

MATH 631: ALGEBRAIC GEOMETRY I (FALL 2026)

COURSE INFORMATION

Lectures: TR 11:30am-1pm in EH 4088

Lecturer: Aaron Pixton

E-mail: pixton@umich.edu

Office Hours: Mon 2:30-3:30pm, Wed 2-3pm, Fri 12-1pm (all in EH 3842), or by appointment

COURSE WEBSITE

The main course website is at <http://websites.umich.edu/~pixton/631/>.

COURSE DESCRIPTION

This course will introduce the basic notions and objects of modern algebraic geometry from a scheme-theoretic perspective. We will be (loosely) following Ravi Vakil's book "Foundations of Algebraic Geometry" (available at <http://math.stanford.edu/~vakil/216blog/index.html>). We will cover most of Chapters 2-13 this term.

PREREQUISITES

The most essential things to know for this class are basic ring/module theory (prime ideals, localization, tensor product of algebras) and some topology (open covers, bases, manifolds, etc). It will also be helpful to have some familiarity with basic category theory (see Chapter 1 of Vakil's book).

PROBLEM SETS

There will be weekly problem sets, usually posted on the course website on Thursday afternoons (beginning Sep 3). They will **not** count towards your grade in the course but you are still expected to think about them to follow along with the course material! Even though the problem sets will not count towards your grade, I am still happy to take a look at any solutions that you want to ask me about and I encourage you to write down and e-mail me anything (at pixton@umich.edu) that you aren't completely sure about. (I am also happy to talk about the problem sets in office hours.)

You are highly encouraged to discuss the problems with your classmates - this is one of the best ways of learning things! On the other hand, I recommend against asking an LLM (large language model, e.g. ChatGPT) for problem set solutions. Although I think current LLMs can be okay at providing hints (if carefully prompted) or at answering standard questions about algebraic geometry, they are not a replacement for thinking about problems yourself or discussing them with other students or in office hours.

(If you are interested, I have written some thoughts about how I currently use LLMs in math here: http://websites.umich.edu/~pixton/llms_in_math_2026.pdf.)

GRADES

There will be a single 40-minute in-class exam on **Thursday, November 19**, with no proofs (due to time constraints). The goal of the exam is to test basic fluency with the language and concepts of scheme theory. Graduate students who do fine on the exam will automatically get an A in the class. All other students (including all undergraduates) will have to schedule a 30-minute oral exam with me (in addition to the in-class exam) sometime after Thanksgiving break. In general you shouldn't worry about your grade in the course if you are keeping up with the material and feel like you have a decent understanding of most of it. If you have any concerns about your potential grade and want me to explain my process more, come talk to me!

OFFICE HOURS

My current weekly office hours are Mon 2:30-3:30pm, Wed 2-3pm, Fri 12-1pm (all in my office, EH 3842). You are also always welcome to contact me to schedule an alternative meeting time.