

9/10/09 outline

- Hand Back Quiz 2
- Hw 3 will be posted shortly and is due 09/15/09
- AND or NOT Gates / Truth Tables
- Boolean Algebra (New operator terms) Slide 19
- Boolean Properties Slide 22

Commutative

Distributive - Look at tricky example

Associative

Identity : $a+0=a$
 $a+1=a$

Complement

Null : $a+1=1$
 $a+0=0$

Idempotent - i·dem·p·tent

$$a+a=a$$

$$a \cdot a = a$$

Involution : $(a')' = a$

→ DeMorgan's Law prove \bar{a} Truth Table

$$(a+b)' = a'b'$$

$$(ab)' = a'+b'$$

Example from Slide 24

B₂D = Binary Coded Decimal

NOT a

a'

$a \vee a'$

a AND b

ab
 $a * b$

a OR b

$a + b$

Decimal	a	b	c	f	f'
0	0	0	0	1	0
1	0	0	1	1	0
2	0	1	0	1	0
3	0	1	1	1	0
4	1	0	0	0	0
5	1	0	1	0	0
6	1	1	0	1	1
7	1	1	1	1	1

$abc \geq 5$
 or
 $abc \leq 3$

3 inputs $2^3 = \underline{8}$

$abc \geq 5$
 and
 $abc \geq 3$

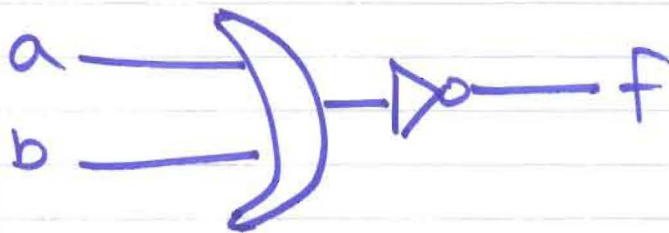
DeMorgan's Law

$$(a + b)' = a'b'$$

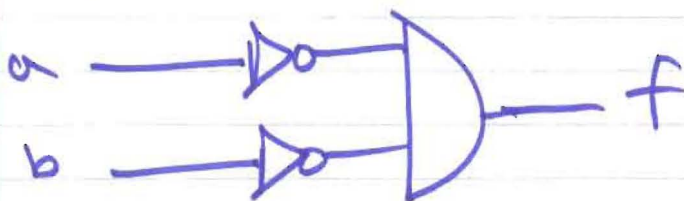
a	b	(a+b)	(a+b)'	a'	b'	a'b'
0	0	0	1	1	1	1
0	1	1	0	1	0	0
1	0	1	0	0	1	0
1	1	1	0	0	0	0

Same

(a+b)'



a'b'



$$(a \cdot b)' = a' + b'$$

a	b	ab	(ab)'	a'	b'	a'+b'
0	0	0	1	1	1	1
0	1	0	1	1	0	1
1	0	0	1	0	1	1
1	1	1	0	0	0	0



$$1) \quad A + A \cdot B \stackrel{?}{=} A$$

$$A(1 + B)$$

Distributive Law (Factor A)

$$A(1)$$

Null Law

$$A = A \checkmark$$

Identity Law

	B	F
1	0	1
1	1	1

$$2) \quad A + \overline{A}B \stackrel{?}{=} A + B$$

$$A + A \cdot B + \overline{A}B \stackrel{?}{=} A + B$$

$$A + B(A + \overline{A})$$

$$A + B(1)$$

$$A + B$$

$$1) \quad A + AB = A$$

from ①

2) Distributive

3) Complement Law

4) Identity

$$3) (A+B)(A+C) \stackrel{?}{=} A + BC$$

$$A \cdot A + A \cdot C + B \cdot A + B \cdot C$$

$$A + AC + B \cdot A + B \cdot C$$

$$A + AC + A \cdot B + BC$$

$$A(1+C) + A \cdot B + BC$$

$$A(1) + A \cdot B + BC$$

$$A + A \cdot B + BC$$

$$A(1 + B) + BC$$

$$A(1) + BC$$

$$A + BC$$

1) Distributive

2) Idempotent

3) Commutative

4) Distributive

5) Null Law

6) Identity

7) distributive

8) Null

9) Identity