Thursday, January 29, 2009
9:00 AM

x_1	x_2	x_3	f
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	0

minterm: $\bar{x}_1\bar{x}_2x_3$, $\bar{x}_1x_2\bar{x}_3$

maxterm: $x_1 + x_2 + x_3$

$f = \text{SOP} = \sum m(1,2,5,6)$

$g = \text{POS} = \prod M(0,3,4,7)$

$f = \bar{x}_1\bar{x}_2x_3 + \bar{x}_1x_2x_3 + x_1\bar{x}_2x_3 + x_1x_2\bar{x}_3 = \bar{x}_2x_3 + x_2\bar{x}_3$

Not AND — OR

$g = (x_1+x_2+x_3)(x_1+\bar{x}_2+\bar{x}_3)(\bar{x}_1+x_2+x_3)(\bar{x}_1+\bar{x}_2+\bar{x}_3)$

$= (x_2+x_3)(\bar{x}_2+\bar{x}_3)$

Not OR — AND

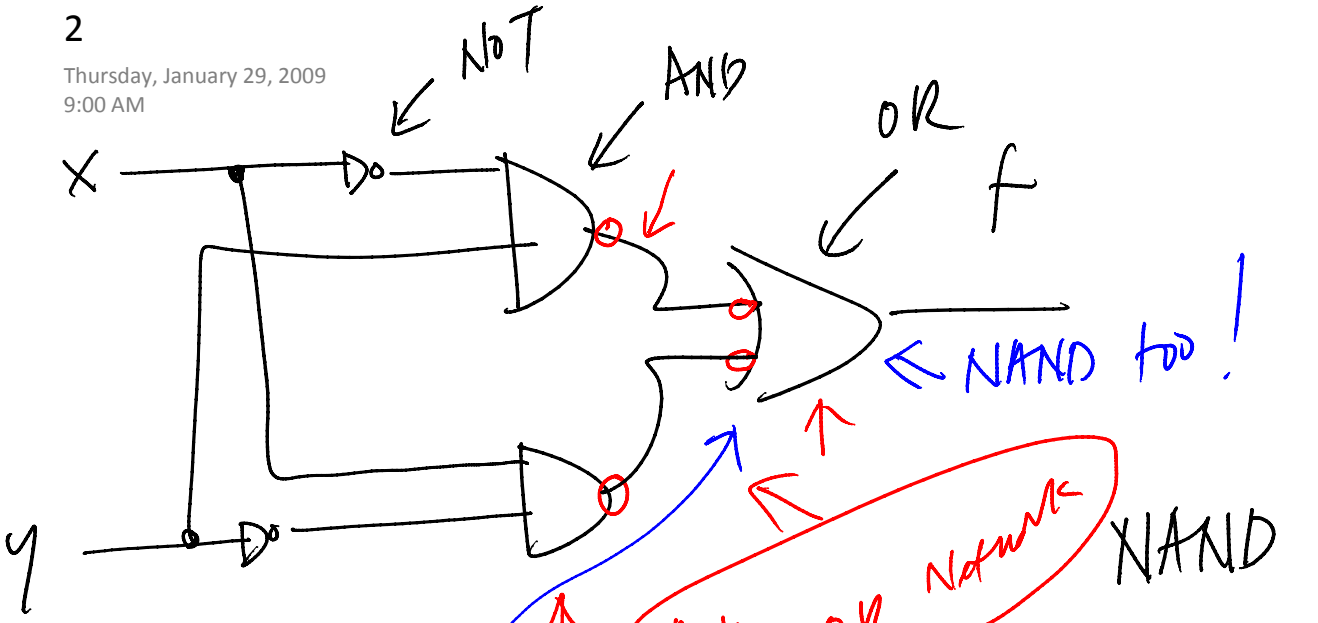
$f = g$

$f = g = (x_2+x_3)(\bar{x}_2+\bar{x}_3)$

$= x_2\bar{x}_2 + x_2\bar{x}_3 + \bar{x}_2x_3 + x_3\bar{x}_3$ ($x_2\bar{x}_2 = 0$, $x_3\bar{x}_3 = 0$)

