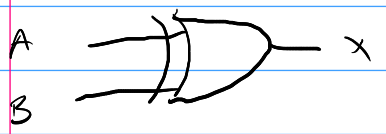
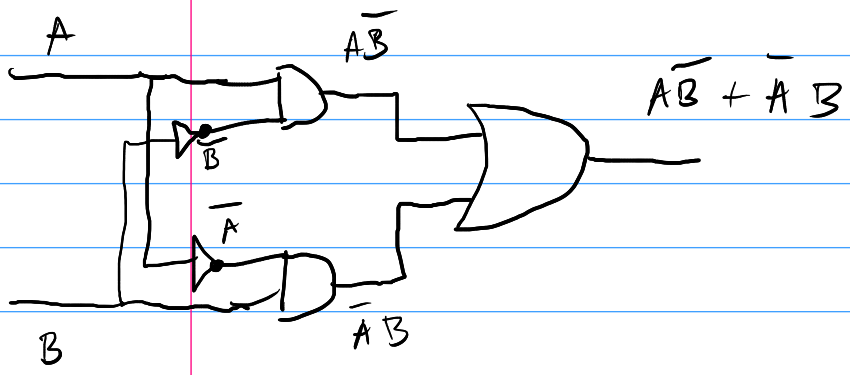
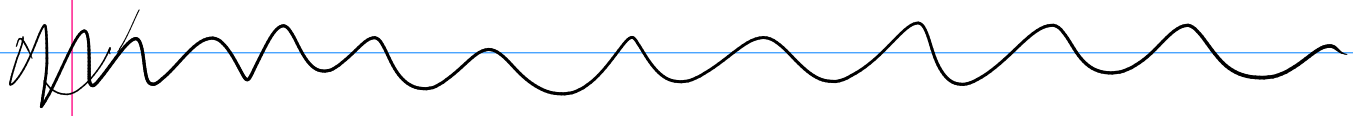
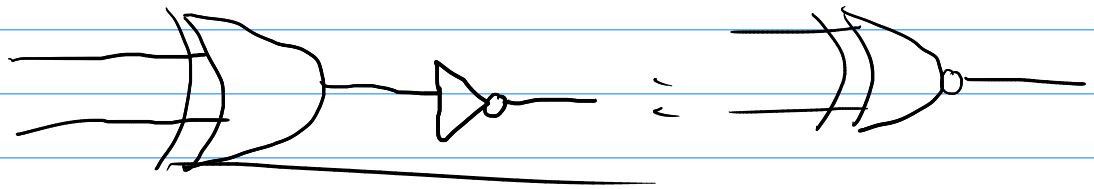


$X = A\bar{B} + \bar{A}B$

A	B	X
0	0	0
0	1	1
1	0	1
1	1	0







$$X = A\bar{B} + \bar{A}B$$

$$= \overline{A\bar{B}}\;\overline{\bar{A}B}$$

$$= \left(\bar{A} + \bar{\bar{B}}\right)\left(\bar{\bar{A}} + \bar{B}\right)$$

$$= \left(\bar{A} + B\right)\left(A + \bar{B}\right)$$

$$= \bar{A}A + \bar{A}\bar{B} + AB + B\bar{B}$$

($\bar{A}A = 0$, $B\bar{B} = 0$)

