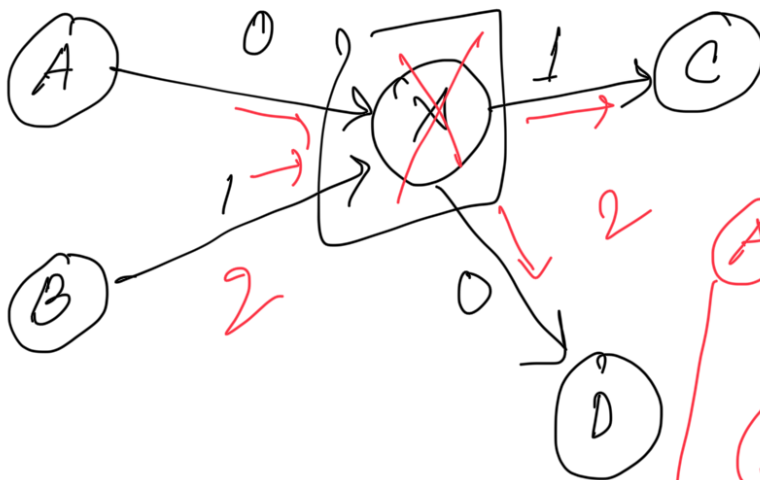
string = 01



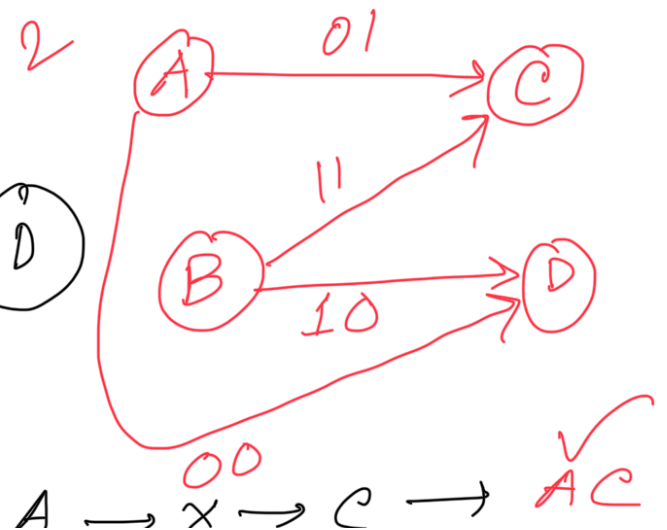
$A \rightarrow B = 01$   
via X



$A \rightarrow B = 01$

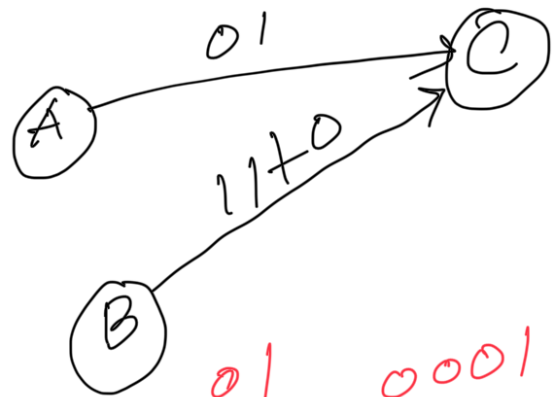
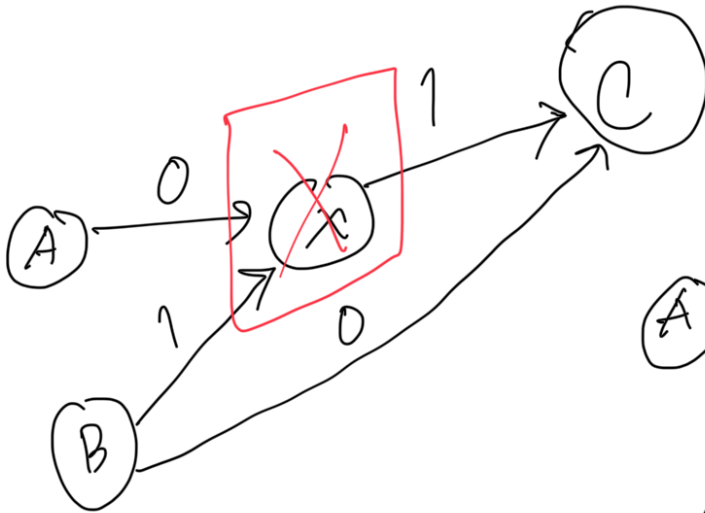


