# Math 290: Mathematical Writing Seminar
# Spring 2026


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| **Instructor:** | Ethan Gwaltney | **Time:** | MWF 3-3:50pm |
| **Email:** | gwaltney@rice.edu | **Office Hours:** | W 4-5, R 1:30-2:30, F 3:30-4:30 |
| **Office:** | HBH 322 | **Websites:** | Canvas, Gradescope |
| **Location:** | HBH B21 | | |


What does it mean to prove something? A criminal lawyer might claim to have 'proven' her case if the jury is convinced 'beyond a reasonable doubt.' A physicist might claim to have 'proven' her theory if all available evidence supports her theory, and there's lots of evidence already. On the other hand, a mathematician means something different if she claims to have 'proven' a theorem.

Written mathematical proof is the central medium by which mathematical progress is made, and writing proofs is a key skill if you wish to study advanced topics in math. In this course, we'll practice proof-writing and communicating our proofs as we explore foundational mathematical concepts, including sets, relations, functions, and more.[1]

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[1] This syllabus is subject to change. Significant changes will be announced on Canvas.

## Course Description

*Co/Prerequisites*

You should be taking this course concurrently with your first proof-based course in the Math Department, e.g., MATH 354, MATH 220, MATH 302, etc. There are no prerequisite courses.

*Course Materials*

- **Textbook 1:** *Reading, Writing, and Proving*, by Daepp and Gorkin. An e-book version is available via Fondren. I will also post pdfs of assigned readings and exercises.
- **Textbook 2:** *How to Solve It*, by Pólya. An e-book version is available via Fondren. I will also post pdfs of assigned readings and exercises.
- All assignments and important announcements will be posted on *Canvas*.
- *Piazza* is a tool on Canvas for asking/answering questions and working collaboratively.
- *Gradescope* is a grading platform where you will upload your written homework and receive detailed feedback. You can also find Gradescope on Canvas.

*Key Learning Goals*

The main topics of this course are: Logic, Sets, Relations, and Functions. Subtopics include:

| | |
|---|---|
| **L-1** quantifiers ('for all' and 'there exists') | **R-1** properties of relations |
| **L-2** implication ('if then' statements) | **R-2** equivalence relations |
| **L-3** logical equivalence | **F-1** properties of functions |
| **S-1** set notation | **F-2** functions on sets |
| **S-2** set operations | **F-3** mathematical induction |

An unusual property of this course is that the (sub)topics we'll study are principally means to our ultimate learning goals:

- To read math proofs for comprehension, as demonstrated by critiquing or correcting
- To write math proofs that are valid, precise, and concise
- To explain math proofs conversationally, balancing precision and approachability

*Lesson Schedule*

| | Learning Objectives: | Text: | Day: |
|---|---|---|---|
| **L-1**: | **Quantifiers.** Distinguish between 'for all' and 'there exists' statements and combinations of the same. Negate statements of first-order logic. Demonstrate vacuously true statements. | | 1-2 |
| **L-2**: | **Implication.** Write the contrapositive and converse of a statement logically and in plain English. Write the truth table for an 'if-then' statement. | | 2-3 |
| **L-3**: | **Logical equivalence.** Demonstrate the equivalence of a conditional statement and its contrapositive. Write a proof by contradiction. | | 3-4 |
| **S-1**: | **Set notation.** Transition between different notations for specifying a set. Identify whether an object/set is an element/subset of a given set or not. Recognize when a given set is actually empty. | | 4-5 |
| **S-2**: | **Set operations.** Explain what it means for an object to be an element of an arbitrary union/intersection. For a given collection of sets, simplify the complement, union, intersection, and combinations of the same. | | 5-6 |
| **R-1**: | **Properties of relations.** Give examples of relations that are/are not reflexive, symmetric, or transitive. Identify a partition of a set. | | 6-7 |
| **R-2**: | **Equivalence relations.** Prove that a relation is/is not an equivalence relation. Give examples of equivalence relations. | | 7-8 |
| **F-1**: | **Properties of functions.** Define an injective, surjective, or bijective function. Explain the difference between equality of numbers and equality of functions. Determine if composition of functions preserves injectivity, surjectivity, etc. | | 8-10 |
| **F-2**: | **Functions on sets.** Define the image of a set under a function. Determine the relationship between a union or intersection and the image of the same under a given function. Same for pre-images. | | 10-12 |
| **F-3**: | **Mathematical induction.** Write a proof that uses traditional/strong mathematical induction. Identify when induction is/is not helpful. | | 12-14 |

