PMATH 433/733 – Fall 2022

Model Theory and Set Theory

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This is an introduction to mathematical logic. It is a graduate course but it is open to advanced undergraduates.

A follow-up topics graduate course on model theory and differential-algebraic geometry will be held in Winter 2023.

The course is approximately one-third set theory and two-thirds model theory. The set theory will be naïve and the model theory will be semantic (i.e., no proof theory). There will be a small overlap with PMATH 432/632 (First Order Logic and Computability), but this latter course is neither pre-requisite nor anti-requisite.

Topics in set theory. Well ordered sets and ordinals, axiom of choice and equivalents, cardinals.

Topics in model theory. Semantics of first order logic, the compactness theorem (via ultra-products) and its consequences, quantifier elimination, algebraic examples.

Pre-requisites. (Equivalent of) PMATH 347 and 348, or consent of instructor. Mathematical maturity.

Courseware. No textbook is required, the lectures will be self-contained and will follow Parts 1 and 2 of my notes "Set Theory and Model Theory" (Version 5) which will be available for purchase at the W Store in SCH.

Structure. Lectures will be held MWF at 1:30 in PHYS 150. I will hold office hours on Wednesdays, 3–5. This is an in-person course with no streaming or recorded video of lectures. There will be five or six homework assignments worth a total of 30% and a final exam worth 70%. There will be no midterm exam.