SEMINAR IN NUMBER THEORY: SYLLABUS
MIT 18.784, SPRING 2026

TR 2:30pm – 4:00pm **Room 2-151**

Instructor
Robin Zhang (robinz@mit.edu)
Office Hours: Wednesdays 3:00pm–4:00pm, Room 2-238.

Writing, Rhetoric, and Professional Communication (WRAP) lecturer
Emily Robinson (erobin73@mit.edu)

Course Website: https://math.mit.edu/∼robinz/teaching/useminar_s26.html
Course Slack: https://mit-18-784-2026sp.slack.com/

1. Course Description

Welcome to the Seminar in Number Theory course! This semester, we will explore Diophantine approximation – an area of mathematics that studies how numbers move. The subject lies at the intersection of dynamical systems and number theory, involving a breadth of mathematical disciplines including:

- Algebraic geometry
- Algebraic number theory
- Analytic number theory
- Complex analysis
- p-adic analysis
- Real analysis
- Dynamical systems
- Game theory

In a seminar, mathematicians help each other learn a body of material. The main objectives of this undergraduate seminar are for you to:

(1) help each other learn various topics in Diophantine approximation, and
(2) help each other improve skills related to presenting, discussing, writing, and reading mathematics research.

You will give short presentations on specific topics in Diophantine approximation, give constructive feedback on other students' presentations, and prepare a short paper on a topic in Diophantine approximation.

This course is a Communication Intensive in Mathematics (CI-M) for undergraduates at MIT. Periodically during the semester, the WRAP lecturer will lead communications workshops on effective mathematical presentation, reading research papers, writing research papers, and peer review.

2. Prerequisites

Students taking the course are required to already have fulfilled one of the two following bullet points:

- Algebra 1 (18.701); or
- Modern Algebra (18.703) and Linear Algebra (18.06 or 18.700).

Students who have learned similar material elsewhere may contact the instructor for prior permission to take the course. Additional mathematical background, such as Complex analysis (18.04 or 18.112) Real analysis (18.100), elementary number theory (18.781), or Galois theory (18.702), will be helpful but not required.

Any questions about course registration and waitlists can be directed towards Charlotte Rubel (crubel@mit.edu).

3. Course Outline

3.1. **Grading Policy.** Your final grade will be according to the following:

Component	**Description**	**Weight**
Presentations	Two paired + two solo talks	50%
Paired presentations	Introductory topics	20%
Solo presentations	Specialized topics	30%
Final paper	Research/expository paper (8–12 pages)	35%
Topic proposal	Proposed topics & references (1–3 pages)	5%
First draft	Full draft	5%
Second draft	Full draft incorporating instructor feedback	5%
Final draft	Final draft incorporating peer review	20%
Peer critique	Written constructive feedback	15%
Presentation feedback	Daily feedback forms	10%
Second draft feedback	Written peer reviews ($\geq$ 2 pages each)	5%

- There will be **no extra credit**.
- Late submissions will be penalized by 25% per 24 hours.
- Class absences will also negatively affect the final grade.
- The grades will not be curved. Your fellow students getting a better grade cannot lower your grade.
- The cutoffs for A, B, C, and D grades will be 90%, 80%, 70%, and 60%, respectively.

3.2. **Presentations.** You will present to your classmates multiple times during the course of the semester. The final breakdown will depend on the course enrollment, but the expected presentations for each student are:

- A 3-minute presentation on a favorite definition/example/theorem, to help your classmates get to know you.
- Two 25-minute (20-minute talk + 5-minute Q&A) paired presentations on an introductory topic in Diophantine approximation.
- A 25-minute (20-minute talk + 5-minute Q&A) solo presentation on a topic in Diophantine approximation.
- A 35-minute (30-minute talk + 5-minute Q&A) solo presentation on the topic of your paper in Diophantine approximation.

The presentations (excluding the 3-minute presentation) will be graded on:

- mathematical correctness (e.g. consistent notation, mathematical motivation, rigor);
- clarity (e.g. appropriate level of detail, examples, pacing, handwriting, board use); and
- audience engagement (e.g. facing the audience, enthusiasm).

