

TRANSITION TO ADVANCED MATHEMATICS

SYLLABUS

Fall 2022

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Math 215

§A. What is this class?

Welcome to **Transition to Advanced Mathematics**! This course is designed to bridge the gap between introductory Math courses, such as Calculus, and more abstract mathematics courses that rely heavily on proofs. We will explore several different mathematical topics, such as symbolic logic, set theory, number theory, relations, and functions. While **the primary focus of the course is on developing skills that will enable you to effectively communicate clear and correct mathematical arguments**, we will also cover expository writing and problem-solving strategies.

Please make use of my office hours and plan to work hard. My classes have a high workload (as all math classes usually do!), so make sure that you stay on top of your assignments and get help early. Remember that part of doing real math is productive failure: you'll try things that don't work; learn something from that failure; and try something new that works a bit better. And... after a while, you will figure it out, and come out with a much stronger understanding of the structure of mathematics.

Additional details on some parts of the syllabus are available on Moodle.

§B. Key Information

Course Info

- **Class Meetings:** MWF 10:00 AM - 10:50 AM (EST), Taylor 209

How to contact me

- **Email:** showdhury@wooster.edu
- **Phone:** 330-263-2473
- **Office:** Taylor 307

Office Hours

See Moodle for Up-to-date hours. You can also stop by any time my door is open, or email me to set up an individual meeting.

Required Study Materials

- **Textbook:** There is no official textbook. We will use an inquiry-based learning (IBL) approach to complete the "Lecture Notes" workbook available on Moodle.
- **Technology:** A large portion of this class will require you to type your assignments using \LaTeX . So a laptop or PC capable of online browsing is required.

Class announcements

- **Available on:** <https://moodle-2223.wooster.edu/>
Check Moodle and your Wooster email at least once before and after each class.

Additional college policies are listed in a separate document called Academic Policies, Procedures & Support Services.

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§C. Prerequisites

Students must have completed Math 115 (or AP/ equivalent credit) with a C- or better. If you have any questions about whether this is the right class for you, speak with me immediately.

§D. Learning Objectives & Goals

Upon successful completion of the course, you will be able to:

- Express in writing, knowledge of the terminology, concepts, basic properties and methodology of symbolic logic, set theory, relations and functions, mathematical induction, cardinality, and number systems.

- Formulate and correctly phrase mathematical statements, both verbally and in writing.
- Identify and critique the structure and logic of written proofs.
- Write a readable and mathematically rigorous proof.

Throughout this course, we will improve our mathematical reasoning and writing skills, justifying all of our work with the appropriate theorems and conveying all solutions clearly through writing. **This course fulfills the “W” requirement toward graduation at The College of Wooster.**

§E. Components of the Course

This is not a lecture-oriented class or one in which mimicking prefabricated examples will lead you to success. You will be expected to work actively to construct your own understanding of the topics at hand with the readily available help of me and your classmates. Many of the concepts you learn and problems you work on will be new to you and ask you to stretch your thinking. You will experience frustration and failure before you experience understanding. This is part of the normal learning process. **If you are doing things well, you should be confused at different points in the semester. The material is too rich for a human being to completely understand it immediately.** Your viability as a professional in the modern workforce depends on your ability to embrace this learning process and make it work for you.

E.1. Weekly Exercises

The exercise problems available at the end of the lecture note are designed for you to practice applying the concepts that we have learned in class and to help you develop the ability to read and write clear mathematical proofs. A certain number of these problems will be assigned at the beginning of the week (usually over the previous weekend), and students are expected to complete (or try their best to complete) them by the end of the week (or the due date). All assignments should be *carefully, clearly, and cleanly* written. Among other things, this means your work should include *proper grammar, punctuation, and spelling*. You should write a draft of a given solution before you write down the final argument, so do yourself a favor and get in the habit of differentiating your scratch work from your submitted assignment.

- Homework will usually be due at 5pm on the due date and should be uploaded to Moodle.
- In general, late homework will not be accepted without prior permission. *If you anticipate being late, let me know early, not on the deadline, and I will try to accommodate you.*
- **Working together on homework is encouraged!** However, you must still complete and turn in an assignment representing your own work.
- If you do work together in a group on a weekly exercise, please write down the names of other students in your group at the top of your submission.
- You are encouraged to check in with me or the TA regarding the accuracy of your homework **before** you submit them.

