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Tutorials for "Automated Reasoning"
Exercise sheet 1

Exercise 1.1: *(4 P)*
Find an abstract reduction system $(A, \rightarrow)$, such that $\rightarrow^+$ is irreflexive and $\rightarrow$ is normalizing, but not terminating.

Exercise 1.2: *(4 P)*
For an alphabet Σ with a well-founded ordering $>_\Sigma$ let the relation $\succ$ be defined as

$$w \succ w' :\Leftrightarrow |w| > |w'| \text{ or } (|w| = |w'| \text{ and } w >_{\Sigma,lex} w').$$

Prove that $\succ$ is a well-founded ordering on Σ^*.

Exercise 1.3: *(4 P)*
Let M be the set $\{a, b, c\}$. Determine an ordering $\succ$ of M such that the following statements hold for the multiset extension $(\succ_{\mathrm{mul}})_{\mathrm{mul}}$ of the multiset extension of $\succ$.

(1) $\big\{\{a, b\}, \{c\}\big\} \, (\succ_{\mathrm{mul}})_{\mathrm{mul}} \, \big\{\{a\}, \{b, c\}\big\}$ and

(2) $\big\{\{b\}, \{c, c\}\big\} \, (\succ_{\mathrm{mul}})_{\mathrm{mul}} \, \big\{\{b, b, b\}, \{c\}\big\}$.

Exercise 1.4: *(6 P)*
Replace the Eliminate rule of the LAE abstract rewrite system by a rule that implements equational solving through substitution. Make sure and argue that the resulting system is still terminating, confluent, sound, and complete.

Submit your solution in lecture hall E1.3, Room 001 during the lecture on November 08. Please write your name and the date of your tutorial group (Mon, Wed) on your solution.

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.