AI - Assignment 7

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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 senctence 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:

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