max planck institut
informatik

**Universität
des
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FR Informatik

Tutorials for "Automated Reasoning"
Exercise sheet 5

Exercise 5.1: *(2+2+2+2 P)*
Consider the modified β-expansion rule of tableaux below that adds the negation of the first descendent to the second sequence.

β**-Expansion+** $N \uplus \{(\phi_1, \ldots, \psi, \ldots, \phi_n)\}$ $\Rightarrow_T$ $N \uplus \{(\phi_1, \ldots, \psi, \ldots, \phi_n, \psi_1)\}$ $\uplus$ $\{(\phi_1, \ldots, \psi, \ldots, \phi_n, \neg\psi_1, \psi_2)\}$

provided ψ is an open β-formula, ψ_1, ψ_2 its direct descendants and the sequence is not closed.

Prove that the tableaux calculus consisting of α-Expansion and β-Expansion+ is
  (i)   sound,
  (ii)   complete,
  (iii) terminating.
  (iv)   What are the advantages, disadvantages of this new rule compared to the old one?
Of course, you may use the known properties of the standard tableaux calculus from the lecture.

Exercise 5.2: *(3+3 P)*
Consider the formula
$$\neg[(P \wedge (P \rightarrow Q)) \leftrightarrow (P \vee Q)]$$
and transform it into CNF using the algorithm
  (i)   bcnf
  (ii)   acnf.

Submit your solution in lecture hall E1.3, Room 002 during the lecture on November 25. Please write your name and the date of your tutorial group (Mon, Thu) on your solution.

Joint solutions are not permitted, please submit individually. However, I encourage you working and solving the exercises in a group.