Artificial Intelligence: Exercise 4

Maik Kschischo, Elina Unruh

Week 4

1. Transform the following formulas to conjunctive normal form.
   (a) $a \Leftrightarrow b$
   (b) $a \wedge b \Leftrightarrow a \vee b$
   (c) $a \wedge (a \Leftrightarrow b) \Rightarrow b$
2. Explain the difference between the following expressions
$$p \Rightarrow q$$
$$p \models q$$
$$p \vdash q$$
3. The resolution rule
$$\frac{A \vee B \quad \neg A \vee C}{B \vee C}$$
   is an inference rule and not an equation. Check, whether $(A \vee B) \wedge (\neg A \wedge C) \equiv (B \vee C)$ is correct?
4. Show by resolution that
   (a) the formula $(a \vee b) \wedge (\neg b \vee c) \Rightarrow (a \vee c)$ is a tautology.
   (b) the formula $\neg(\neg\text{gasintank} \wedge (\text{gasintank} \vee \neg\text{carstarts}) \Rightarrow \neg\text{carstarts})$ is unsatisfiable.
5. Solve the following case with the help of a resolution proof: "If the criminal had an accomplice, then he came in a car. The criminal had no accomplice and did not have the key, or he had the key and an accomplice. The criminal had the key. Did the criminal come in a car or not?"