$$X = \bar{A}\bar{B} + AB$$

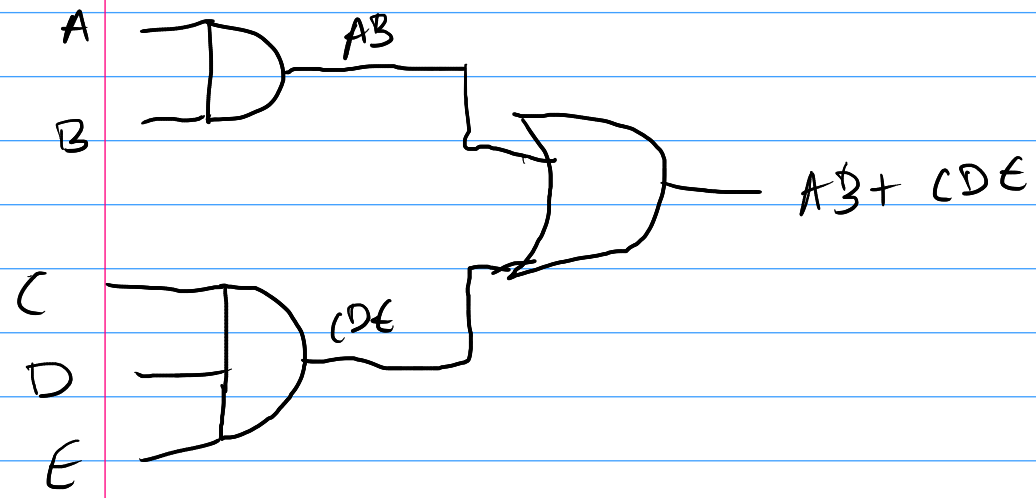
$$\overline{X + y} = \bar{X}\,\bar{y}$$

$$\overline{Xy} = \bar{X} + \bar{y}$$

Implementing Combinational logic

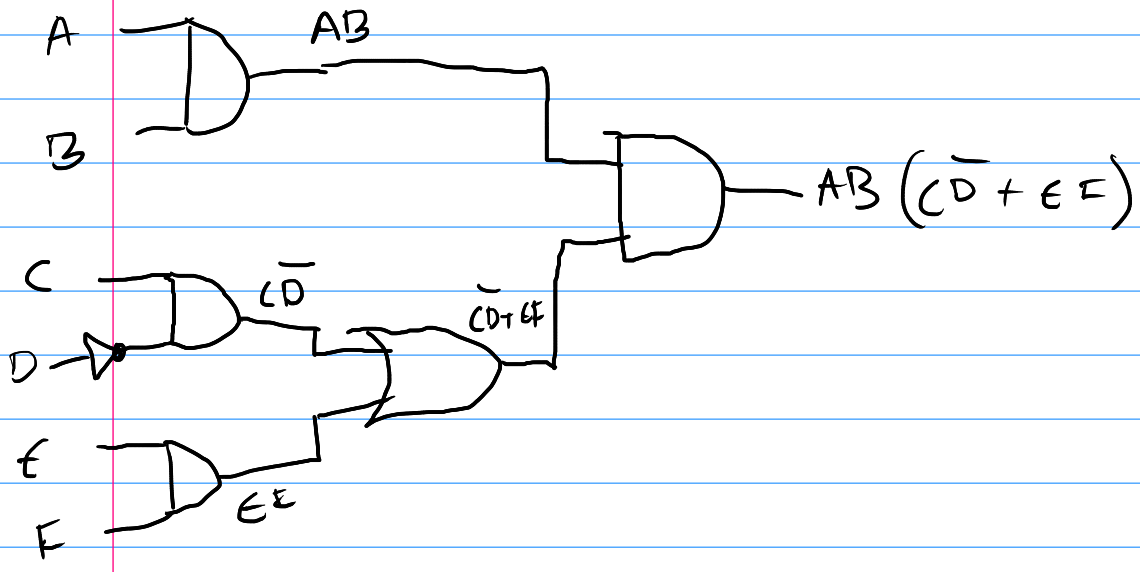
Let's examine the following Boolean expression:

$$X = AB + CDE$$



Draw logic diagram for:

