

Math 2283 - Introduction to Logic

Homework #4 - 2006.09.22

Due Date - 2006.09.29

Solutions

Convert the following Sentential wffs to Polish Sentential.

1. $((P \vee Q) \Rightarrow \neg R) \wedge (P \Leftrightarrow (Q \wedge \neg R))$

Polish Sentential: $\wedge \Rightarrow \vee P Q \neg R \Leftrightarrow P \wedge Q \neg R$

2. $((R \vee Q) \wedge S) \vee ((R \wedge S) \vee Q)$

Polish Sentential: $\vee \wedge \vee R Q S \vee \wedge R S Q$

3. $((R \wedge (Q \Rightarrow \neg P)) \Leftrightarrow ((P \wedge Q) \Rightarrow \neg R))$

Polish Sentential: $\Leftrightarrow \wedge R \Rightarrow Q \neg P \Rightarrow \wedge P Q \neg R$

4. $((R \Leftrightarrow (P \Rightarrow Q)) \vee ((P \wedge \neg Q) \Rightarrow R))$

Polish Sentential: $\vee \Leftrightarrow R \Rightarrow P Q \Rightarrow \wedge P \neg Q R$

Convert the following Polish Sentential wffs to Sentential.

5. $\vee \Rightarrow \Leftrightarrow R P Q \wedge P \Rightarrow \neg Q R$

Sentential: $((R \Leftrightarrow P) \Rightarrow Q) \vee (P \wedge (\neg Q \Rightarrow R))$

6. $\vee \vee R \wedge Q S \wedge R \vee S Q$

Sentential: $((R \vee (Q \wedge S)) \vee (R \wedge (S \vee Q)))$

7. $\vee P \Leftrightarrow \Rightarrow Q \wedge \neg R P \wedge Q \neg R$

Sentential: $(P \vee ((Q \Rightarrow (\neg R \wedge P)) \Leftrightarrow (Q \wedge \neg R)))$

8. $\wedge R \Rightarrow Q \neg \Leftrightarrow P \wedge P \Rightarrow Q \neg R$

Sentential: $(R \wedge (Q \Rightarrow \neg(P \Leftrightarrow (P \wedge (Q \Rightarrow \neg R))))$

9. Compute the truth table for the wff in problem 3, and state if the wff is consistent, inconsistent or a tautology.

P	Q	R	$((R \wedge (Q \Rightarrow \neg P)) \Leftrightarrow ((P \wedge Q) \Rightarrow \neg R))$
T	T	T	F
T	T	F	F
T	F	T	F
T	F	F	F
F	T	T	F
F	T	F	F
F	F	T	T
F	F	F	F

After examining the truth table, we see that this wff is consistent.

10. Compute the truth table for the wff in problem 4, and state if the wff is consistent, inconsistent or a tautology.

P	Q	R	$((R \Leftrightarrow (P \Rightarrow Q)) \vee ((P \wedge \neg Q) \Rightarrow R))$
T	T	T	T
T	T	F	T
T	F	T	T
T	F	F	T
F	T	T	T
F	T	F	T
F	F	T	T
F	F	F	T

After examining the truth table, we see that this wff is a tautology.