

Übungsblatt 7

Abgabe: Dienstag, 19.06.07 bis 13 Uhr

Exercise 1 Truth Tables, Models (25 Points)

a) [7 pts.] Using truth-tables, show that $((a \vee c) \wedge (b \Rightarrow c) \wedge (c \Rightarrow a))$ is equivalent to $((b \Rightarrow c) \wedge a)$, but not equivalent to $((a \vee c) \wedge (b \Rightarrow c))$.

b) [8 pts] Consider a vocabulary with only four propositions, A , B , C , and D . How many models are there for the following formulae? Explain. (Taken from the text book, pg. 237)

1. $(A \wedge B) \vee (B \wedge C)$
2. $A \vee B$
3. $A \Leftrightarrow B \Leftrightarrow C$

c) [10 pts.] Decide whether each of the following sentences is valid, unsatisfiable, or neither. Verify your decisions using truth tables or the equivalence rules (annexed to the sheet). (Taken from the text book, pg. 237)

1. $Smoke \Rightarrow Smoke$
2. $Smoke \Rightarrow Fire$
3. $(Smoke \Rightarrow Fire) \Rightarrow (\neg Smoke \Rightarrow \neg Fire)$
4. $Smoke \vee Fire \vee \neg Fire$
5. $((Smoke \wedge Heat) \Rightarrow Fire) \Leftrightarrow ((Smoke \Rightarrow Fire) \vee (Heat \Rightarrow Fire))$
6. $(Smoke \Rightarrow Fire) \Rightarrow ((Smoke \wedge Heat) \Rightarrow Fire)$
7. $(Big \wedge Dumb) \vee \neg Dumb$

Exercise 2 Modelling, Proofs (15 Points)

Given the following, can you prove that the unicorn is mythical? How about magical? Horned? (Taken from the text book, pg. 238)

If the unicorn is mythical, then it is immortal, but if it is not mythical, then it is a mortal mammal. If the unicorn is either immortal or a mammal, then it is horned. The unicorn is magical if it is horned.