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Tutorials for "Automated Reasoning"
Exercise sheet 9

Exercise 9.1: (*4+4 P*)
Prove validity the following formulas by free-variable tableau. There is only one sort S in the signature with according symbol definitions.

1. $\exists x.(\forall y.((P(x) \rightarrow R(x,y)) \vee P(a)))$
2. $(\exists x.\forall y.R(x,y)) \rightarrow (\forall y.\exists x.R(x,y))$

Exercise 9.2: (*3+6 P*)
Transform the following formulas into CNF using the ACNF algorithm for first-order logic. There is only one sort S in the signature with according symbol definitions.

1. $\forall x.\exists y.\exists z.(R(y,z) \vee \neg(R(x,y) \rightarrow P(y)))$
2. $\exists x.\forall y.\exists z.(R(x,y) \leftrightarrow ((P(x) \vee P(y)) \rightarrow Q(x,y,z)))$

Exercise 9.3: (*4 P*)
Present a formula and an interpretation showing that Skolemization does not preserve validity.

Submit your solution in lecture hall E1.3, Room 001 during the lecture on January 24. 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.