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Tutorials for "Automated Reasoning"
Exercise sheet 8

Exercise 8.1: (*4 P*)
Prove Theorem 3.25.2-3.

Exercise 8.2: (*3 P*)
Determine whether the following formula is satisfiable or not:

$$\forall x\,(p(x) \to p(f(x))) \wedge p(b) \wedge \neg p(f(f(b)))$$

by first transforming the formula to CNF, then applying to the obtained clause set Resolution for General Clauses.

Exercise 8.3: (*4 P*)
Using the standard and the polynomial unification rules, compute most general unifiers of $P(g(x_1, g(f(x_3), x_3)), g(h(x_4), x_3))$ and $P(g(x_2, x_2), g(x_3, h(x_1)))$, if any exists.

(Make sure that you understand differences between the two unification schemas.)

Exercise 8.4: (*2 P*)
Using the polynomial unification rules, compute a most general unifier of the two atoms from Exercise 7.5.

(Compare your solution with the one of Exercise 7.5, make sure that you understand differences between the two unification schemas.)

Challenge Problem: (*2 Bonus Points*)
We call a term t *linear* if any variable occurs at most once in t. We define the *depth* of a term t to be $max\{|p| \mid p \in pos(t)\}$. Now consider two linear terms s, t that do not share variables. Prove that for any mgu σ of s and t we have

$$max(depth(t), depth(s)) = max(depth(t\sigma), depth(s\sigma))$$

Submit your solution in lecture hall 002 during the lecture on June 15. Please write your name and the date of your tutorial group (Tue, Wed, Fri) on your solution.

Note: Joint solutions are not permitted (work in groups is encouraged).