Presentation dates and rubrics will be provided on the course website.

There will be no late or make-up presentations. Missing a presentation due to medical emergencies or other urgent matters must be referred through Student Support Services (S3).

3.3. **Final paper.** You will write a paper on a topic in Diophantine approximation. The paper does not need to contain original results, but the writing must be your own and all sources must be properly cited (ask if you have questions). The paper must be written in the style of a research or expository journal article and must be 8 to 12 pages long in LaTeX with the *amsart* class on default settings (10-point font, standard margins, standard spacing).

The paper will be completed in stages:

- Topic proposal
- First draft for instructor feedback
- Second draft for peer feedback
- Final draft of the paper

The paper will be graded based on:

- mathematical correctness (e.g. synthesis of sources, rigor);
- exposition (e.g. cohesion, concisiveness, motivation, appropriate citations, examples); and
- writing process (e.g. successful revisions, incorporation of feedback).

Due dates and rubrics will be provided on the course website.

3.4. **Peer critique.** During the semester, you will written feedback on presentations within 24 hours and written feedback ($\geq$ 2 pages) on second drafts of two peer papers.

The presentation feedback will be submitted via a feedback form that opens at the beginning of each class and is due at 2:30pm of the following day.

You will also provide written feedback for the second drafts of two other students' papers. After carefully reading the drafts, you will prepare a list of suggestions typed in LaTeX of at least 2 full pages in length.

3.5. **Attendance.** In-person attendance of the course is mandatory; unexcused absences will negatively affect your final grade. Excused excuses must be referred through Student Support Services (S3) and then emailed to me as early as possible.

3.6. **Collaborative work and academic integrity.** Collaboration in this course is encouraged; please feel free to use the course Slack channel: http://mit-18-784-2026sp.slack.com/. You may brainstorm ideas and discuss preparation for the talks and paper with other students. You may also ask other students for help with LaTeX formatting, commands, templates, etc. However, all drafts of the paper must be written by yourself.

Large language models (LLMs) and other artificial intelligence (AI) tools may *only* be used to help generate ideas during the topic proposal phase or to find LaTeX commands – but be warned that even the best AI tools will hallucinate references and have a very poor grasp of research mathematics.

The Institute's Communication Requirement was created (in part) in response to alumni reporting that writing and speaking skills were essential for their professional success. Since this is a college writing and communication course designed to improve core rhetorical skills, the unauthorized use of text generated by LLMs and AI tools is prohibited in this course. Any such use by a student will be treated analogously to plagiarism.

MIT's policies on academic integrity, explained at https://integrity.mit.edu/, will be enforced. Consequences may include **automatic failure in the course and formal filings with the MIT Committee on Discipline (COD)**.

4. Resources

4.1. **Communication resources.** In addition to the assistance you will receive from your peers and me, help with presenting and writing is available from the WRAP lecturer.

General help with writing and presenting (not specific to mathematics) is available from MIT's Writing Center: https://cmsw.mit.edu/writing-and-communication-center.

4.2. **Student Support Services (S3).** Personal and medical issues can make it hard to focus on academics. If you find that something is getting in the way of your ability to attend class, complete work, or take an exam, you should contact a dean in Student Support Services (S3). The deans will provide you with support and help you work with us to determine next steps. We ask that you go to S3 so we know you have had a chance to talk through your situation with someone and to connect with any resources you might need. You can reach out to a dean you have worked with in the past, join their virtual help queue (https://sicp-s3.mit.edu/queue), or e-mail s3- support@mit.edu.

4.3. **Disability and Access Services (DAS).** MIT is committed to the principle of equal access and we want all of our students to feel welcome here. Students who need disability accommodations are encouraged to speak with Kathleen Monagle, Associate Dean, prior to or early in the semester so that accommodation requests can be evaluated and addressed in a timely fashion. Even if you are not planning to use accommodations, it is recommended that you meet with DAS staff to familiarize yourself with the services and resources of the office. You may also consult with Disability and Access Services in 5-104 or at 617-253-1674. If you have already

been approved for accommodations, please contact me early in the semester so that we can work together to get your accommodation logistics in place.