

CSCI 2011 HW 1

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1 1.2 Problem 18

Let P , Q and R be statements. Determine whether the following is true.

$$P \oplus (Q \oplus R) \equiv (P \oplus Q) \oplus R$$

2 1.3 Problem 18

The inverse of the implication of $P \Rightarrow Q$ is the implication $(\sim P) \Rightarrow (\sim Q)$.

- (a) Use a truth table to verify that $P \Rightarrow Q \not\equiv (\sim P) \Rightarrow (\sim Q)$.
- (b) Find another implication that is logically equivalent to $(\sim P) \Rightarrow (\sim Q)$ and verify your answer.

3 1.3 Problem 25

For two statements P and Q , use truth tables to verify the following.

- (a) $P \vee Q \equiv (\sim P) \Rightarrow Q$.
- (b) $P \wedge Q \equiv \sim (P \Rightarrow (\sim Q))$.
- (c) $\sim (P \Rightarrow Q) \equiv P \wedge (\sim Q)$.

4 1.4 Problem 12

For every two statements P and Q , use truth tables to verify the following.

- (a) $P \Leftrightarrow Q \equiv (\sim P) \Leftrightarrow (\sim Q)$.
- (b) $P \Leftrightarrow Q \equiv (P \wedge Q) \vee ((\sim P) \wedge (\sim Q))$.
- (c) $\sim (P \Leftrightarrow Q) \equiv P \Leftrightarrow (\sim Q)$.

5 1.5 Problem 10

Let S and R be two compound statements with the same component statements. If S is a tautology and R is a contradiction, then what is the truth value of the following?

- (a) $S \vee R$
- (b) $S \wedge R$

(c) $S \Rightarrow R$

(d) $R \Rightarrow S$

(e) $S \Leftrightarrow R$