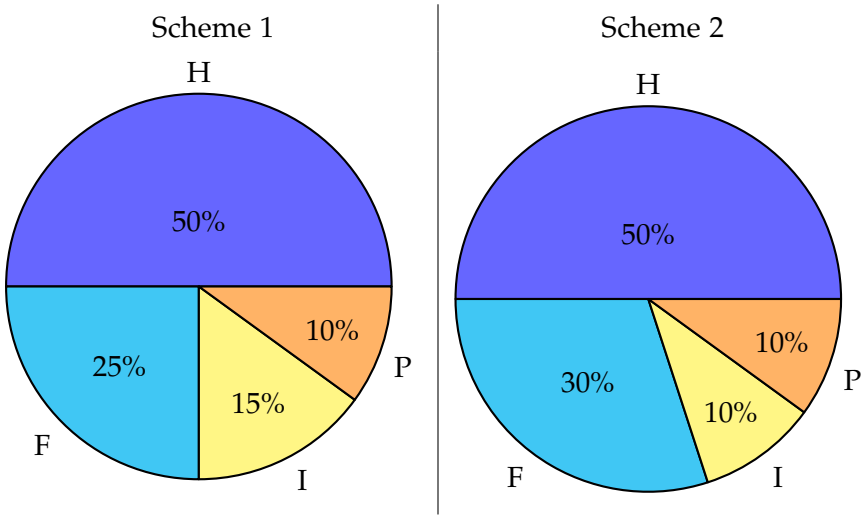
## Course Structure

*Grading Policy*

We will assess progress using the following tools:

1. **Homework (H):** Handwritten HW will receive detailed feedback and will generally be due to Gradescope on Fridays at 11:59pm. Each homework problem will be scored from 0 to 5. 0 means no serious effort was made; 1-3 means the problem is incomplete, and you are invited to resubmit that problem; 4 means you've received full marks (100%), and 5 means you've produced something exceptional. Resubmissions of problems scored 1-3 must be made no later than 4 days after you receive feedback on your most recent submission. You may resubmit a problem twice; no problem will exceed 3 total submissions.
2. **Final exam (F):** The course will conclude with a take-home written final exam.
3. **Interviews (I):** We will conduct three short one-on-one interviews, in which I will prompt you to prove at the board one fact you've been asked to prove before (e.g., in class or on homework) and one fact you may or may not have seen before (but that uses objects familiar from class).
4. **Participation (P):** The remainder of your grade is earned by participating in various humanizing activities. See below for details.

Your grade will reflect your performance in the course using whichever of the following two grading schemes results in a *higher* grade for you.




A letter grade will be assigned to percentages via the following brackets.

| F | D- | D | D+ | C- | C |
|---|---|---|---|---|---|
| $[0, 60)$ | $[60, 63.\bar{3})$ | $[63.\bar{3}, 66.\bar{6})$ | $[66.\bar{6}, 70)$ | $[70, 73.\bar{3})$ | $[73.\bar{3}, 76.\bar{6})$ |
| C+ | B- | B | B+ | A- | A |
| $[76.\bar{6}, 80)$ | $[80, 83.\bar{3})$ | $[83.\bar{3}, 86.\bar{6})$ | $[86.\bar{6}, 90)$ | $[90, 93.\bar{3})$ | $[93.\bar{3}, 100]$ |

I reserve the right to award A+ for exceptional engagement and performance. I reserve the right to adjust the grade cutoffs at the end of the semester. Any change I make will only make it *easier* to obtain a certain letter grade.

*Rice Honor Code*

You have pledged to uphold the Rice Honor Code. Follow the below instructions on collaboration to abide by the Rice Honor Code in this course.

- For homework, you should not receive any AI or internet assistance. Additionally, your **first** submission should be attempted independently. In particular, until the initial deadline for an assignment has passed, no Piazza posts posing/answering substantive math questions from that assignment are permitted. Your second (and third, if necessary) submissions may be attempted with collaborators from our class, and your submission should list any collaborators.
- For quizzes and exams, no external resources are permitted. Your work must be solely your own.

*Participation*

Your participation grade will be calculated via **participation points** (PP). Each PP is worth 0.5% of your grade (up to a maximum of 10%). Thus, you need to earn 20 PP to earn full marks in participation. There are several ways to participate in this course in and outside of lessons, including:

- Completing the first day survey and other course surveys
- Attending office hours (2 PP per attendance)
- Asking/answering a substantive math question on Piazza (a good place to practice LaTeX!)

I will make clear when an activity is eligible to earn participation points and update your progress periodically on Canvas. Everyone should be able to earn the full participation grade. I reserve the right to grant extra participation credit to students who exceed 20 PP for the semester.