$$X = AB(C\bar{D} + EF)$$



1 → Variable

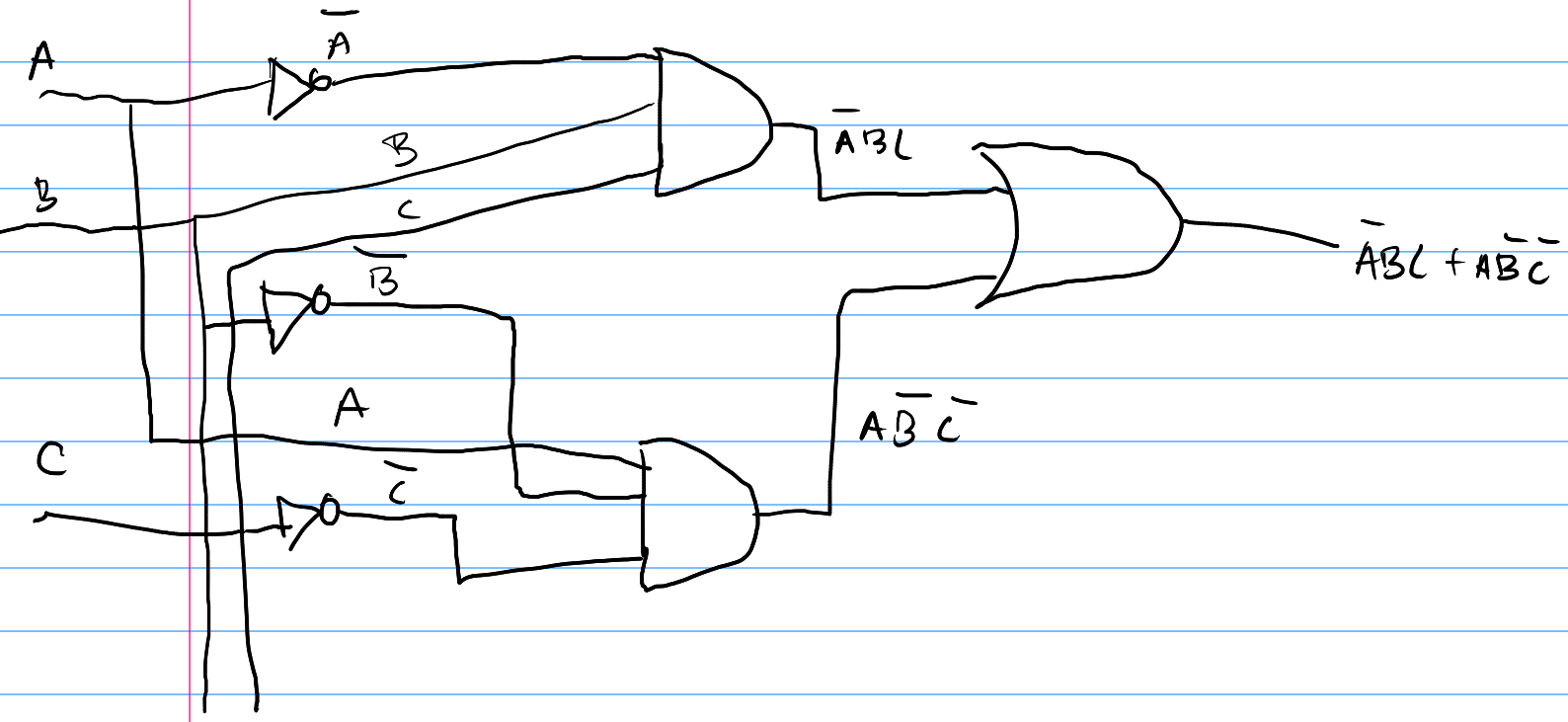
0 → variable complement

A	B	C	X
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	0

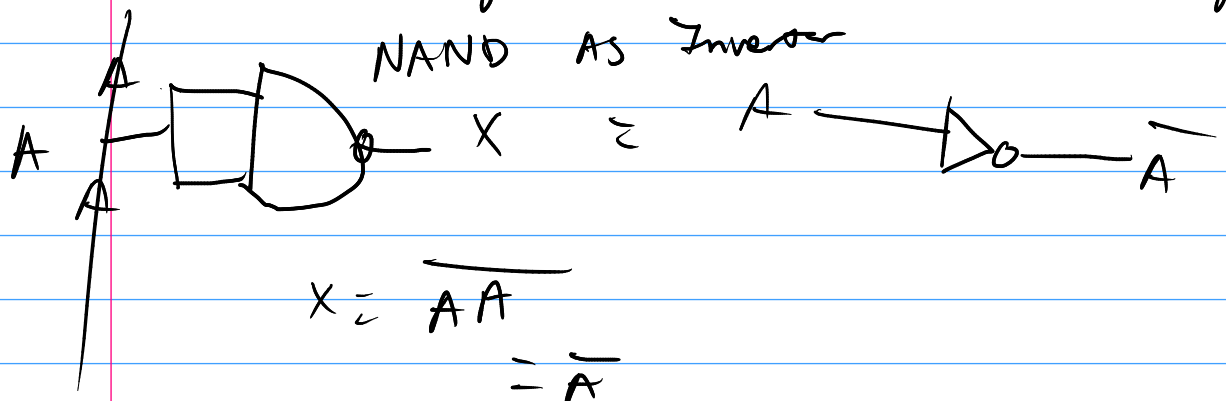
ABC → $\bar{A}BC$

ABC → $A\bar{B}\bar{C}$

SOP Expression : $\bar{A}BC + A\bar{B}\bar{C}$



1. Nand gate as a universal logic element



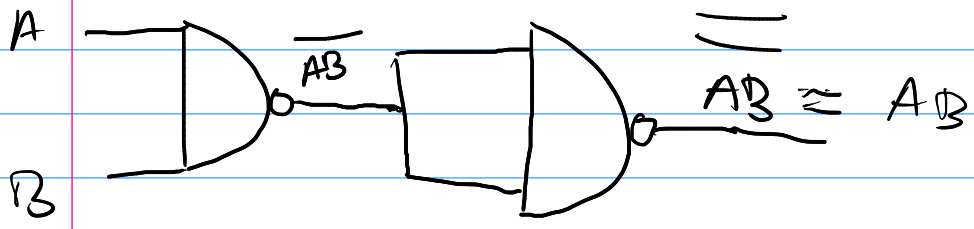
$X = \overline{AA}$

$= \overline{A}$

$A \cdot A = A$

2. NAND gate as AND gate

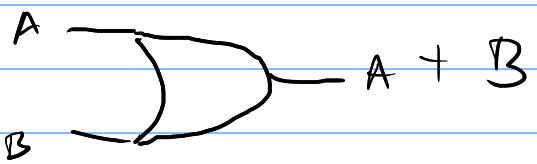
AND = NAND + Inverter



3. NAND gate as OR Gate

$X = \overline{A+B}$