# of incoming

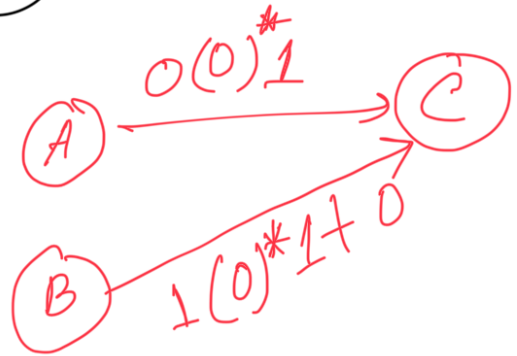
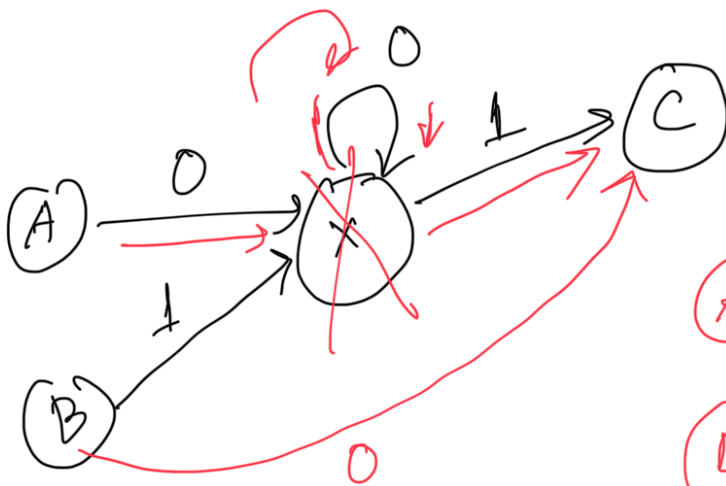


<sup>X</sup>  
# of outgoing

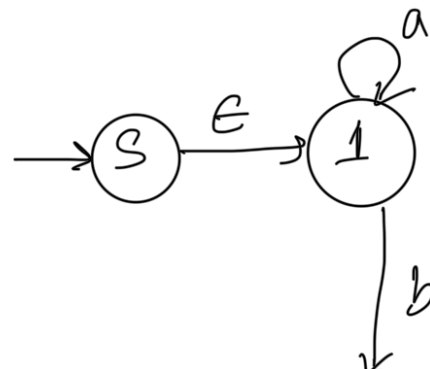
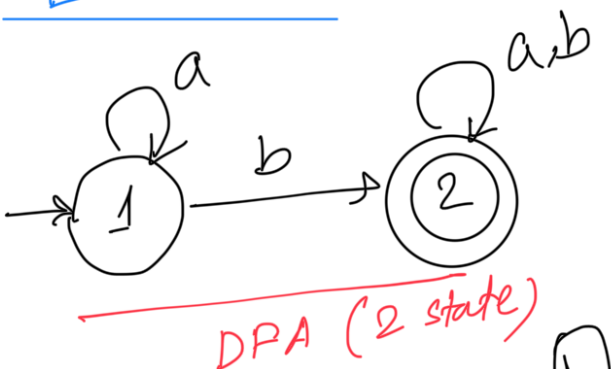
$A \rightarrow X \rightarrow D \rightarrow AD \checkmark$   
 $B \rightarrow X \rightarrow C \rightarrow BC \checkmark$   
 $B \rightarrow X \rightarrow D \rightarrow BD \checkmark$

