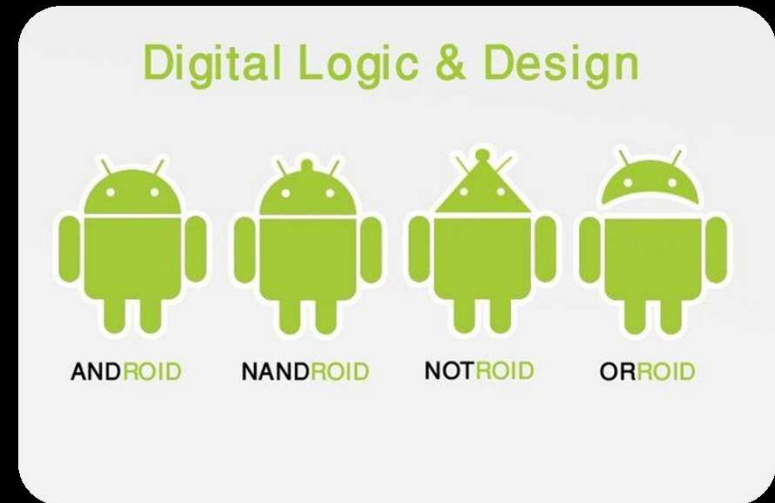




# Week 2 Review

# Week 2 review

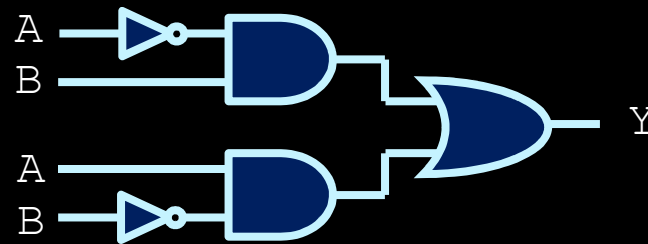
- Using logic gates
  - Combinational circuits
  - Circuit reduction
  - Karnaugh maps



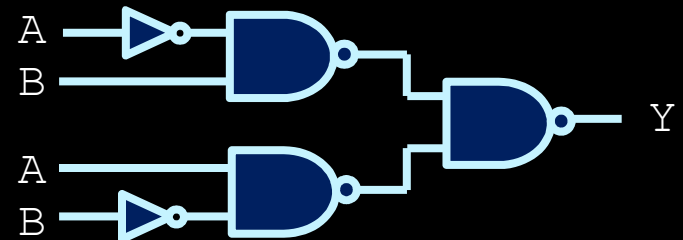
# Question #1

- How can you express a two-input XOR gate as a combination of NAND and NOT gates?
  - Draw the circuit using only these two logic gates.

A	B	Y
0	0	0
0	1	1
1	0	1
1	1	0

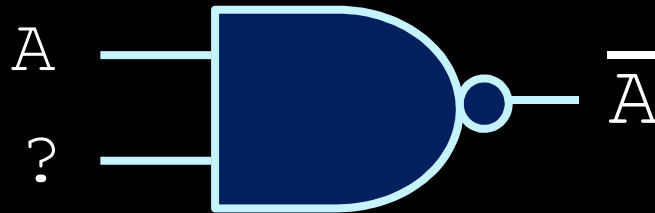


- Remember De Morgan's!
  - $(W' + Z') = (WZ)'$



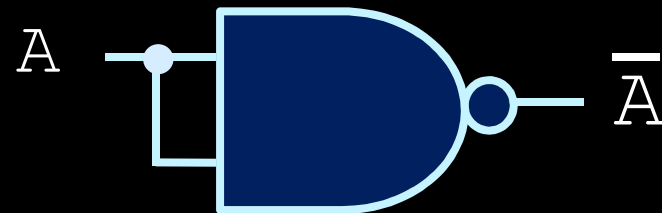
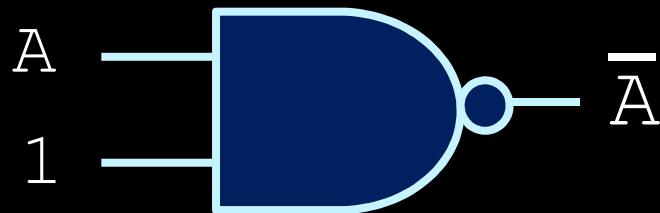
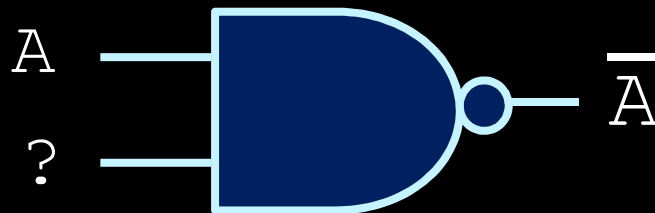
## Question #2