## Policies

*Hospitality in the classroom*

My ideal for the classroom is one in which every student is excited about the course and feels welcome. We might think of me as a host—I "set the tone" and "decide the meal," and, if I'm a good host, I make you feel welcome. This vision motivates several of the design elements for the course, including my endorsement of the Departmental Statement of Conduct below, which imposes responsibilities on students as well as instructors. If you have comments, concerns, suggestions, etc., please email me directly. If anonymity is required, use this Google form instead.

**Statement of Conduct:** The Department of Mathematics supports an inclusive learning environment where diversity and individual differences are understood, respected, and recognized as a source of strength. Racism, discrimination, harassment, and bullying will not be tolerated. All students and faculty are expected to treat each other with courtesy and respect, and to adhere to the Mathematics department standards of collegiality, respect, and sensitivity as well as the Rice Student Code of Conduct. If you think you have experienced or witnessed unprofessional or antagonistic behavior, then the matter should be brought to the attention of the instructor and/or department chair. The Ombudsperson is also available as an intermediate, informal option, and contacting them will not necessarily trigger a formal inquiry.

*Attendance Policy*

Attendance at our MW lessons is required in the sense that quizzes that affect your grade will sometimes be given in class. You are responsible for all the material and announcements covered in class, *including any class you miss*. This does not mean contacting me if you miss class; consult a friend from class instead. No Zoom offering is available, nor will I post notes.

*Late/Missed Assignment Policy*

**Homework:** There is a 48-hour grace period for submitting handwritten homework to Gradescope after the posted deadline. There is no penalty for using this grace period, and you do not need to notify me of its use. **No** late homework will be accepted after this 48-hour late deadline, and no (further) resubmissions will be permitted. Exceptions are possible; see the note below.

**Note:** If you are having consistent problems keeping to the schedule, or if you find yourself struggling with unexpected personal events, I encourage you to reach out and email me (gwaltney@rice.edu) as soon as possible. Depending on the situation, I may grant flexibility on a case-by-case basis.

*Regrading Policy*

Occasionally, graders (including me!) may make a mistake. You should inspect your returned assignments carefully, and, if you find an error, you should submit a Regrade Request via Gradescope within one week after the assignment has been returned. Please be sure to double check that a perceived error is a true error *before* submitting your request.

*Contact / Email policy*

If you have a course-related question, you are strongly encouraged to post in the course Piazza before emailing me (unless, of course, the question pertains an assignment problem that has not yet been due). Others might be able to answer your question, and others might find the answer to your question helpful as well. When you do email me, I will do my best to respond to your email in a timely manner (by the end of the next business day).

## Resources

*Office Hours*

Office hours are dedicated times for you to ask me any and all questions that you have (about course content, mathematics, careers, life at Rice, or life in general). Coming to office hours is a great way to earn (**double**) participation points! Note you are welcome to schedule an appointment if the posted hours don't fit your schedule, or if you'd like to have a private conversation– just email me or talk to me after class to schedule.

*Services for Students with Disabilities*

The Americans with Disabilities Act requires that all qualified persons should have equal opportunity and access to education regardless of the presence of any disabling conditions. Any student with a documented disability who needs academic accommodations should 1) visit the Disabilities Resource Center (DRC) to make sure that the required documentation is on file and 2) speak to the instructor as soon as possible. The DRC is located in Allen Center 111, and can also be reached at adarice@rice.edu.

*Mental Health Resources*

**Your wellbeing and mental health is important.** The Wellbeing and Counseling Center provides cost-free mental health services to help you manage personal challenges that threaten your personal or academic well-being. The Center is located in the Gibbs Wellness Center and can be reached at 713-348-3311 (available 24/7).

*Further Resources*

- The Access and Opportunity portal website has financial support for:
  - academic, social, and professional opportunities
  - participation in Residential College or university life
  - **emergency funds** for students in crisis (e.g. impending eviction or emergency surgery)
- Rice University supports your college experience by providing a variety of resources:
  - Other access and opportunity resources at Rice.
  - A list of campus resources from the Office of Student Success Initiatives.

*Title IX*

At Rice University, unlawful discrimination in any form, including sexual misconduct, is prohibited under Rice Policy on Harassment and Sexual Harassment (Policy 830) and the Student Code of Conduct. Please be aware that all employees of Rice University are "mandatory reporters," which means that if you tell me about a situation involving sexual harassment, sexual assault, dating violence, domestic violence, or stalking, I must share that information with the Title IX Coordinator. Nevertheless, you will control how your case will be handled, including whether or not you wish to pursue a formal complaint.

To report sexual harassment, please contact the Title IX Coordinator at titleix@rice.edu. To explore supportive measures and other resources that are available to you, please visit the Office if Interpersonal Misconduct Prevention and Support at safe.rice.edu.