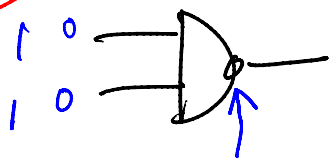
$= x_2\bar{x}_3 + \bar{x}_2x_3 = f$

Thursday, January 29, 2009
9:00 AM



AND-OR Network

NAND



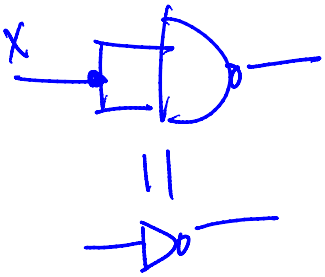
① $\overline{x+y} = \bar{x}\bar{y}$

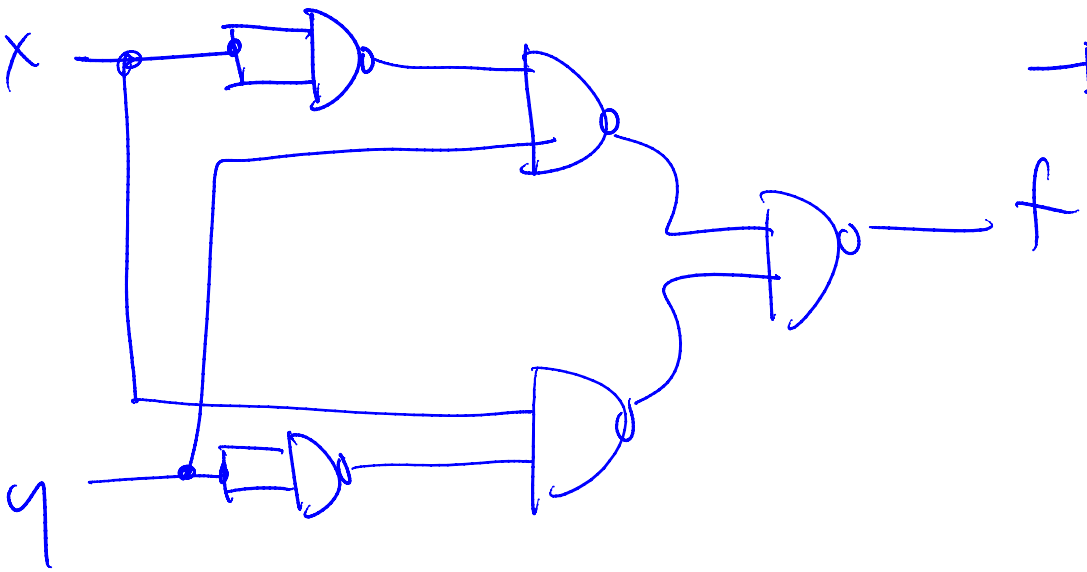
② $\overline{xy} = \bar{x}+\bar{y}$

NAND

two NAND

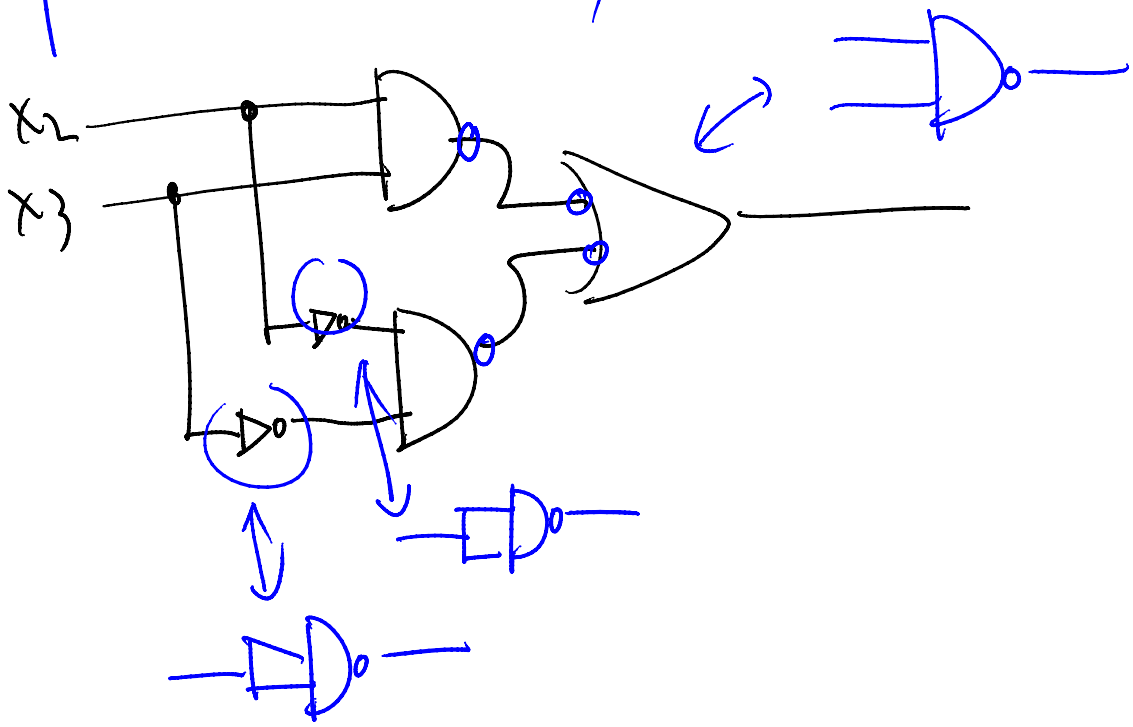
x	X	xNAND X
0	0	1
1	1	0





Thursday, January 29, 2009
9:00 AM

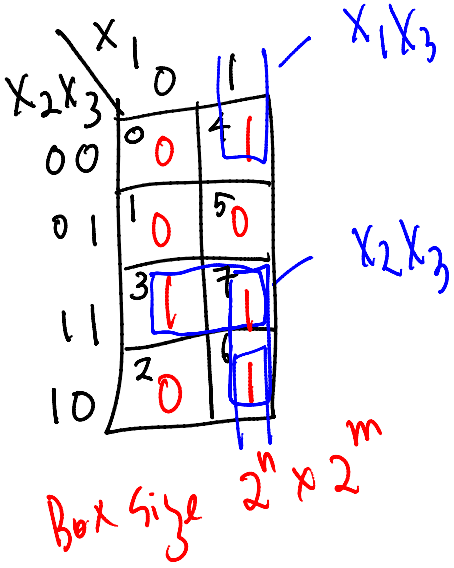
$f = x_2 x_3 + \bar{x}_2 \bar{x}_3$ using NAND only



Thursday, January 29, 2009
9:00 AM

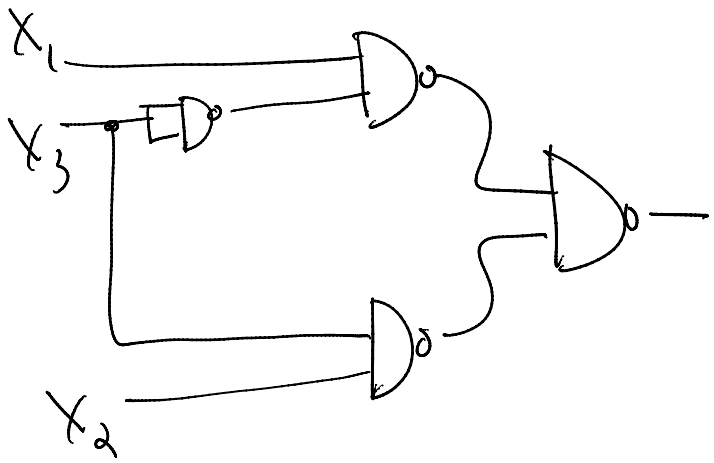
$f(x_1, x_2, x_3) = \sum m(3, 4, 6, 7)$, Implement f using NAND only.

$$f = \bar{x}_1 x_2 x_3 + x_1 \bar{x}_2 \bar{x}_3 + x_1 x_2 \bar{x}_3 + x_1 x_2 x_3$$



$$= (\bar{x}_1 + x_1) x_2 x_3 + x_1 (\bar{x}_2 + x_2) \bar{x}_3$$

$$= x_2 x_3 + x_1 \bar{x}_3$$



Thursday, January 29, 2009
9:00 AM

NOR only:

$f = \sum m(3,4,6,7)$ sop

$= \prod M(0,1,2,5)$ pos

x_1	x_2	x_3	f
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	1
1	1	1	1

$f = (x_1+\underline{x_2}+x_3)(x_1+x_2+\bar{x}_3)(x_1+\underline{\bar{x}_2}+x_3)(\bar{x}_1+x_2+\bar{x}_3)$

$= \overline{[(x_1+x_3)+x_2]}\,\overline{[(x_1+x_2)+\bar{x}_2]}\,\overline{[x_1+(x_2+\bar{x}_3)]}\,\overline{[\bar{x}_1+(x_2+\bar{x}_3)]}$

14b 14b

$= (x_1+x_3)(x_2+\bar{x}_3)$

OR-AND