

LE4.4.1: Logic Simplification

10/10 points (ungraded)

Use logic simplification to solve the following problems.

$$a + 1 = \boxed{1} \quad \checkmark \text{ Answer: } 1$$

Explanation

Taking the logical **OR** of anything together with 1 results in 1.

$$a + 0 = \boxed{a} \quad \checkmark \text{ Answer: } a$$

Explanation

Taking the logical **OR** of anything together with 0 has no effect, so it returns ***a***.

$$a \cdot 0 = \boxed{0} \quad \checkmark \text{ Answer: } 0$$

Explanation

Taking the logical **AND** of anything together with 0 results in 0.

$$a \cdot 1 = \boxed{a} \quad \checkmark \text{ Answer: } a$$

Explanation

Taking the logical **AND** of anything together with 1 has no effect, so it returns ***a***.

$$a + a = \boxed{a} \quad \checkmark \text{ Answer: } a$$

Explanation

Taking the logical **OR** of anything with itself, just returns the original value.

$$a \cdot a = \boxed{a} \quad \checkmark \text{ Answer: } a$$

Explanation

Taking the logical **AND** of anything with itself, just returns the original value.

$$a + \bar{a} = \boxed{1} \quad \checkmark \text{ Answer: } 1$$

Explanation

Taking the logical **OR** of anything together with 1 results in 1. In this example, either a or $\bar{a} = 1$.

$$a \cdot \bar{a} = \boxed{0} \quad \checkmark \text{ Answer: } 0$$

Explanation

Taking the logical **AND** of anything together with 0 results in 0. In this example, either a or $\bar{a} = 0$.

$$a + ab = \boxed{a} \quad \checkmark \text{ Answer: } a$$

Explanation

Through the distributive function, this is equal to $a(1 + b)$. 1 **OR** ed with anything returns 1. So this reduces to $a(1) = a$.

$$(a + b)(a + c) = \boxed{a + bc} \quad \checkmark \text{ Answer: } A + BC$$

Explanation

The answer is $a + bc$. To arrive at this answer, you first apply the distributive function to the original problem, and find that this equation $= aa + ba + ac + bc$. Due to the commutative function, we know that $ba = ab$. We also know that $aa = a$. So we have $a + ab + ac + bc$. This can be rewritten as $a(1 + b + c) + bc$. This in turn can be reduced to $a + bc$ since the contents within the parentheses are 1 **OR** ed with something else which always returns 1, and $a1 = a$.

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