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**Tutorials for “Automated Reasoning II”**  
**Exercise sheet 5**

**Exercise 5.1:**

Prove that the Equality Factoring rule (page 49 of the lecture notes) is sound.

**Exercise 5.2:**

Prove that the multiset extension of a reduction ordering is stable under substitutions (which implies that the literal ordering defined on page 50 of the lecture notes 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 5.3:**

On page 50 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 5.4:**

Compute  $R_\infty$  for the clause set  $\{f(x) \approx a\}$  and the signature  $\Sigma = (\{f/1, g/1, a/0\}, \emptyset)$ ; use the LPO with  $g > f > a$ .

Submit your solution (or solution attempt) by e-mail to [uwe@mpi-inf.mpg.de](mailto:uwe@mpi-inf.mpg.de), subject Ex 5. until June 28.