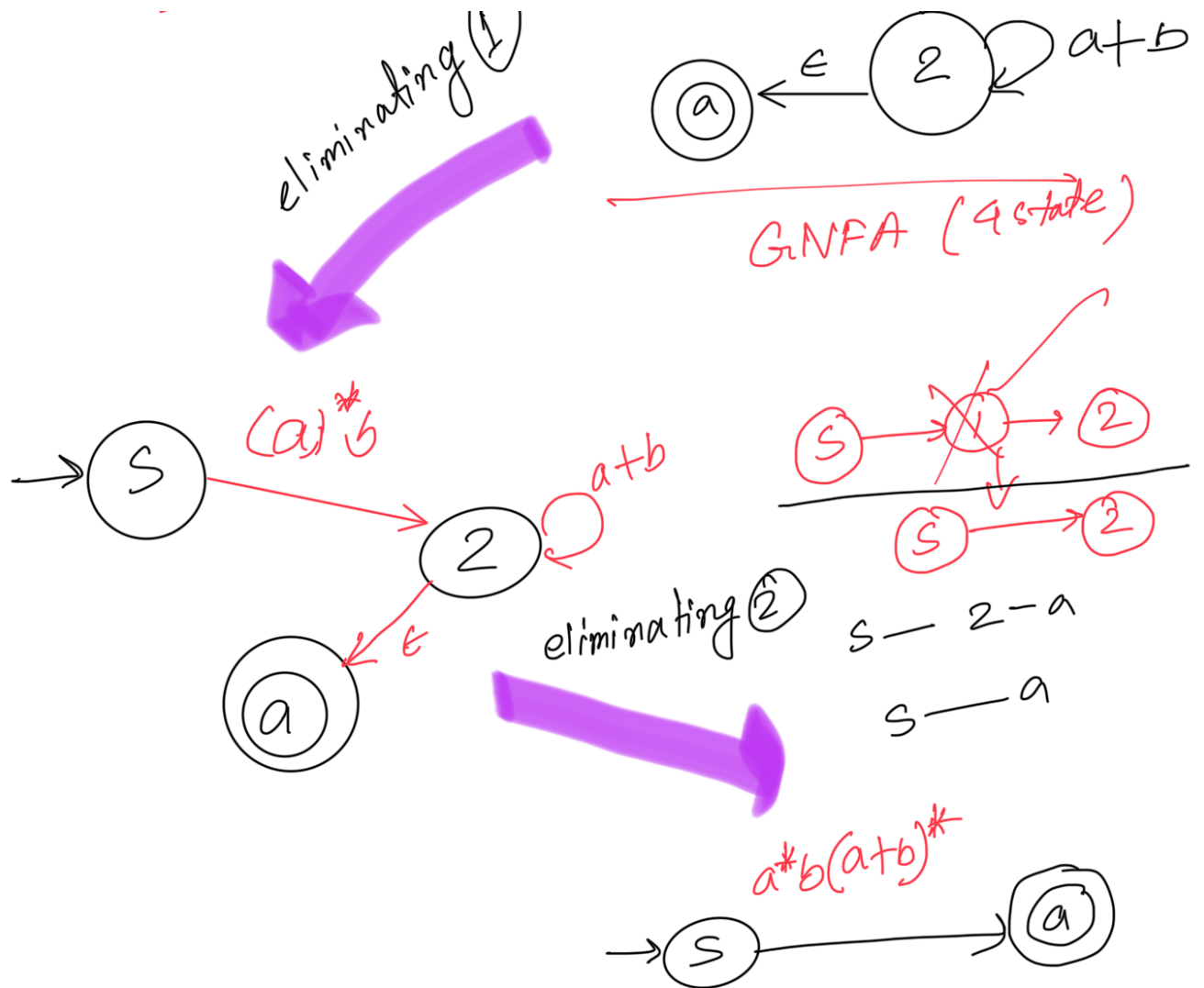


01  
001  
0001

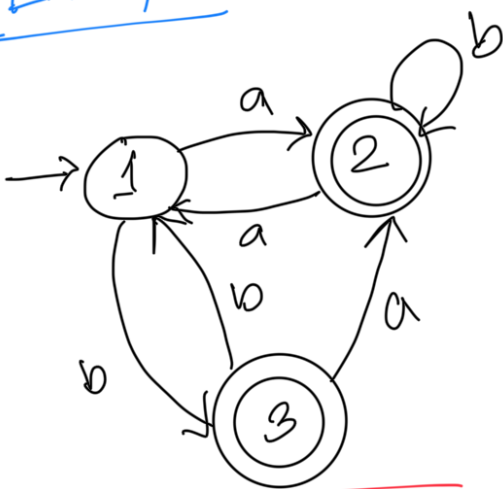


## Example

