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Tutorials for "Automated Reasoning"
Exercise sheet 10

Exercise 10.1: (*2 P*)
Prove Theorem 3.42(ii).

Exercise 10.2: (*4 P*)
Is the rewrite system

$$\{ f(a) \to f(b),\ f(b) \to f(c),\ f(c) \to f(a),\ f(x) \to x \}$$

(i) terminating, (ii) normalizing, (iii) locally confluent, (iv) confluent? Give a brief explanation.

Exercise 10.3: (*3 P*)
Let $\Sigma = (\Omega, \emptyset)$ with $\Omega = \{a/0, b/0, f/1\}$. Given $E = \{f(f(x)) \approx a\}$ derive $E \vdash f(a) \approx a$. How many elements does the universe of $T_\Sigma(\emptyset)/E$ have? How do they look like?

Exercise 10.4: (*2 P*)
Let E be a set of equations, let $\theta : X \to T_\Sigma(X)$ be a substitution. Prove that $E \vdash t \approx t'$ implies $E \vdash t\theta \approx t'\theta$ for all terms t, t' over Σ.

Challenge Problem: (*2 Bonus Points*)
Let $\to$ be a relation, such that if $y \leftarrow x \to z$ and $y \neq z$, then there is an element u such that $y \to u \leftarrow z$.

Show that if an element a has a normal form, then there is no infinite reduction sequence starting from a.

Submit your solution in lecture hall 002 during the lecture on June 29. 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).