PHI 432/532: Completeness & Decidability

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Office Hours: T, 2:30-3:45 p.m., W, 1:00 p.m.–2:15 p.m., and by appointment
Course Web Page: http://www.albany.edu/~amu78/432s04.html

Text: Introduction to the Theory of Logic by José L. Zalabardo

I’m most interested in covering the material in chapters 1–5 and 8. The text should serve as a basic reference: we’ll omit some topics and may expand on others. As far as possible, however, I’ll try to make the notation and manner of presentation conform to that of the text. In addition to the text, I’ll distribute notes as appropriate. Additional readings, if any, will be placed on reserve in the library.

Course Work:
Students will be required to complete regular homework assignments—probably about once a week. In addition, there will be a take-home final.

Students are expected to attend class regularly, and complete all the assignments and the final.

Grading:
For students enrolled in 432, the homework assignments will count for two thirds of your grade, and the final for one third.

For students enrolled in 532, the homework assignments will count for 50% of your grade, the final for 30%, and you will be assigned an additional piece of work (to be determined) which will count for 20% of your grade.

Course Content:
Introductory courses in symbolic logic focus on describing formal models of reasoning, and on applying them to the analysis and evaluation of arguments. In this course we are concerned with studying certain (general/mathematical) properties of the formal systems themselves, not in applying them to analyze and evaluate particular arguments. (Our topic is sometimes described as metalogic, or the metatheory of logic.) In particular, we shall concentrate on the system known as classical first-order predicate logic and on formal theories (e.g. of arithmetic) based on it. Two of the more important meta-theoretical results for first-order logic are:

i) that first-order logic is complete (Gödel)
ii) that first-order validity is undecidable (Church)
and for the first-order theory of arithmetic are:

iii) that arithmetical truth is undefinable (Tarski)
iv) that arithmetic is incomplete (Gödel).

We shall prove at least some of these results and discuss all of them. To this end, we shall need to consider various other topics besides, which are of interest in their own right.