Logic I
Fall 2009
Final exam study guide

- The exam is Tuesday, December 15 9:00AM – 12:00 in 56-154.
- It will be a mixture of true/false questions, short answers questions, truth-table questions, and derivations.
- Questions may be on material from any segment of the course.
- Suggested study strategy:
  - Review the glossaries at the ends of the chapters of TLB that were assigned. Make sure you can provide all the definitions off the top of your head.
  - Review all psets and pset answer sheets, making sure you understand how to answer questions of each type.
  - Review all quizzes and make sure you understand what your mistakes were.
  - Read through all the slides that have been posted, and be sure you understand them.
  - Reread all the handouts that I distributed over the course of the semester.
- The exam will include questions on topics such as the following:
  - The difference between deductive and inductive arguments.
  - Putting English arguments in *standard form* (TLB pg. 7).
  - Evaluating arguments in English for deductive validity and soundness.
  - The notions of logical truth, falsity, indeterminacy, and set of sentences for logical consistency, inconsistency, equivalence, inequivalence.
  - Truth-functionality.
  - Simple sentences vs. compound sentences vs. truth-functionally compound sentences.
  - Truth-functional vs. non-truth-functional connectives.
  - Truth-tables for connectives.

- Symbolizing English sentences in SL.
- English compound sentences that can only be translated as atomic sentences of SL.
- Worries about how well the connectives of SL can capture ordinary language.
- The syntax of SL.
- Determining the main connective of a sentence of SL.
- The semantics of SL, what a truth-value assignment is.
- Creating truth-tables for sentences of SL.
- The notions of truth-functional truth, falsity, indeterminacy, equivalence, inequivalence, entailment, validity.
- How to use truth-tables to test sentences or sets of sentences for those properties.
- The notion of a derivation system.
- Scope and scope lines.
- Primary vs. auxiliary assumptions.
- Open vs. closed / discharged assumptions.
- Accessibility.
- The rules of SD.
- Definition of an SD derivation, derivability in SD.
- The notions of validity in SD, equivalence in SD, inequivalence in SD, consistency in SD, inconsistency in SD, theorem in SD.
- How to use derivations in SD to establish derivability, validity, inconsistency, theoremhood, equivalence.
- The relationship between SD and SD+.
- The strategy of mathematical induction. Basis clauses, inductive steps, inductive hypotheses.
- The notion of a sentence expressing a truth-function.
- The notion of truth-functional completeness for sets of connectives.
- Characteristic sentences for rows of truth-tables.
- The algorithm for finding sentences that express certain truth-functions.
- The notions of soundness and completeness for derivation systems.
- Set-theoretic notions and notations: subset / superset, empty set, set membership.
- '$\vdash$' vs. '$\models$'.
- The strategy for proving soundness of SD. Use of mathematical induction and proof by cases for the rules of SD.

- The strategy for proving completeness of SD.
  - The use of consistency / inconsistency in SD, truth-functional consistency / inconsistency.
  - Enumerating sentences of SL.
  - Constructing maximal consistent sets.
  - Establishing properties of maximal consistent sets.
  - Showing that maximal consistent sets are truth-functionally consistent.
- Compactness.
- Singular terms, individual constants, predicates.
- Variables and quantifiers.
- Symbolization keys.
- Universe of discourse.
- The syntax of PL.
- Formulas vs. sentences.
- Atomic formulas of PL, logical operators, main logical operators, scopes of quantifiers.
- Open sentences, free vs. bound variables.
- Definition of a substitution instance and notation for it.
- Quantifier scope ambiguities.
- Translating English sentences into PL.
- '=', functors, and functions. Complex terms. Open vs. closed terms.
- How to translate definite descriptions like 'the dog'.
- Semantics for PL: interpretations (informal, as in ch. 8.1, formal as in 8.7), partial interpretations.
- Notions of quantificational truth, falsity, determinacy, indeterminacy, equivalence, inequivalence, consistency, inconsistency, entailment, validity.
- Truth / falsity on an interpretation.
- Satisfaction of formulas.
- Variable assignments and variants thereof.
- Denotations of terms, extensions.
- Determining truth-values of sentences on formal interpretations.
- The rules of PD, restrictions on $\forall I$, $\exists$E.
- Sub-derivations and instantiating constants.
- The notions of derivability in PD, validity, theorem, equivalence, inconsistency.

– Using derivations to establish those properties.
– The rules of PDE. Instantiating terms.
– Strategy for proving soundness of PD.
– Basic strategy for proving completeness of PD, main steps and notions involved.

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