Universität
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Tutorials for "Automated Reasoning"
Exercise sheet 6

Exercise 6.1: (*4 P*)
Transform the first-order formula

$$F \;=\; \forall x \, \exists y \, \exists z \Big(\big(P(x) \wedge R(x,y) \big) \vee \neg \forall w \, Q(z,w) \Big)$$

into clause normal form using the improved algorithm from Section 3.6. (There are no subformulas in F for which one should introduce a definition.)

Exercise 6.2: (*5 P*)
Let $\Sigma = (\Omega, \Pi)$ with $\Omega = \{b/0,\ c/0,\ d/0\}$ and $\Pi = \{P/1,\ Q/0\}$. Are the following statements correct? Give a brief explanation.

(1) The formula $\forall x \, P(x)$ has infinitely many Σ-models.

(2) The formula $P(b) \wedge P(c) \wedge \neg P(d)$ has a Σ-model with a two-element universe.

(3) Every Σ-model of $P(b) \wedge P(c) \wedge P(d)$ is a model of $\forall x \, P(x)$.

(4) Every Herbrand model over Σ of $P(b) \wedge P(c) \wedge P(d)$ is a model of $\forall x \, P(x)$.

(5) The formula $P(b) \wedge P(c) \wedge \neg P(d)$ has exactly two Herbrand models over Σ.

Submit your solution in lecture hall E1.3, Room 003 during the lecture on December 7. Please write your name and the time of your tutorial group (Mo 8–10 or Mo 12–14) 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.