Formale Systeme Proseminar

Tasks for Week 3, 20.10.2016

Task 1 Check in each of the following cases whether the given rule is correct. If it is, give arguments to show this. If it is not, give a counter example.

    (a) There are K's which are also M's
        All K's are L's
        ———————————————

        There are L's which are M's

    (b) No one K is an M
        All K's are L's
        ———————————————

        No one L is an M

Task 2 For each of the following concrete propositions, write an abstract proposition which corresponds to it:

    (a) I love you and will always be true to you.

    (b) If it is raining, then I will stay home and watch a movie.

    (c) $x^2 > 4$ if, and only if, $x > 2$ or $x < -2$.

    (d) I will go to play tennis if you bring the balls with you.

Task 3 Give the following propositions in words again, with 'it is raining' for a, 'it is windy' for b, and 'I am wet' for c.

    (a) $a \wedge \neg b$

    (b) $\neg(a \vee b)$

    (c) $(a \Rightarrow c) \vee (b \Rightarrow \neg a)$.

    (d) $\neg\neg a$.

Task 4 Draw the trees of the following abstract propositions and give the main symbol for each of them.

    (a) $(a \Rightarrow (b \Rightarrow a))$

    (b) $((\neg(a \Rightarrow b)) \Leftrightarrow (a \wedge (\neg b)))$

    (c) $((\neg(\neg a)) \Rightarrow ((\neg a) \wedge b))$

(d) $(a \Rightarrow ((b \wedge a) \vee c))$.

Task 5 Drop as many parentheses as possible from the abstract propositions of Task 4.

Task 6 Give the truth tables of the abstract propositions of Task 4.

Task 7 For which values of $a, b,$ and c one gets 0 in the truth-table of

$$(a \wedge (b \Rightarrow c)) \Rightarrow ((b \Rightarrow a) \wedge c) ?$$

Task 8 Check if the following propositions are equivalent

(a) $\neg(b \vee \neg c)$ and $\neg b \wedge c$

(b) $a \Rightarrow b$ and $\neg a \Rightarrow \neg b$

(c) $(a \vee b) \wedge a$ and a

(d) $(a \vee b) \wedge b$ and $(b \wedge c) \vee (b \wedge \neg c)$.