E.2. Practically Perfect Proofs

Over the course of the semester, each student will receive about twelve problems whose solutions involve crafting coherent, convincing, and mathematically correct arguments, also known as *proofs*. These

problems are more difficult than regular homework exercises and always require careful thought, lots of attention, and lots of time to think and make mistakes.

You will need to **independently** submit a formal, correct, professionally-typeset solution (a P³ or Practically Perfect Proof) for these, and each will go through a revision process. The first time you submit your P³, you will receive a provisional grade and feedback on your work and may choose to resubmit the assignment. An honest attempt at each P³ assignment must be submitted on the initial due date in order to be eligible for revision. All P³ assignments must be typeset in L^AT_EX, which will provide you several opportunities to learn this skill.

Note: Senior majors in the MCS department must write their IS thesis using L^AT_EX. See the next section for info about L^AT_EX and guidance on typesetting your solutions.

Find the pdf file titled **Practically Perfect Proofs** in Moodle for further rules and explanations.

E.3. L^AT_EX

L^AT_EX (pronounced “lay-tek”) is a free typesetting system for preparing technical documents and is widely used in mathematics. You will learn the basics of L^AT_EX in this course and use it to typeset your P³ assignments and your final expository paper. During weekly homeworks, you will be given instructions on how to typeset your work in L^AT_EX. **No previous knowledge of L^AT_EX is assumed.**

I highly recommend using the cloud-based TeX editor Overleaf (<https://www.overleaf.com>) if you are new to L^AT_EX. They have a comprehensive tutorial/help page: <https://www.overleaf.com/learn>.

However, you can also install a local installation of L^AT_EX on your personal computer (e.g., TeXShop for Mac: <http://pages.uoregon.edu/koch/texshop/> or MiKTeX for Windows: <https://miktex.org>).



Warning: Please note that I am **not** the right person to ask if you have *technical* issues with your local installation. If you need help with a particular technical issue, you can always try an internet search that is verbatim your issue. It is very likely that someone else in the world has had the same issue before, so the solution may be out there!

E.4. Module Quizzes

There will be three quizzes during the semester. The quizzes will be designed to check your understanding of fundamental concepts and principles; you will be expected to apply the material learned to solve a wide variety of new and potentially unfamiliar problems and proofs.

See the ‘Lecture Note’ for a tentative schedule. I will post more details about the format of each quiz as the date approaches.

E.5. Expository Paper

You will be writing and presenting an expository mathematical paper - a presentation of a mathematical topic, complete with an annotated bibliography. Find the pdf file titled **Expository Paper Guidelines** in Moodle for further details. Although topic selection will begin after fall break, I am providing you with the document ahead of time so that you can do a little research before deciding on a project.

E.6. Participation Credits

The best way to maximize your experience in this course is to fully engage with the material and your classmates. Your active participation not only helps you, but it also creates a better learning environment for everyone in the course. This semester, there will be many different ways for you to demonstrate your engagement and professionalism remotely and in-person. For example,

- Completing the guided lecture notes and assignments on time.
- Completing the occasional checkpoint quizzes posted on Moodle on time,
- Asking relevant questions in class, office hours, or through email.
- Volunteering to present solutions in class.
- Giving constructive feedback to your classmates.
- Completing (to a satisfactory level decided by me) the reflection tasks.

Note: If I decide that not enough good faith effort was given to complete a reflection task, I may mark it as incomplete, and ask you to resubmit it.

§F. How Semester Grade is Determined

Your grade for the semester is not based on percentages because a lot of items in the course don't carry point values. Also, different types of assignment assesses different skills - and they cannot be compared numerically. So instead, your grade will be based on the quantity and quality of evidence you can provide of across-the-board mastery of Math 215.

