Minterms (cont.)

A hint to help us remember how to identify a minterm:

Read the inverted variable as a 0 and the uninverted variable as a 1. So:

$\bar{A} . B . \bar{C} \rightarrow 010$

Looking again at truth tables:

A	B	A+B		
0	0	0	$= m_0$	$(\bar{A} . \bar{B})$
0	1	1	$= m_1$	$(\bar{A} . B)$
1	0	1	$= m_2$	$(A . \bar{B})$
1	1	1	$= m_3$	$(A . B)$

To recreate this truth table, we want minterms m_1, m_2, and m_3.

These will give a 1 in the desired cases, and only then.

i.e. $m_1 = \bar{A} . B$ will always give 1 if $A = 0$ and $B = 1$,

and will give 0 in all other cases.
This then holds for the other minterms.

We then combine the desired minterms (here m_1, m_2, and m_3) by ORing them together:
↳ the ones will output 1 in the table

$$A + B = (\bar{A} . B) + (A . \bar{B}) + (A . B)$$

e.g. for output 0 1 0 1, we get $m_1 + m_3 = (\bar{A} . B) + (A . B)$

This ~~equation~~ expression will give us a 1 in the exact cases when $A+B$ would, so it is equivalent. (It will give us a 0 wherever $A+B$ would also.)

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(we're in the future now)

Minterms (cont.)

Example: AND

A	B	A.B	
0	0	0	$m_0 = \bar{A}.\bar{B}$
0	1	0	$m_1 = \bar{A}.B$
1	0	0	$m_2 = A.\bar{B}$
1	1	1	$m_3 = A.B$

Only want m_3 $\Rightarrow$ we get $(A.B)$

Example: XOR

A	B	$A \oplus B$	
0	0	0	
0	1	1	$m_1 = \bar{A}.B$
1	0	1	$m_2 = A.\bar{B}$
1	1	0	

Only want m_1, m_2 to give 1 $\Rightarrow$ combine those with OR

$\Rightarrow A \oplus B = (\bar{A}.B) + (A.\bar{B})$

Example: Coin

A	B	$\overline{A \oplus B}$	
0	0	1	*
0	1	0	
1	0	0	
1	1	1	*

Combine m_0 and m_3

$\Rightarrow \overline{A \oplus B} = (\bar{A}.\bar{B}) + (A.B)$

To Sum Up

We now have a method for deriving equations from truth tables.
We OR together all minterms where the output = 1 in the table