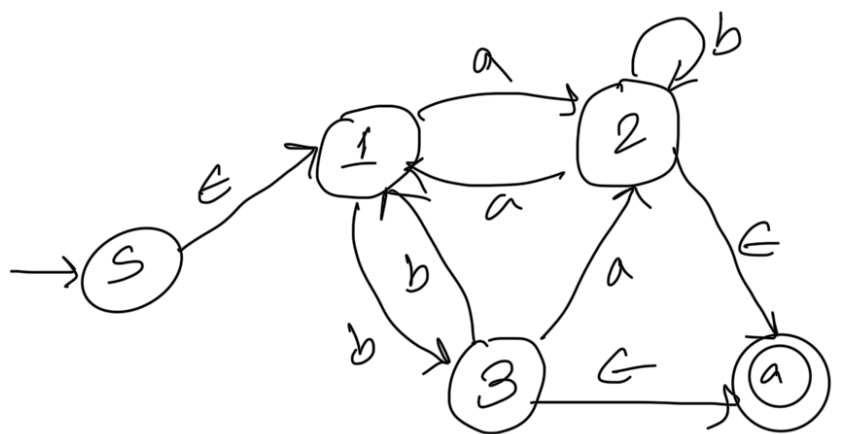




## Example



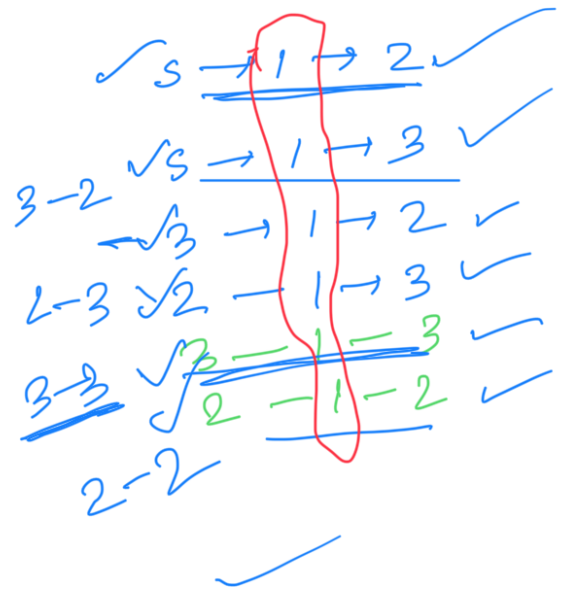
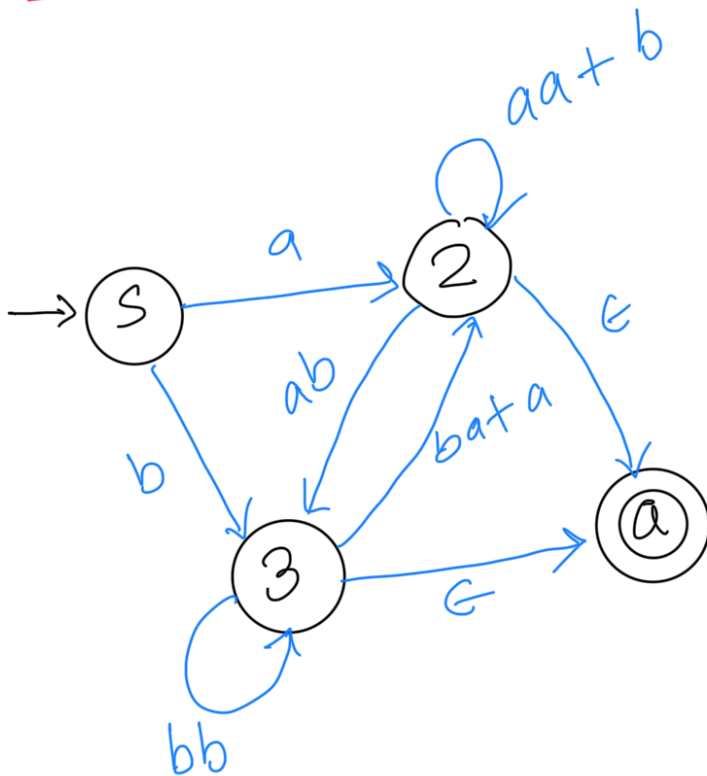
DFA



