Show using truth tables or expansion on why !(P && Q) is logically equal to (!P || !Q) * 4 points

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By expansion:

$$!(P \&\& Q) = (!P \,||\, !Q)$$

Let P = true, Q = false

$$!(\text{true} \,\&\&\, \text{false}) = (!\text{true} \,||\, !\text{false})$$

$$!(\text{false}) = (\text{false} \,||\, \text{true})$$

$$\text{true} = \text{true}$$

By Truth Table:

!(P&&Q)			
P	Q	P&&Q	!(P&&Q)
T	T	T	F
T	F	F	T
F	T	F	T
F	F	F	T

=

(!P || !Q)				
P	Q	!P	!Q	!P || !Q
T	T	F	F	F
T	F	F	T	T
F	T	T	F	T
F	F	T	T	T

The truth table covers all possible values and proves !(P&&Q) is equal to (!P || !Q).
It is always better to prove using truth table.

Make a truth table for the following logical expression: * 4 points

(A && B) || (!(A && C) && (B || C))

Values of A, B, C are boolean
Simplify each expression as much as possible
e.g. Make separate columns for A, B, (A&&B), (A&&C), !(A&&C).....(!(A && C) && (B || C), (A && B) || (!(A && C) && (B || C))

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A	B	C	A&&B	A&&C	!(A&&C)	B||C	!(A&&C) && (B||C)	(A&&B)||(!(A&&C) && (B||C)
T	T	T	T	T	F	T	F	T
T	T	F	T	F	T	T	T	T
T	F	T	F	T	F	T	F	F
T	F	F	F	F	T	F	F	F
F	T	T	F	F	T	T	T	T
F	T	F	F	F	T	T	T	T
F	F	T	F	F	T	T	T	T
F	F	F	F	F	T	F	F	F

Simplifying the expression is important when creating a truth table.