MATH 632: ALGEBRAIC GEOMETRY II (WINTER 2026)

Course Information

Lectures: TR 11:30am-1pm in EH 3866
Lecturer: Aaron Pixton
E-mail: pixton@umich.edu
Office Hours (first week only): F 2pm-3pm (in my office, EH 3842), or by appointment

Course Website

The main course website is at http://websites.umich.edu/~pixton/632/.

Course Description

This is a continuation of Math 631. Topics covered will include quasicoherent sheaves, line bundles, sheaf cohomology, algebraic curves, differentials, and the Riemann-Roch theorem. For most of the term we will be (loosely) following Ravi Vakil's notes "Foundations of Algebraic Geometry" (available at http://math.stanford.edu/~vakil/216blog/index.html), beginning with Chapter 6 and then proceeding from Chapter 14.

Prerequisites

I will assume general familiarity with Chapters 1-5 and 7-13 of "Foundations of Algebraic Geometry".

Problem Sets

There will be weekly problem sets, usually posted on the course website on Thursday afternoons (beginning Jan 15). 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.

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 consulting an LLM (large language model, e.g. ChatGPT). This is despite the fact that current LLMs perform relatively well on these problem sets (and are the reason why the problem sets will not count towards your grade). Some of the issues with using current LLMs to learn math:

- At best, consulting an LLM is similar to looking for an explanation or proof of something in a different textbook or via Google searches or by coming to office hours - it isn't going to replace trying to figure things out yourself.
- But also LLMs still make many more errors than other sources, and these errors can be tricky to notice.

- LLMs perform even worse when asked questions like "Explain why [false statement] is true." (they will confidently prove the false statement) or "When is [statement] true?" (they will confidently give an incorrect criterion) than when asked standard problem set questions. Unfortunately such questions are more common than the problem set type when you are learning something and don't know what is true!

I give more detailed thoughts on using LLMs in math here: `http://websites.umich.edu/~pixton/llms_in_math.pdf`.

Grades

There will be a single in-class exam on **Thursday, Mar 26**, mainly consisting of true/false questions and sheaf cohomology computations (no proofs). In addition, near the end of term you will be asked to read and learn more about some additional topic of your choice in algebraic geometry and then do an informal oral presentation/exam on that topic in my office. Some suggested topics and more information about this are available here: `http://websites.umich.edu/~pixton/632/project.pdf`.

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 office hours for the first week of classes are Fri 2-3pm (in my office, EH 3842). I will post a survey on Canvas asking about good times for office hours and then update the course website with more permanent office hours starting on the second week of classes. You are also always welcome to contact me to schedule an alternative meeting time.