Homework 1

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Contents

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1 Write the truth table for $(p \wedge q) \wedge \neg p$:

p	q	$(p \wedge q) \wedge \neg p$
T	T	F
T	F	F
F	T	F
F	F	F

2 Write the truth table for $\neg p \wedge q \vee r \wedge \neg p$

p	q	r	$\neg p \wedge q \vee r \wedge \neg p$
T	T	F	F
T	F	F	F
F	T	F	T
F	F	F	F
T	T	T	F
T	F	T	F
F	T	T	T
F	F	T	T

3 Write the truth table for $(p \to q) \wedge (q \to r)$

p	q	r	$(p \to q) \wedge (q \to r)$
F	F	F	T
F	F	T	T
F	T	F	F
F	T	T	T
T	F	F	F
T	F	T	F
T	T	F	F
T	T	T	T

4 Write the truth table for: $p \to q \to r$

p	q	r	$p \to q \to r$
F	F	F	T
F	F	T	T
F	T	F	T
F	T	T	T
T	F	F	T
T	F	T	T
T	T	F	F
T	T	T	T

5 Use the theorems of logical equivalence to prove the following logical equivalence: $(p \wedge \neg q) \vee p \equiv p$

Distributive Law

$$(p \wedge \neg q) \vee p \equiv (p \vee p) \wedge (p \vee \neg q)$$

Idempotent Law

$$(p \vee p) \equiv p$$

Substitute

$$(p \wedge \neg q) \vee p \equiv p \wedge (p \vee \neg q)$$

Absorption Law

$$p \wedge (p \vee \neg q) \equiv p$$

Finally

$$(p \wedge \neg q) \vee p \equiv p$$

6 Use the theorems of logical equivalence to prove the following logical equivalence: $p \wedge (\neg q \vee p) \equiv p$

Absorption Law

$$p \wedge (\neg q \vee p) \equiv p$$