

# Homework Assignment 6

# Properties

**Distributive**

$$ab+ac = a(b+c)$$
$$(a+b)(a+c) = a+bc$$

**Commutative**

$$ab = ba$$
$$a+b = b+a$$

**Complement**

$$aa' = 0$$
$$a+a' = 1$$

**Identity**

$$a \cdot 1 = a$$
$$a+0 = a$$

**Null elements**

$$a \cdot 0 = 0$$
$$a+1 = 1$$

**Idempotence**

$$aa = a$$
$$a+a = a$$

## Simplify Boolean Equation

For each equation, simplify using the properties above. Fill out the steps in the table with the appropriate property in the adjacent cell. The property listed should be the one used to achieve the step to the left. Only make one change per step.

1.  $\mathbf{w}\mathbf{x} + \mathbf{w}\mathbf{x}'$  to  $\mathbf{w}$

Step	Property

2.  $(\mathbf{wz} + \mathbf{wz}') + \mathbf{wx}'$  to  $\mathbf{w}$

[illegible]

3.  $(wx' + wx) + (wy' + wy)$  to  $w$

Step	Property

4.  $(A + B') (A + B)$  to  $A$

Step	Property

5.  $(A + B) (A + C) + A' + BC$  to  $1$

Step	Property

## Convert to Sum-of-Products

Convert each equation to a sum-of-products representation.

6.  $y = a(b + b'c) \Rightarrow$

7.  $y = ab(c + d) \Rightarrow$

8.  $y = a + c(b + ab') \Rightarrow$

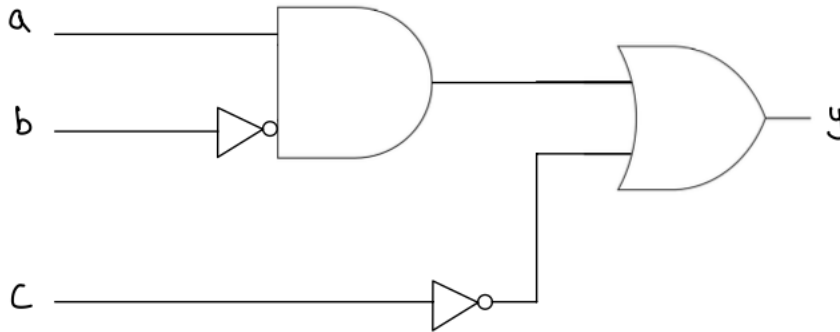
9.  $y = (a' + b)(c + d) \Rightarrow$

10.  $y = a'(b + b'c) \Rightarrow$

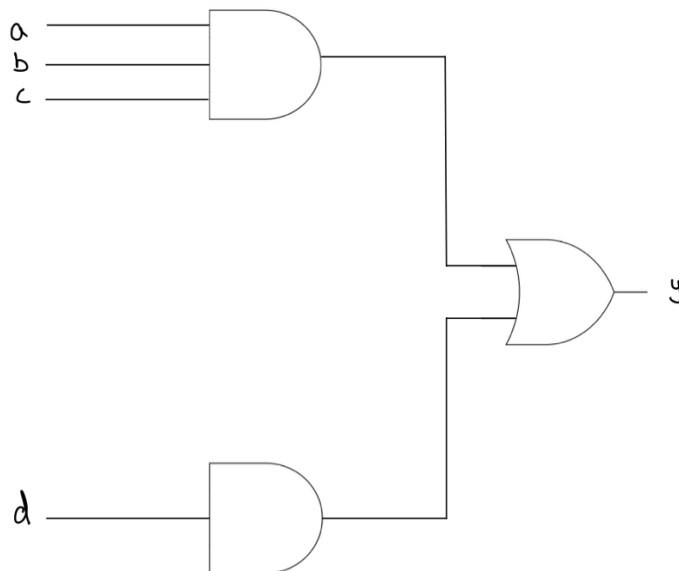
## Two-Level Circuit Equations

Convert the following two-level circuits to their respective sum-of-product equation.

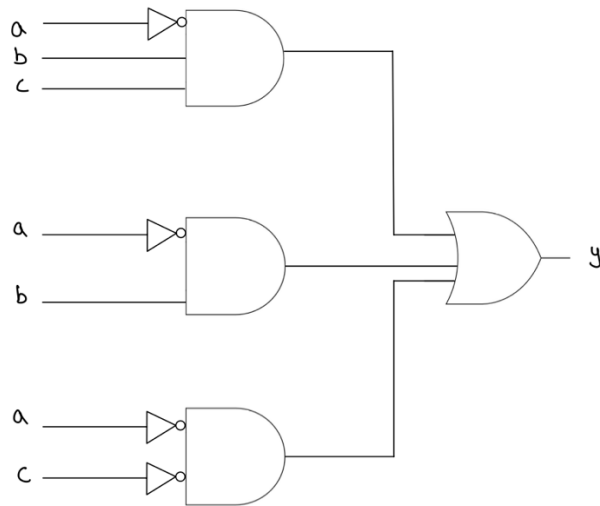
11.  $y =$



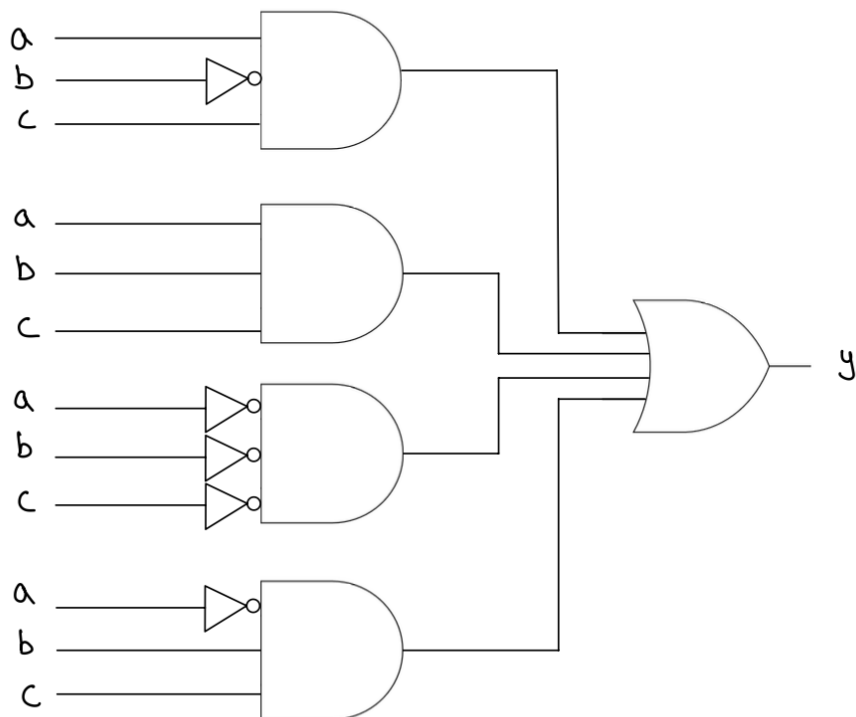
12.  $y =$



13.  $y =$



14.  $y =$



15.  $y =$

