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Tutorials for "Automated Reasoning II"
Exercise sheet 6

Exercise 6.1:
Prove that the multiset extension of a reduction ordering is stable under substitutions (which implies that the literal ordering defined on page 48 of the script is stable under substitutions). Note: There are several ways to characterize a multiset ordering, see e.g. the lecture notes from the previous semester or the book by Baader and Nipkow. You may pick the most convenient one for this purpose.

Exercise 6.2:
Prove the lifting lemma (Lemma 3.7) for the equality factoring inference rule.

Exercise 6.3:
On page 48 of the lecture notes it is stated that the ordering restrictions of the inference rules of the superposition calculus must be satisfied *after applying the mgu to the premises.* Give a simple example that shows that a literal may be maximal in a clause, but that the maximality requirement may be violated after applying the mgu.

Exercise 6.4:
Compute the rewrite systems R_C and R_∞ for the set of ground clauses N:

$$
\begin{array}{rl}
f(a) \approx d \ \vee \ f(a) \approx c & (1) \\
a \not\approx d \ \vee \ f(b) \approx f(d) & (2) \\
f(c) \approx f(d) & (3) \\
f(d) \approx d \ \vee \ f(d) \approx b & (4) \\
a \approx b & (5) \\
c \approx d & (6)
\end{array}
$$

Use the KBO with $f > a > b > c > d$ and weight 1 for all symbols as term ordering. Which is the smallest clause $C \in N$ such that C is neither productive nor true in R_C? Use it to show that N is not saturated up to redundancy.

Bring your solution (or solution attempt) to the tutorial on June 27.