- How can you implement a NOT gate from a 2-input NAND gate?



## Question #2

- How can you implement a NOT gate from a 2-input NAND gate?



## Question #3

- Given the minterms below, can you fill in the truth table on the right?

$$Y = m_2 + m_3 + m_7 + m_9 \\ + m_{12} + m_{14}$$

A	B	C	D	Y
0	0	0	0	
0	0	0	1	
0	0	1	0	
0	0	1	1	
0	1	0	0	
0	1	0	1	
0	1	1	0	
0	1	1	1	
1	0	0	0	
1	0	0	1	
1	0	1	0	
1	0	1	1	
1	1	0	0	
1	1	0	1	
1	1	1	0	
1	1	1	1	

## Question #3

- Given the minterms below, can you fill in the truth table on the right?

$$Y = m_2 + m_3 + m_7 + m_9 \\ + m_{12} + m_{14}$$

A	B	C	D	Y
0	0	0	0	0
0	0	0	1	0
0	0	1	0	1
0	0	1	1	1
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	1
1	0	0	0	0
1	0	0	1	1
1	0	1	0	0
1	0	1	1	0
1	1	0	0	1
1	1	0	1	0
1	1	1	0	1
1	1	1	1	0

# Helpful Hint

A Karnaugh map for a 4-variable function with variables A, B, C, and D. The map is a 4x4 grid with rows labeled AB (00, 01, 11, 10) and columns labeled CD (00, 01, 11, 10). The values in the cells are as follows:

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

Groupings are indicated by green brackets:

- A**: A vertical bracket on the left side of the map, grouping the rows AB=11 and AB=10.
- B**: A horizontal bracket on the right side of the map, grouping the columns CD=01 and CD=11.
- C**: A horizontal bracket above the top two columns, grouping CD=11 and CD=10.
- D**: A horizontal bracket below the bottom two columns, grouping CD=01 and CD=11.

The cells (AB=11, CD=11) and (AB=10, CD=11) are highlighted in yellow.





# Problem Set 02

# Questions

1. Minimize the K-Map in POS terms:

	$C'D'$	$C'D$	$CD$	$CD'$
$A'B'$	0	0	1	1
$A'B$	1	1	0	0
$AB$	1	1	0	0
$AB'$	0	0	0	0

$$F = (A' + C') \cdot (B + C) \cdot (B' + C')$$

# Questions

2. Reduce  $F(A,B,C) = \sum(1,4,5,6,7)$  to the most minimum Boolean expression

$$F = A'B'C + AB'C' + AB'C + ABC' + ABC$$

Simplifying:

$$F = A'B'C + A(B'C' + B'C + BC' + BC)$$

$$F = A'B'C + A(B'(C'+C) + B(C'+C))$$

$$F = A'B'C + A(B'+B)$$

$$F = A'B'C + A$$

$$F = B'C + A$$

# Questions

3. Draw the K-map for the following Boolean expression:

$$F = AB'C'D' + A'BC' + A'D + BD$$

	$\overline{C} \cdot \overline{D}$	$\overline{C} \cdot D$	$C \cdot D$	$C \cdot \overline{D}$
$\overline{A} \cdot \overline{B}$	0	1	1	0
$\overline{A} \cdot B$	1	1	1	0
$A \cdot B$	0	1	1	0
$A \cdot \overline{B}$	1	0	0	0

# Questions

4. What is the Boolean expression for G as given in the K-Map below:

	$B \cdot C$	$B \cdot C$	$B \cdot C$	$B \cdot C$
<b>A</b>	X	0	0	1
<b>A</b>	X	0	1	1

