Homework 3

October 14, 2019

Deadline

Due: October 21, 2019, 23:59. Good luck!

Problem 1

Convert the following formulas to polish notation and reverse polish notation.

1. $P \wedge \neg R \leftrightarrow P \vee Q$
2. $\neg\neg P \vee (W \wedge R) \vee \neg Q$

Solution.
Your solution here.

Problem 2

Convert the following formulas to CNF, DNF, PCNF and PDNF.

1. $P \vee \neg P$
2. $P \wedge \neg P$
3. $P \leftrightarrow (Q \rightarrow (Q \rightarrow P))$

Solution.
Your solution here.

Problem 3

Prove the following formula with three proof methods, including theorem 2.8.1 in p32 of the textbook, theorem 2.8.2 in p32 of the textbook and interpretaion method in p32 of the textbook.

$$(P \wedge Q) \Rightarrow (P \rightarrow Q)$$

Solution.
Your solution here.

Problem 4

Assuming that $P_i \rightarrow Q_i (i = 1, ..., n)$, $P_1 \vee P_2 \vee ... \vee P_n$ and $\neg(Q_i \wedge Q_j)(i \neq j)$ are true, prove that $Q_i \rightarrow P_i (i = 1, ..., n)$ are true by deduction in 2.9.

Solution.
Your solution here.

Problem 5

Prove the following theorem by resolution in 2.10.

$$(P \vee Q) \wedge (P \rightarrow R) \wedge (Q \rightarrow R) \Rightarrow R$$

Solution.
Your solution here.

Problem 6

Prove

1. $A \rightarrow B$ is a tautology iff $B^* \rightarrow A^*$ is a tautology

2. $A \to B$ is satisfiable iff $B^* \to A^*$ is satisfiable

3. $A \leftrightarrow B$ is a tautology iff $B^* \leftrightarrow A^*$ is a tautology

4. $A \leftrightarrow B$ is satisfiable iff $B^* \leftrightarrow A^*$ is satisfiable

Solution.
Your solution here.