**CS 291 Exam Two Terms and Concepts**

**Hein Section 7.1 First-Order Predicate Calculus**

* Understand *predicates*, *existential quantifiers* and *universal quantifiers* over a *domain*.
* Know what a well-formed formula (wff) is and all the standard terminology associated with this idea.
* Be familiar with *scope* of quantified variables and how to distinguish *bound* from *free* variables.
* Know the concepts of *valid*, *unsatisfiable* and *satisfiable* as applied to wffs.

**Hein Section 7.2 Equivalent Formulas**

* Be familiar with the concept of *logical equivalence*.
* Be able to do various manipulations to show that one logical form is equivalent to another logical form.
* Know about *prenex normal form* and how to to through the steps to put a wff into this form.
* Beyond this, be able to put wffs into *disjunctive normal form* and *conjunctive normal form*.
* Be able to formalize English sentences into wffs and find natural sounding English sentences that are equivalent to wffs.

**Hein Section 7.3 Formal Proofs in Predicate Calculus**

* Know how to do formal conditional proofs in FOL using natural deduction.
* Be familiar with *universal instantiation (UI)*, *existential generalization (EG)*, *existential instantiation (EI)*, and *universal generalization (UG)*.
* Be able to take English sentences, translate them into formal wffs and go through the process of doing a formal proof.

**Hein Section 7.4 Equality**

* There are various proofs in this section that I won't expect you do do much with.
* You should know the *Equal for Equals (EE)* rule well enough to use it in proofs.
* You should extend your ability to formalize English sentences in FOL to include aspects of equality, as in the homework problems.

**Hein Section 8.1 Program Correctness**

* You should understand the {P} S {Q} syntax used in program correctness proofs.
* Know the *Assignment Axiom* and the *Consequence Rules* and how to use them in proofs.
* Be familiar with the *Composition Rule* and the *If-Then Rule* and *If-Then-Else Rule* and how to use them in proofs. If I expected you to use any of these three rules in proofs, I would give them to you on the exam.
* I do **not** expect you to be able to do correctness proofs with the *While Rule* or any of the array assignment stuff or program termination proofs.

**Hein Section 8.2 Higher-Order Logics**

* Nothing from this section.

**Hein Section 8.3 Automatic Reasoning**

* I expect you to be able to take logical wffs and put them in *clausal form*, including *Skolemization* as necessary. This includes being able to carefully apply *Skolem's Rule*.
* You should be able to do *resolution proofs*, both with propositional logic clauses and first-order logic clauses.
* Understand *substitution* and *unification* and how they are used in resolution proofs.
* Be able to use *Robinson's Unification Algorithm* to find *most general unifiers (mgus)*.
* To restate, be able to do full blown first-order logic resolution proofs from beginning to end.