CS472 Foundations of Artificial Intelligence
Fall 2001
Assignment 3

Due Monday, October 28 at the beginning of class.

Solutions must be typed, although equations, graphs, tables, etc., can be drawn in by hand.

1. **Propositional Reasoning (5 pts.)** Exercise 6.7 of Russell & Norvig.
2. **Representation (5 pts.)** Exercise 6.10 of Russell & Norvig.
3. **Inference and proof procedures (15 pts.)**
   (a) Inference in propositional and first-order logic is monotonic. What does that mean? Show how this follows from the definition of logical "entailment" ($\models$) for propositional / first-order logic.
   (b) What is the advantage of the resolution proof procedure over the axiomatic method using the modus ponens rule (as discussed in class)? What is a disadvantage of resolution?
   (c) Resolution takes an exponential number of steps on Pigeon Hole formulas. One can get around this problem by making resolution more powerful. How? (general idea only)
4. **First-order logic (15 pts.)** Consider the statements:

   If a course is easy, some students are happy. If a course has a final, no students are happy.

   (a) Represent the above statements using first-order logic.
   (b) Prove by resolution that, *If a course has a final, the course isn't easy.* (Formalize query. Show full detail of resolution proof.)
5. **Representation (20 pts.)** Exercise 7.9 of Russell & Norvig.
6. **Representation (10 pts.)** Exercise 8.8 of Russell & Norvig.