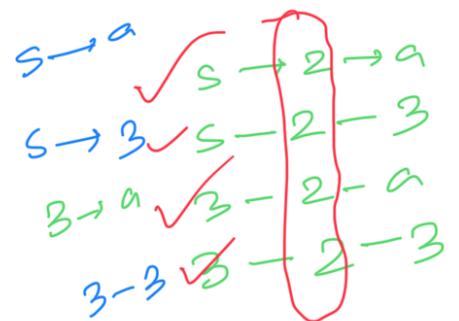
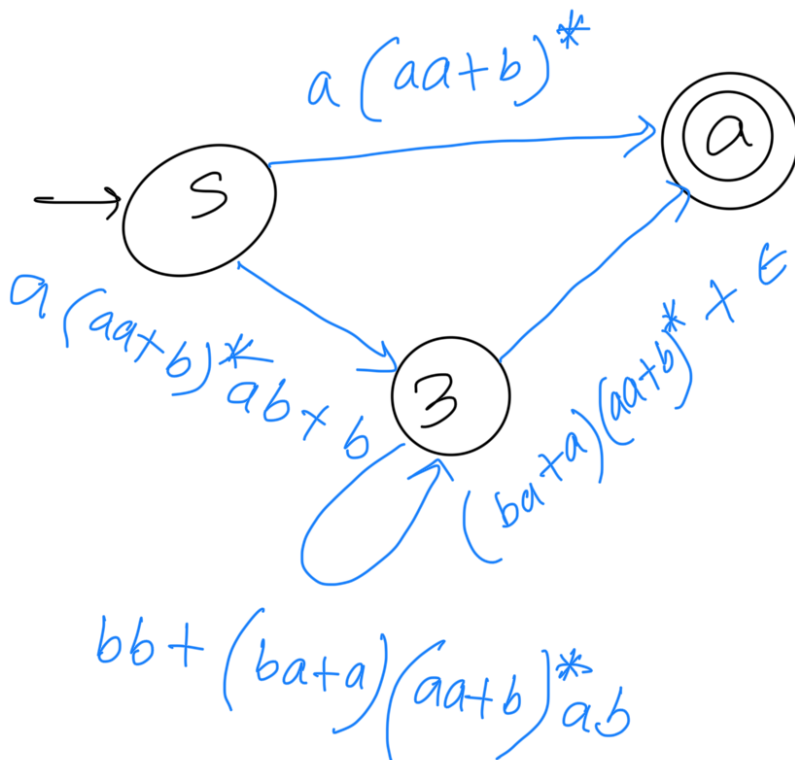
GNFA

eliminate state in this seq:  $(1) \rightarrow (2) \rightarrow (3)$

After eliminating ①

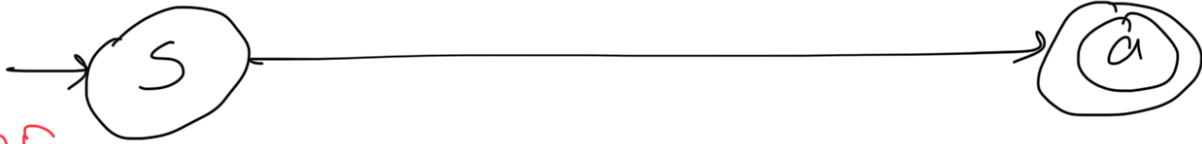


After eliminating ②



S → 3 → a

After eliminating ③



RE

$$(a(a+ab)^*ab + b)(bb + (ba+ab)(a+ab)^*ab)^* \left( (ba+ab)(a+ab)^* + \epsilon \right) + a(a+ab)^*$$