Mathematics 570: MATHEMATICAL LOGIC

Fall 2020

Instructor: Lou van den Dries

MWF, from 12 to 12:50, Psychology Building 23

This course gives an introduction to *First Order Logic* (Predicate Logic). No previous study of logic is assumed. Included in the course are:

- The completeness and compactness theorems for first order logic. The first says that provability from a set of axioms is equivalent to validity in all models of the axioms. The second of these is basic to model theory.
- Elements of model theory: theorem of Skolem-Löwenheim, complete theories, back-and-forth, quantifier elimination, Presburger arithmetic.
- Elements of computability theory and Gödel's incompleteness theorem. The latter says that no system of effectively given axioms that includes some basic arithmetic can be complete. Also a discussion of decidable and undecidable theories with examples.

There will be a midsemester exam, a final exam, and regular homework. The part that will be graded will usually be assigned on Wednesday, and is always due on Monday **at the beginning of class** (except for Labour Day, September 7). These count to your course grade as follows:

HW: 20/100, midterm: 30/100, final: 50/100.

Prerequisites: For undergraduates, Math 414 or consent of the instructor. Some knowledge of (naive) set theory is desirable.

Lecture notes can be downloaded as follows: go to the webpage of the math department, click on "directory", click on "faculty", click on my name (Lou van den Dries, under D), click on "website", and download "Logic Notes". Alternatively, send me an email and I can send you the pdf file of these notes. My grader is (to be announced), who you can contact if there are problems with accessing the course webpage. Our email addresses:

vddries@illinois.edu (to be announced)

Office Hours: Monday and Friday, 9-9.50.

Course webpage: you can access it by going to: learn.illinois.edu
and then it will be listed on the left as: MATH 570 X1 FA20. This will contain all kinds of extra information, such as homework assignments, solutions, and little essays and extra material that are not in the Lecture Notes but that might be instructive to some of you.

Reminders in connection with the pandemic:

- Wait until outgoing students have left the room before entering.
- Wipe your seat and writing surface upon entering the class with wipes provided.
- Use only seats that are marked as usable.
- Fill the seats so as to minimize congestion: start furthest from the door.