

Introduction to Logic, P. Suppes - exercises

Dominik Lenda

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Exercise 5.

Let

N = New York is larger than Chicago

W = New York is north of Washington

C = Chicago is larger than New York

$N = true, W = true, C = false$

Which of the following sentences are true?

- (a) $N \vee C = true$
- (b) $N \wedge C = false$
- (c) $\neg N \wedge \neg C = false$
- (d) $N \leftrightarrow \neg W \vee C = false$
- (e) $W \vee \neg C \rightarrow N = true$
- (f) $(W \vee N) \rightarrow (W \rightarrow \neg C) = true$
- (g) $(W \leftrightarrow \neg N) \leftrightarrow (N \leftrightarrow C) = true$
- (h) $(W \rightarrow N) \rightarrow [(N \rightarrow \neg C) \rightarrow (\neg C \rightarrow W)] = true$

Exercise 6.

Let

P = Jane Austen was contemporary of Beethoven

Q = Beethoven was a contemporary of Gauss

R = Gauss was a contemporary of Napoleon

S = Napoleon was a contemporary of Julius Caesar

$P = true, Q = true, R = true, S = false$

Find the truth values of the following sentences:

- (a) $(P \wedge Q) \wedge R = true$
- (b) $P \wedge (Q \wedge R) = true$
- (c) $S \rightarrow P = true$
- (d) $P \rightarrow S = false$
- (e) $(P \wedge Q) \wedge (R \wedge S) = false$
- (f) $P \wedge Q \leftrightarrow R \wedge \neg S = true$
- (g) $(P \leftrightarrow Q) \rightarrow (S \leftrightarrow R) = false$

- (h) $(\neg P \leftarrow Q) \leftarrow (S \leftarrow R) = true$
- (i) $(P \rightarrow \neg Q) \rightarrow (S \leftrightarrow R) = true$
- (j) $(P \rightarrow Q)[(Q \rightarrow R) \rightarrow (R \rightarrow S)] = false$
- (k) $P \rightarrow [Q \leftrightarrow (R \rightarrow S)] = false$