F.1. Determine your base grade

To determine your course **base grade** (the letter A/B/C/D/F without plus/minus modifications), use the following table. To earn a grade, you must complete **all** the requirements in the column for that grade; your base grade is the **highest grade level for which all the requirements have been met or exceeded.**

Category	A	B	C	D
Weekly Homework	80%	70%	60%	50%
Module Quizzes	70%	60%	50%	40%
Reflection Tasks (3)	3	3	2	1
Participation and Engagement	Frequent	Regular	Occasional	Minimal
Practically Perfect Proofs (13)	6E, 6M	4E, 6M	2E, 6M	6M
Expository Paper				
Summary and Discussion	Required	Required	Required	
Outline and Annotated Bibliography	Required	Required		
Full First Draft	Required	Required		
Presentation (14)	11	8	5	
Peer Review	2 peers	1 peer	1 peer	
Final Submission (56)	50	44	38	32

Note: Again, all of the requirements in a grade column must be met or exceeded in order to earn that grade. Otherwise your grade is the highest grade for which all the requirements are met or are exceeded. For example, if you only earn 60% in weekly homeworks during the semester, you are not eligible for a grade of B or A in the course, regardless of your other performances. A grade of F is given if not all the requirements for a D are met.

F.2. Determining plus/minus modifiers

'Plus' or 'Minus' letter grades will be assigned based on the proximity to the nearest full letter grade and will be according to the instructor's discretion. Note that you can only get the following letter grades: A, A-, B+, B, B-, C+, C, C-, D, or F.

§G. How different types of assignments are scored

The weekly homework and module quizzes will be scored numerically for accuracy. The participation credits (reflection tasks, class engagement etc.) will be given for completion. See the pdf files on **Practically Perfect Proofs** and on **Expository Paper** for their grading scheme.

§H. Policies

H.I. Attendance and Absence

Attendance is crucial to success in this class. Your best chance to discuss new material, ask questions, and avoid confusion is during class. So, don't miss class! You are responsible for all material and

announcements from class, even in case of absence. Much of this information will be available on MOODLE. Please check in with me and with your classmates when you are back.

That said, life happens. We get the flu (or COVID!). Relatives need your help. When this happens, do what you need to do. I trust that you are an adult and will make the best choices that you can. I appreciate it if you can notify me in advance of an absence, if possible.

If you think you will miss more than one class in a row, you should contact me beforehand to let me know, and meet me afterward to discuss how you can catch up and move forward in the course. If you miss four or more classes, I will send out an academic alert. If you miss more than two weeks of classes, you should contact Dean Jen Bowen and/or Amber Larson, Director of the Academic Resource Center. They can help you consider options for completing or dropping the course.

H.2. Early and Late Work

You can arrange to take a quiz up to two days early if you have a conflicting extracurricular college event on that day, and you got permission from the Dean's office or your coach. *In such cases, you must give me a heads-up at least a week in advance.* Contact me directly regarding other cases.

If you have significant extenuating circumstances that would cause you to miss an assignment deadline, meet with me to discuss arrangements.

Note: The Academic Resource Center, which is in APEX (Gault library) offers a variety of academic support services such as time management and class preparation, ELL peer tutoring, coordinating accommodations for students with diagnosed disabilities, etc. Please see the Academic Policies, Procedures & Support Services document for further details or go to the ARC website.

H.3. Special Accommodations

The Academic Resource Center, which is in APEX (Gault library) offers a variety of academic support services such as time management and class preparation, ELL peer tutoring, coordinating accommodations for students with diagnosed disabilities, etc. Please see the **Academic Policies, Procedures & Support Services** document for further details or go to the ARC website.

H.4. Email Responses

I do my best to reply to emails promptly and helpfully. However, I receive a lot of email. To help both you and me, here are some specific expectations about emails:

- If you email me between 8:00 am and 6:00 pm on a weekday, I'll reply to you on the same day.
- If you email me in the evening or overnight (after 6:00 pm), I will reply to you the next weekday.
- If your email asks a question that is answered in the Syllabus or on Moodle (such as in an announcement or an assignment sheet), I may reply by directing you to read the appropriate document.

See MOODLE for further instructions and examples of good professional emails.

§I. How to get help?

I.1. My Office Hours

Please come see me during my office hours if you have questions or just want to discuss something from class. These will be most effective if you have spent some time formulating your questions beforehand - often you will answer your own questions during that process! You can also contact me via Email or MS Teams with your questions. See the email response section above for my 'business hours'!

I.2. Teaching Assistant Office Hours

Luke Wilson (class of '24) is your TA for this course. Luke will not be present during classes but will hold weekly office hours outside the classroom. You can ask him for help with Edfinity homework and for going over past checkpoint quizzes.

See Moodle for office hour times and further instructions.