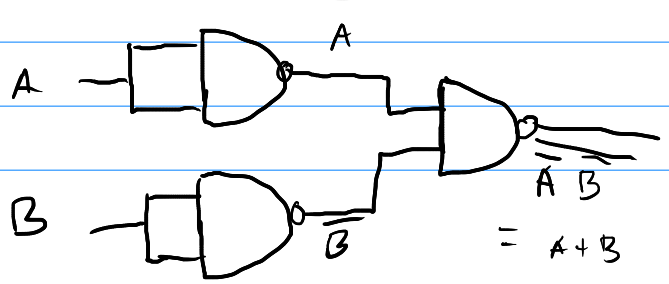
$= \overline{\overline{A+B}}$



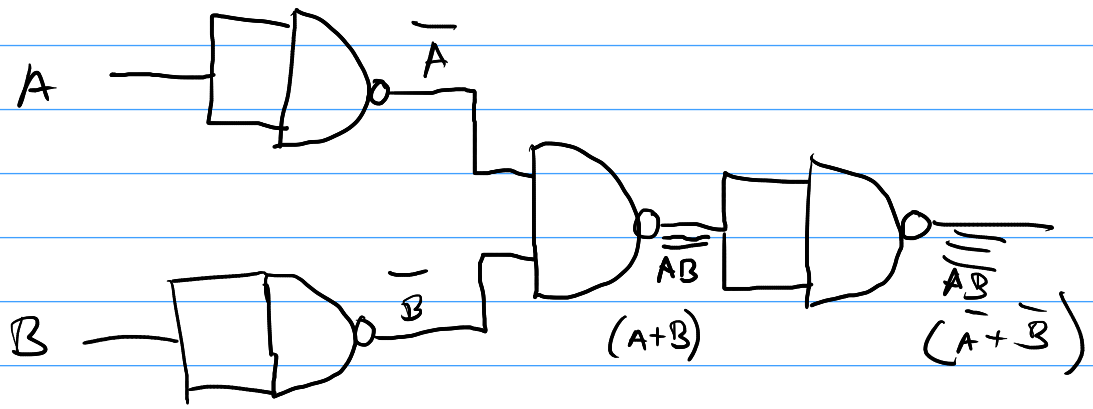
$\overline{A+B}$

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

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

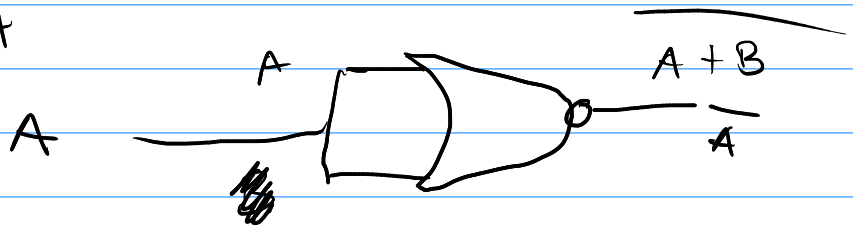


NAND GATE AS NOR Gate

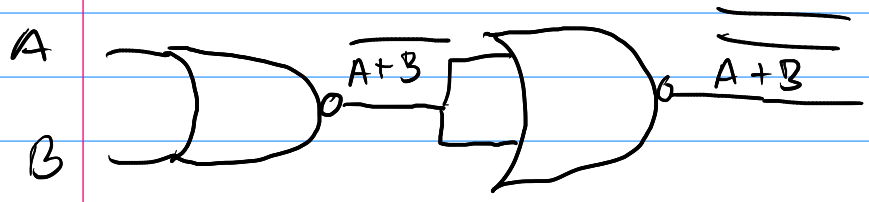


NOR Gate as an inverter

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



NOR GATE as an OR Gate



NOR GATES AS AND GATE

$$Y = AB = \overline{\overline{A}\,\overline{B}}$$

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