

CS444 HW #5

Answers to the following exercises should be prepared in a text editor and submitted through blackboard as .pdf files.

1. Convert the following sentences into conjunctive normal form. Show all steps.
 - $\neg(A \Rightarrow B)$
 - $A \Rightarrow \neg(B \vee C)$

2. Consider the following knowledge base:

- If Bob studied, then he passed the exam and he graduated.
- If Bob overslept, then he did not pass the exam.
- Bob did not graduate.
- Bob overslept.

Construct a resolution proof showing that Bob did not study. Show all steps.

3. Express the following knowledge base in first order logic using the predicates Taller, SeesOver, CanRide, and HasTicket.
 - Anyone who has a ticket and is taller than Alice can ride the roller coaster.
 - Anyone who can see over another person's head is taller than that person.
 - If some first person can see over a second person's head, and that second person is taller than some third person, then the the first person is taller than the third person.
 - Bob can see over Tim's head.
 - Tim can see over Alice's head.
 - Bob has a ticket.

4. Prove that Bob can ride the roller coaster. Each step in your proof should explicitly invoke one of the inference rules described in Chapters 7 or 9 and should state which previous lines of the proof are being used.

5. Rewrite the knowledge base from question 3 as a set of Prolog rules and facts. Load your Prolog file into an interpreter and try some queries. Include your entire database in your submission, along with the results of the following queries:

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?- can_ride(tim).  
?- can_ride(bob).  
?- can_ride(X).
```