

Problem 1

Determine if the following statements are tautologies, contradictions, or neither:

(a) $(P \vee Q) \wedge (\neg P \vee \neg Q)$

(b) $(P \vee Q) \wedge (\neg P \wedge \neg Q)$

(c) $[P \wedge (Q \vee \neg R)] \vee (\neg P \vee R)$.

Solution

Problem 2

Use truth tables to determine whether or not the following statements are valid:

- (a) Either John or Bill is telling the truth. Either Sam or Bill is lying. Therefore, either John is telling the truth or Sam is lying.
- (b) Either sales will go up and the boss will be happy, or expenses will go up and the boss won't be happy. Therefore, sales and expenses will not both go up.

Solution

Problem 3

Use the laws stated in the text to find simpler formulas (as simple as possible!) equivalent to these formulas.

(a) $\neg(\neg P \vee Q) \vee (P \wedge \neg R)$.

(b) $\neg(\neg P \wedge Q) \vee (P \wedge \neg R)$.

(c) $(P \wedge R) \vee [\neg R \wedge (P \vee Q)]$.

Solution