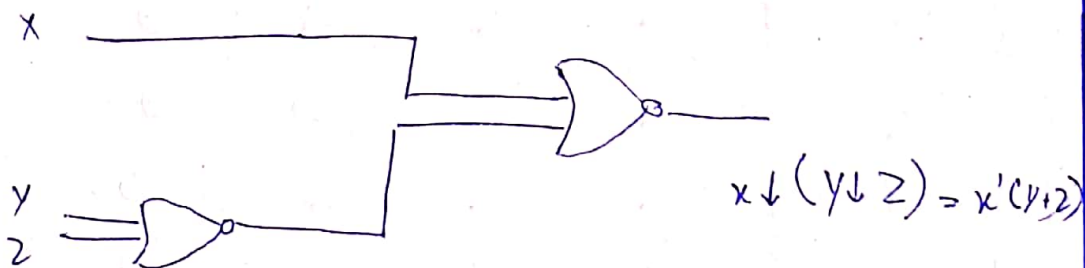
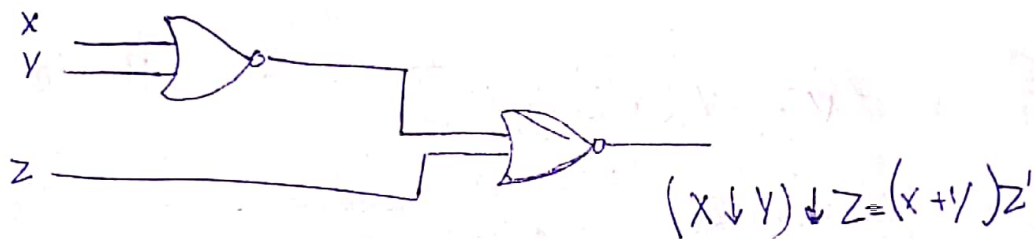


The NAND And NOR commutative  
not associative.

Sol:  $(x \downarrow y) \downarrow z = [(x+y)' + z]' = (x+y)'' z' = (x+y) z'$

~~$(x \downarrow y) =$~~   
 $x \downarrow (y \downarrow z) = [x + (y+z)']' = x'(y+z)$



nonassociativity of the NOR operator:

Therefore,  $(x \downarrow y) \downarrow z \neq x \downarrow (y \downarrow z)$

# Truth tables:-

a NAND

b NOR

Commutative  $\overline{A \cdot B} = \overline{B \cdot A}$

Commutative  $\overline{A+B} = \overline{B+A}$

A	B	$\overline{A \cdot B}$	$\overline{B \cdot A}$	$\overline{A+B}$	$\overline{B+A}$
0	0	1	1	1	1
0	1	1	1	0	0
1	0	1	1	0	0
1	1	0	0	0	0

a Associative

$\overline{A(B \cdot C)} = \overline{(A \cdot B)C}$

b  $\overline{A+(B+C)} = \overline{(A+B)+C}$

A	B	C	$\overline{A(B \cdot C)}$	$\overline{(A \cdot B)C}$	$\overline{A+(B+C)}$	$\overline{(A+B)+C}$
0	0	0	1	1	1	1
0	0	1	1	1	0	0
0	1	0	1	1	0	0
0	1	1	1	1	0	0
1	0	0	1	1	0	0
1	0	1	1	1	0	0
1	1	0	1	1	0	0
1	1	1	0	0	0	0

NAND and NOR gate are  
commutative and associative