



Uwe Waldmann
Christoph Weidenbach

July 10, 2006

Tutorials for “Automated Reasoning”
Exercise sheet 12

Exercise 12.1: (2 P)

To prove the completeness of Knuth-Bendix completion, a cost is associated with every proof step. This cost is a triple. In which subcase of the proof of Lemma 3.42 is the last component of this triple used? How does this subcase work?

Exercise 12.2: (3 P)

Use superposition to show that the following set of (implicitly universally quantified) clauses is unsatisfiable:

$$\begin{aligned}f(b, a) &\approx a \\f(x, a) &\approx x \\f(c, b) &\not\approx c \vee a \not\approx b\end{aligned}$$

Use the LPO with precedence $f > a > b > c$ and left-to-right lexicographic status for f as term ordering; compute only inferences that are required according to the ordering restrictions of the superposition calculus.

Exercise 12.3: (2 P)

Let \succ be the LPO with the precedence $g > d > f > c > b$. Order the following ground equational clauses according to the clause ordering defined in Sect. 3.7 of the course:

$$\begin{aligned}f(b) &\approx d \\c \not\approx d \vee f(b) &\approx c \\g(c) &\approx f(f(d)) \vee f(b) \approx c \\f(f(b)) &\approx f(d) \vee f(b) \approx d \\f(c) &\not\approx f(c)\end{aligned}$$

Exercise 12.4: (3 P)

A Σ -interpretation \mathcal{A} is called term-generated, if for every $b \in U_{\mathcal{A}}$ there is a ground term $t \in T_{\Sigma}(\emptyset)$ such that $b = \mathcal{A}(\beta)(t)$. Prove: A set of universally quantified equational clauses has a model if and only if it has a term-generated model.

Submit your solution in lecture hall 003 during the lecture on July 17. Please write your name and the date of your tutorial group (Mon, Thu, Fri) on your solution.

Note: Joint solutions, prepared by up to three persons together, are allowed (but not encouraged). If you prepare your solution jointly, submit it only once and indicate all authors on the sheet.