

AI - Assignment 7

Patrick Nagel: patrick.nagel@h-brs.de

Amirhossein Pakdaman: amirhossein.pakdaman@smail.inf.h-brs.de

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1. Describe the following concepts in the context of logical reasoning as precisely and compact as possible:

- Enumeration
- Validity. i.e. when is a sentence valid/invalid?
- Satisfiability. I.e. when is a sentence satisfiable/ when is it unsatisfiable?
- CNF and DNF. Give an example for each.
- Resolution

2. Consider the following Implication:

$$[(Food \Rightarrow Party) \vee (Drinks \Rightarrow Party)] \Rightarrow [(Food \wedge Drinks) \Rightarrow Party]$$

- (a) Determine, using enumeration, whether this sentence is valid, satisfiable (but not valid), or unsatisfiable.
- (b) Convert the left-hand and right-hand sides of the main implication into CNF separately, showing each step, and explain how the results confirm your answer.
- (c) Prove your answer to (a) using resolution.

3. Let A, B and C be propositional formulas such that A and B entails C (e.g. $A \wedge B \rightarrow C$). Then, is $(A \rightarrow C) \vee (B \rightarrow C)$ always true?

4. Prove the following formulas:

- $\neg P \wedge \neg Q \Leftrightarrow \neg(P \vee Q)$
- $\neg(P \wedge Q) \Leftrightarrow \neg P \vee \neg Q$
- $P \vee (P \wedge Q) \Leftrightarrow P$