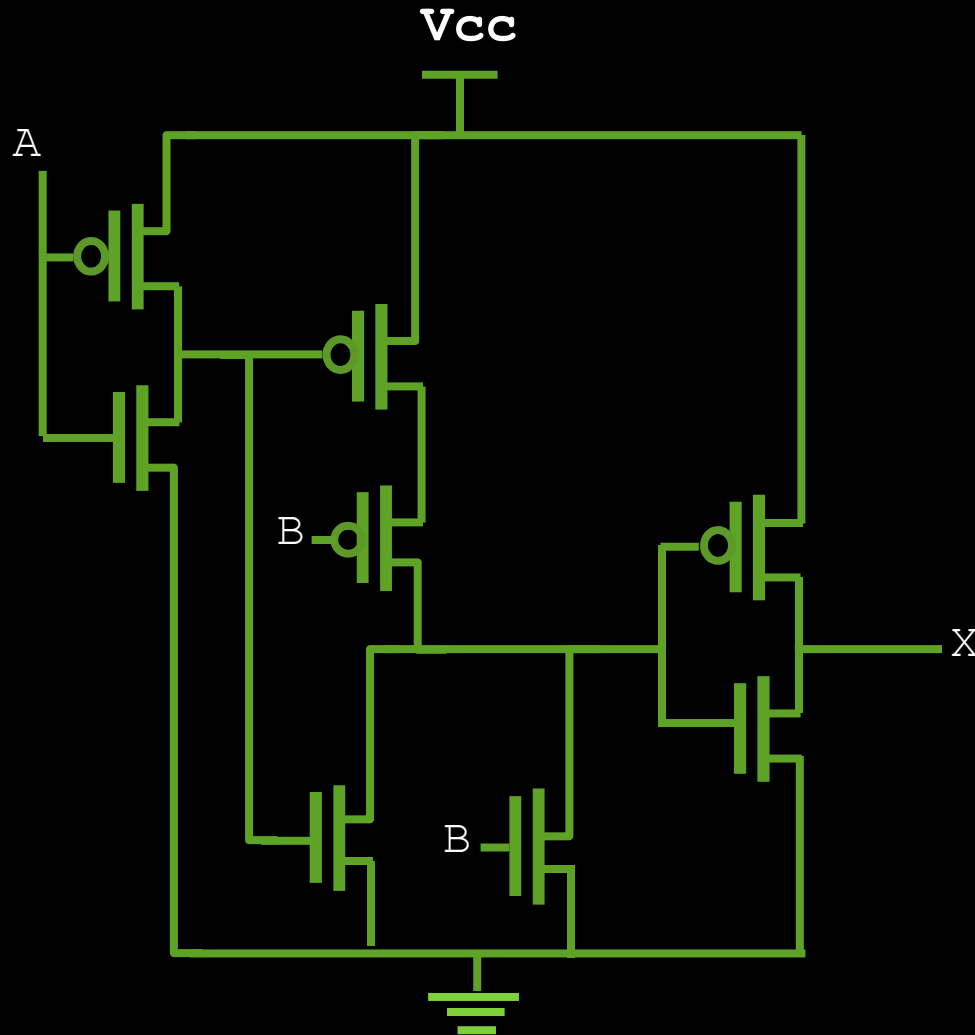
$$F = C' + AB$$



# Problem Set 03

# Question 1

What gate is created by the following?



## Question 2 - Minterms

- Write Y in SOM (Sum Of Minterms) form.

A	B	C	Y
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	1



# Question 3

- What is the most reduced form, in sum of products form, of the function from the truth table on the right?

$$Y = m_0 + m_1 + m_2 + m_5 \\ + m_7 + m_8 + m_9 \\ + m_{10} + m_{13} + m_{15}$$

A	B	C	D	Y
0	0	0	0	
0	0	0	1	
0	0	1	0	
0	0	1	1	
0	1	0	0	
0	1	0	1	
0	1	1	0	
0	1	1	1	
1	0	0	0	
1	0	0	1	
1	0	1	0	
1	0	1	1	
1	1	0	0	
1	1	0	1	
1	1	1	0	
1	1	1	1	