§J. Academic Integrity and Collaboration

The goals of academic integrity are (i) to give credit where credit is due, and (ii) to create a record that enables other learners and scholars to trace the development of ideas. A good rule of thumb is: always cite your sources, resources, or people that you received assistance from, with as much specificity as possible. Please ask me if you have any questions about balancing academic integrity and assignments.

The College's understanding and expectations regarding issues of academic honesty are fully articulated in the Code of Academic Integrity as published in [The Scot's Key](#) and form an essential part of the implicit contract between the student and the College. The Code provides a framework at Wooster to help students develop and exhibit honesty in their academic work. You are expected to know and abide by these rules.

In this class, we will use the following definition of plagiarism:

Definition 10.1

Plagiarism is the act of submitting the work of someone else as if it were your own. Specifically, this action misleads the instructor to think that the work is the result of learning and understanding by the student named on the paper, when in fact the understanding truly belongs to someone else. This may apply to an entire solution, or individual parts of a solution.

In Math 215, collaboration is permitted and even encouraged in most circumstances! However, *you may only collaborate with students currently enrolled in math 215*. In all cases where collaboration has occurred, you must acknowledge this clearly:

Acknowledging collaboration: In all work, specifically homeworks, you must clearly state the name(s) of the person(s) you collaborated with on each problem.

J.1. Specific academic honesty expectations

It is often unclear what exactly "collaboration" means when working on assignments. The following section should clarify what my expectations are regarding this and give guidelines for avoiding plagiarism

in assignments. The list is intended to be helpful but not exhaustive. If you are unsure about the appropriateness of some form of assistance on an assignment, you should always ask me.

- **Lecture Note:** I encourage you to work with and get help from your peers with answering the questions in the lecture note as much as possible - and we will be specifically working on many of the problems together during class.
- **Homework:** On homework problems, every step of every solution should be one that you understand yourself and that you have generated on your own. You are permitted to discuss big ideas and hints with your classmates and your TA.

Any collaboration should occur only when your collaborator is at essentially the same stage of the problem solution as yourself. In particular, if you have not yet started problem #4 and you ask a friend (who has already completed it), "How did you do problem 4?", this counts as **plagiarism**.

- **Outside resources in general:** On all work, unless directly stated otherwise, the only resources you may use are our class notes. You are not permitted to go looking for completed solutions to problems in other texts or resources. **In particular, use of internet resources is completely off limits for completing homework problems.** Often, full solutions for our homework problems can be found online. If you see such a solution prior to submitting homework, there is essentially no way that you can claim to have an original solution. Evidence of using internet sources in your work will result in a *minimum* penalty of earning 0 on the relevant task.
- **Copying:** Copying a solution, or any part of a solution, from any source (friend, internet, book, etc.) in any setting, constitutes **plagiarism**.
- **Past students:** On any assignment, basing your work on the efforts of another student who previously completed this course or one like it, is considered **plagiarism**.
- **Office hours with Instructor and TA:** You are encouraged to seek help from me and our TA, Luke, with your homework assignments. You may not discuss a P3 assignment with the TA.

J.2. Consequences of academic dishonesty

Evidence of dishonest behavior on any assignment will be grounds for a minimum penalty of earning a zero on all relevant tasks for that assignment. Other penalties may include permanently failing the relevant component (regardless of other work) or, in severe cases, failure of the course. **Peers who willingly assist others in acts of plagiarism are equally guilty and will suffer similar penalties.** In all cases, the guidelines established in [The Scot's Key](#) will be followed. I reserve the right to discuss the nature and origins of any assignment with any student prior to assigning a grade.

J.3. A positive note

Remember that I want you to be successful. That is, I want you to develop a deep personal understanding of the material we study so that you become a better student of mathematics who can go on to do well in all of your future endeavors. Every part of this course structure - including both collaborative work and restrictions on collaboration - is intended to help you with this. You will often struggle, and that's intentional - struggle (and eventual success!) is essential to learning. Indeed, productively failing (and learning from it) is part of your final grade.

In all aspects of the course, please understand that I am generous with hints and am always willing to discuss problems with you. I will never simply give you an answer, but I will offer direction and guidance that will assist you in coming up with a solution on your own. This is by far the most satisfying way to solve a problem, and the difficulty is well worth it. You are always welcome to discuss your questions or concerns with me at any time.

§K. Disclaimer

I reserve the right to make changes to this syllabus if needed. Any changes will be announced to the class in a timely manner.