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Tutorials for "Automated Reasoning"
Exercise sheet 7

Exercise 7.1: *(4 P)*
Prove validity of the following formula via tableau:

$$(\forall x_S.(P(x_S) \to Q(x_S)) \wedge \exists x_S.(Q(x_S) \vee P(x_S))) \to \exists x_S.Q(x_S)$$

where S is the only sort and predicates are defined accordingly.

Exercise 7.2: *(4+1 P)*
Consider the following tableau:

$$\{((\exists x_S(Q(x_S) \vee P(x_S)), \forall x_S.\neg Q(x_S)), \{a\})\}$$

where again S is the only sort and predicates and functions are defined accordingly.

1. Saturate the tableau.
2. Determine a Herbrand model for an open tableau branch.

Exercise 7.3: *(2+2 P)*
Construct an initial tableau $\{((\phi), J)\}$

1. such that ϕ does not contain any function symbols and saturation of the tableau does not terminate.
2. such that ϕ does contain non-constant function symbols and saturation of the tableau does terminate.

Exercise 7.4: *(4 P)*
Prove the following: if an initial tableau $\{((\phi), J)\}$ only contains constants as function symbols and no explicit or implicit existential quantifier, i.e, existential subformulas with positive or zero polarity or universal subforumulas with negative or zero polarity, then saturation of the tableau terminates.

Submit your solution in lecture hall E1.3, Room 001 during the lecture on January 10. Please write your name and the date/time of your tutorial group (Wed-Fabian, Wed-Tobias) 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.