15-819K: Logic Programming

Pretest

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Name _____

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This pretest is designed to assess your background in order to plan the course most effectively. None of the questions reflect required or expected prior knowledge.

1. I will take this course for credit (circle most appropriate answer):

   definitely   probably   undecided   probably not   definitely not

2. I plan to audit this course: yes   no

3. Give an ML (either SML or O'Caml) datatype declaration to capture the following definition, where P stands for propositional variables.

   Formulas $\quad A \quad ::= \quad P \mid A_1 \wedge A_2 \mid A_1 \supset A_2 \mid A_1 \vee A_2 \mid \bot \mid \top \mid \neg A$

4. Consider the following function in SML.

```
fun f (x::l) k = f l (fn y => k (x::y))
  | f nil    k = k nil
```

   (a) Give its type as infered by SML.

   (b) Describe its action in a simple form.

   (c) Prove that it satisfies the specification from part (b).

5. For each of the following, indicate if they are theorems in intuitionistic and classical logic.

Formula	Intuitionistically true?	Classically true?
$A \vee (A \supset B)$		
$((A \vee B) \supset C) \supset ((A \supset C) \wedge (B \supset C))$		
$\exists x.\, \forall y.\, A(x) \supset A(y)$		

6. Explain briefly in your own words the significance of Gentzen's cut elimination theorem (also known as the *Hauptsatz*) for first-order predicate calculus.

7. Consider the following Prolog program.

```
p([], L-L).
p([X|K], [X|L]-M) :- p(K, L-M).
```

Provide the answers of the following queries.

(a) `?- p([1,2,3], L-M).`

(b) `?- p(K, [1,2,3]-[4,5]).`

(c) `?- p(K, [1,2|L]-L).`