

Assignment 1 – COMP 426: Automated Reasoning

Fall 2007
Due Sep 21 2006

Exercise 1: Natural deduction proofs [70 pts]

Give proofs in natural deduction using the proof tutor Tutch:

1. $(A \wedge B \wedge C) \supset (A \wedge B)$
2. $(A \supset B) \supset ((B \supset C) \supset (A \supset C))$
3. $(A \vee (B \wedge C)) \supset ((A \vee B) \wedge (A \vee C))$
4. $(A \vee B) \supset C \supset (A \supset C) \wedge (B \supset C)$
5. $(A \supset C) \wedge (B \supset C) \supset (A \vee B) \supset C$
6. $((A \supset B) \wedge (A \vee C)) \supset (B \vee C)$
7. $(A \supset \neg A) \supset (\neg A)$

Exercise 2: Logical Equivalence [30 pts]

Assume someone defines conjunction with the following two rules:

$$\frac{\frac{A \wedge B}{C} \quad \begin{array}{c} \frac{-u}{A} \quad \frac{-v}{B} \\ \vdots \\ C \end{array}}{\wedge E^{u,v}} \quad \frac{A \quad B}{A \wedge B} \wedge I$$

Are these rules sound and complete? – Show local soundness and completeness.