Karnaugh map

* Circle cells so that the bits that never flip stay, and the bits that flip disappear. *

2^4

- Lay rows/colomns in gray code order (00, 01, 11, 10)
- Group 1's for sum of products
  group 0's for product of sums
- make every group a power of 2

C \ AB	00	01	11	10
0	0	1	1	1
1	0	0	0	1

What changes?

→ for group 1: when C is always 0, B stays the same but A changes. Therefore, the outputs for the 2 1's do not depend on A.
depends on B
* look for variable that doesn't change

$B\bar{C}$

since the output is 1 when C is 0, we put not C ($\bar{c}$)

→ for group 2, C changes. It is independant of C. AB is same.
A is 1, matches output, but B is 0 so $\bar{B}$

$F = B\bar{C} + A\bar{B}$

$= 1(\bar{1}) + 0(\bar{1})$

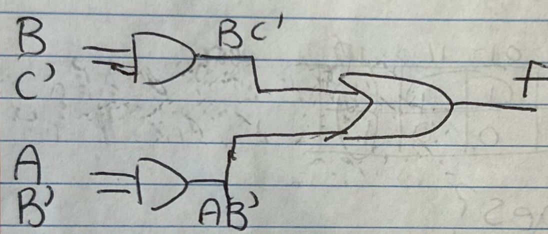
$= 1(0) + 0(0) = 0V$

match output

$F = B\bar{C} + A\bar{B} = (BC')(+)(AB')$

OR gate

Need an AND gate to connect BC and AB



Mau

Example 2:

BC \ A	0	1
00	0	1
01	1	1
11	1	0
10	0	1

Group 2: A always 0, C always 1, B changes

$A'C +$

Group 3: ~~AB~~ ABC'

Group 1: B never changes, A is always 1, but C changes, so dependant on C

~~BC~~ AB'

Simplifying Algebra Equations

① Expression: $Y = A \cdot A + A \cdot B$

$\rightarrow$ Since $A \cdot A = A$

$$Y = A + A \cdot B$$

Absorption law: $A + A \cdot B = A$

$\boxed{\text{SO } Y = A}$

② $Y = A \cdot (A + B)$

Absorption law $\rightarrow$ $A + B = A$

$A \cdot A = A$ $\rightarrow$ $\boxed{Y = A}$

$A \cdot (A) = A$

③ $Y = A + \bar{A} + B$

$A \cdot \bar{A} = 0$ (inverse)

$0 + B = B$ (identity)

$\boxed{Y = B}$

④ $Y = (A + B)(A + \bar{B})$

distributive: $(A + B)(A + \bar{B}) = A + (B \cdot \bar{B})$

Inverse: $B \cdot \bar{B} = 0$

$A + 0 = A$

$\boxed{Y = A}$

⑤ $\overline{A + B}$

demorgan: $\bar{A} \cdot \bar{B}$

⑥ $Y = \overline{\bar{A} \cdot \bar{B}} + A$

demorgan: $\bar{A} + \bar{B} + A$

$\bar{A} + A = 1$ $\boxed{Y = 1}$

$1 + \bar{B} = 1$