Formal_Logic_1

Truth Table

p	q	r	$p \wedge q$	$q \oplus r$	$(p \wedge q) \vee r$	$(q \oplus r) \wedge p$	P
T	T	T	T	F	T	F	F
T	T	F	T	T	T	T	T
T	F	T	F	T	T	T	T
T	F	F	F	F	F	F	T
F	T	F	F	T	F	F	T
F	F	T	F	T	F	F	F
F	F	F	F	F	F	F	T

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LHS of P              RHS of P
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LHS	RHS	LHS->RHS
T	T	T
T	F	F
F	T	T
F	F	T

> *The premise is true ∧ the conclusion is false -- if then is false*

Logical Analysis

The only time P: LHS -> RHS is false (F) is when LHS ∧ RHS are F Logically analyze the problem ∧ see what is needed based on the above statement.

Logical Equivelence

$P = \neg(LHS) \vee (RHS)$
$= [\neg(p \wedge q) \wedge (\neg r)] \vee [((q \wedge (\neg r)) \vee (\neg q \wedge r)) \vee p]$
$= [(\neg p) \vee (\neg q) \wedge (\neg r)] \vee [(q \wedge (\neg r) \wedge p) \vee (\neg q \wedge r) \wedge p]$
$= [\neg p \wedge \neg r] \vee [\neg q \wedge \neg r] \vee [q \wedge \neg r \wedge p] \vee [\neg q \wedge r \wedge p]$

> *This leads to the same result as the above table, similar to algebra f∨ f∨mal logic*

Compound propositions P ∧ Q are described in terms of atomic propositions p, q, r, ... are logically equivalent. This is written as

$P \equiv Q(\vee P <==> Q)$

if P ∧ Q has identical truth values this means...

- Every assignment that makes P = F makes Q = F
- Every assignment that makes P = T makes Q = T

Definition

A proposition R is a tautology if it is always T, i.e., no matter the truth values of the atomic proposition R is T - p ∨ ¬ p - (p ∧ q) -> p - p -> p ∨ q