

Truth Tables (DeMorgan's Law)

Date: _____

Learning Goals:

By the end of the lesson I will be able to:

-
-
-
-

I Think I Can!

☐
☐
☐
☐

Review: Homework Question 4

Simplify: $A(A + \overline{B}C) + A(\overline{B} + C)$

Answer: _____.

The correct answer is actually _____. We're kinda stuck, so we're going to use a truth table to find out if our answer and the actual answer are the same.

A	B	C		
T	T	T		
T	T	F		
T	F	T		
T	F	F		
F	T	T		
F	T	F		
F	F	T		
F	F	F		

DeMorgan's Law Truth Table
Remember, DeMorgan's law states:

But how do we know it's true? Can we prove it algebraically? Not easily. So let's use a truth table instead.

A	B	AB	$\overline{AB}$	$\overline{A} + \overline{B}$
T	T			
T	F			
F	T			
F	F			

Algebraic Proofs

In order to prove that two boolean logic expressions are equivalent we must manipulate one (or both) sides until they are the same. In addition, we can prove things using truth tables.

Example: Prove that $A(A + B) = A$ using boolean algebra rules and truth tables.

Algebraic Method

Here we can see that the right side, A , cannot be manipulated. So we will manipulate the left side to make it look like the right side.

Truth Table Method

A	B	$A + B$	$A(A + B)$
T	T		
T	F		
F	T		
F	F		

Absorption Property

Prove that $A(A + B + C) = A$ using boolean algebra.

This is called the absorption property. Now that we know this, we can use it to finish question 4 from yesterday's work:

$$A(A + \overline{B}C) + A(\overline{B} + C)$$

The absorption property has two rules:

- 1.
- 2.

Which means the rules look like: