Universität Koblenz-Landau

FB 4 Informatik

Prof. Dr. Viorica Sofronie-Stokkermans **November 10, 2011**

Exercises for "Non-Classical Logics"
Exercise sheet 3

Exercise 3.1: (*2 P*)
Prove or refute the following statements:

(a) If F is a first-order formula, then F is valid if and only if $F \to \bot$ is unsatisfiable.

(b) If F is a first-order formula and x a variable, then F is unsatisfiable if and only if $\exists x F$ is unsatisfiable.

(c) If F and G are first-order formulae, F is valid, and $F \to G$ is valid, then G is valid.

(d) If F and G are first-order formulae, F is satisfiable, and $F \to G$ is satisfiable, then G is satisfiable.

Exercise 3.2: (*2 P*)
What is the clausal normal form of

$$\exists x \, \forall y \, (\forall z \, (p(y, z) \vee \neg \, (x \approx y)) \to (\forall z \, q(y, z) \wedge \neg \, r(x, y)))$$

Exercise 3.3: (*1 P*)
Compute a most general unifier of

$$\{ \, f(x, g(x)) = y, \;\; h(y) = h(v), \;\; v = f(g(z), w) \, \}$$

Exercise 3.4: (*2 P*)
Use resolution to show that the following set of clauses is unsatisfiable:

$$p(a, z)$$
$$\neg p(f(f(a)), a)$$
$$\neg p(x, g(y)) \vee p(f(x), y)$$

Exercise 3.5: (*2 P*)
Prove that the following set of formulae is unsafisfiable by using first-order semantic tableaux:

$$\{p(a), \quad \forall x(p(x) \to p(f(x))), \quad \neg p(f(f(a)))\}$$

Please submit your solution until Wednesday, November 16, 2011 in the evening. Please do not forget to write your name on your solution.

Submission possibility:

- Hand the solution in at the lecture.
- By e-mail to `sofronie@uni-koblenz.de` with the keyword "Homework Non-Classical Logics" in the subject.