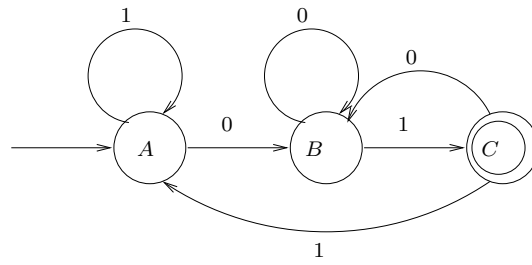


## Discussion 4

1. Recognize the language accepted by the following DFA  $M$  and prove that the DFA accepts the language.



### Proof

$L(M) = ?$

### Claim:

- (a)  $A \xrightarrow{w}_M A$  iff  $w \in L_A$ .
- (b)  $A \xrightarrow{w}_M B$  iff  $w \in L_B$ .
- (c)  $A \xrightarrow{w}_M C$  iff  $w \in L_C$ .

$L_A = ?$

$L_B = ?$

$L_C = ?$

**Proof of the Claim:** Proof by induction on ?

- **Base case:**  $|w| = 0$ .

- **Inductive case:**

Induction hypothesis: ?

(a) To prove:  $A \xrightarrow{w}_M A \Rightarrow w \in L_A$ .  
Case  $w = x0$ :

Case  $w = x1$ :

To prove:  $w \in L_A \Rightarrow A \xrightarrow{w}_M A$ .  
Case  $w = x0$ :

Case  $w = x1$ :

(b) To prove:  $A \xrightarrow{w}_M B \Rightarrow w \in L_B$ .  
Case  $w = x0$ :

Case  $w = x1$ :

To prove:  $w \in L_B \Rightarrow A \xrightarrow{w}_M B$ .  
Case  $w = x0$ :

Case  $w = x1$ :

(c) To prove:  $A \xrightarrow{w}_M C \Rightarrow w \in L_C$ .  
Case  $w = x0$ :

Case  $w = x1$ :

To prove:  $w \in L_C \Rightarrow A \xrightarrow{w}_M C$ .

Case  $w = x0$ :

Case  $w = x1$ :

2. Use the procedure discussed in the class to convert the following regular expressions to NFA.

(a)  $((00)^*(11) \cup 01)^*$

3. Use the procedure discussed in the class to give an equivalent regular expression for the following DFA.

