Theorem Proving and Equality

Exercise 25 *Derive the empty clause from the following set of clauses with Superposition without Equality Factoring, but allowing superposition inferences into tautologies. Assume $a \succ b \succ c \succ d$:*

$\underline{c} \approx d \rightarrow,$
$\rightarrow \underline{b} \approx d$
$\rightarrow \underline{a} \approx b, a \approx d$
$a \approx d \rightarrow \underline{a} \approx c$

Exercise 26 *Do the above exercise but use Merging Paramodulation plus Positive Factoring instead of superposition into tautologies.*

Exercise 27 *Saturate the following set of clauses with Superposition*

- *with Equality Factoring*
- *with Merging Paramodulation plus Positive Factoring*

$\{\rightarrow b \approx d, \quad \rightarrow a \approx b, a \approx c\}$ *assuming* $a \succ b \succ c \succ d$.

Construct a Herbrand equational interpretation for both saturated sets and argue which one is the perfect model.

Exercise 28 *Prove Lemma 11:*
For every set of ground clauses S, the set R_S of rules generated for S is convergent. If $R_C \models C$, then $R \models C$.