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Tutorials for "Automated Reasoning"
Exercise sheet 7

Exercise 7.1: (*4 P*)
Let $\succ$ be the total ordering on the ground atoms $D \succ C \succ B \succ A$. Let N be the clause set $\{A \vee B \vee C, \neg A \vee \neg B, \neg B \vee \neg A \vee C, \neg C \vee B\}$.

a) Stratify (order) the given clause set.

b) Determine I_N.

c) Which clause is false in I_N?

d) Show the resolution step yielding a smaller counterexample.

Exercise 7.2: (*2 P*)
For each item of the note for Theorem 3.15 (pages 55–56 of the script), namely:

a) $I \models L_1 \vee \ldots \vee L_n \;\Leftrightarrow$ there exists i: $I \models L_i$,

b) $I \models A$ or $I \models \neg A$,

give two first-order formulas (with variables) disproving the item. Clarify your hypotheses.

Exercise 7.3: (*2 P*)
Prove Proposition 3.17.(i).

Exercise 7.4: (*4 P*)
Let $\Sigma = (\{a/0, b/0, f/1\}, \{p\})$ be a signature and I – a Herbrand interpretation over Σ. For formulas c) – f) from the Exercise 5.2, provide Herbrand interpretations over Σ showing satisfiability and non-validity of the formulas. Clarify your hypotheses.

Exercise 7.5: (*2 P*)
Compute a most general unifier of $P(h(x_1), x_4, g(x_2, f(x_2)))$ and $P(h(x_4), g(f(x_3), x_5), x_1)$.

Challenge Problem: (*2 Bonus Points*)
Prove Proposition 3.18.(iv).

Submit your solution in lecture hall 002 during the lecture on June 8. 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).