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PAUL POLLACK

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ABOUT | RESEARCH | COURSES

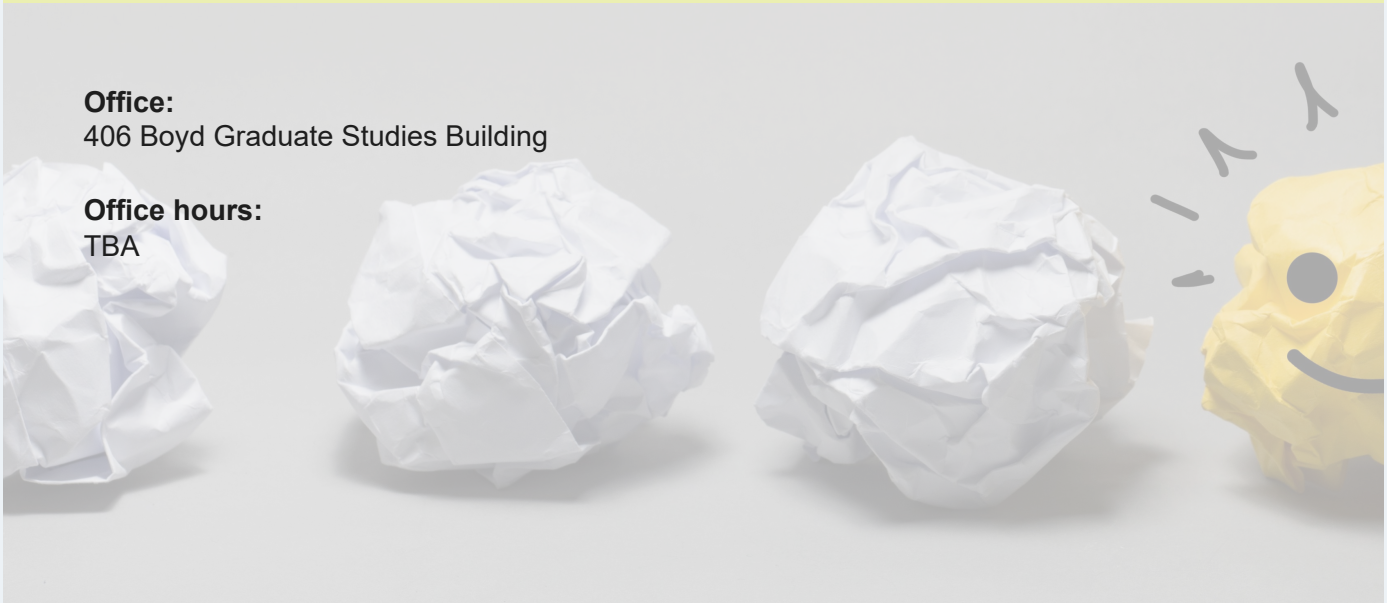
MATH 3200: Introduction to Higher Mathematics

MWF 11:30 AM-12:20 PM, Boyd Graduate Studies Building, Room 303

FALL 2024

Office:
406 Boyd Graduate Studies Building

Office hours:
TBA



CURRENT ASSIGNMENTS/OTHER COURSE MATERIALS

Watch your inbox for a class questionnaire.

Read sections 1.1 and 1.2 in the course text. complete by 8/16

COURSE SUMMARY TO DATE (REVERSE CHRONOLOGICAL ORDER)

8/14 Discussion of syllabus. Some "food for thought".

COURSE CONTENT SUMMARY

Given that this class is titled "Introduction to Higher Mathematics.", it makes sense for us to begin by discussing what "higher" mathematics is, and how it differs from the more terrestrial flavor of mathematics you are likely accustomed to.

A useful way of conceptualizing higher mathematics can be seen in a common name people have for courses like MATH 3200. MATH 3200 is what many people would call a "transition course". The transition is *away* from a focus on computation, and away from an emphasis on correct answers as the end goal. The transition is *towards* a focus on logical reasoning, and towards an emphasis on deep conceptual understanding.

Why is there such an emphasis placed on logical reasoning? One answer is: Communication! If two groups of people are given the same mathematical problem, the group claiming a solution needs to be able to convince the others that they indeed have found a solution.

Depending on the problem, convincing someone you have a solution can be easy or difficult. As an example of the former, suppose you are asked to prove that 2024 can be written as a sum of four squares of integers. If you know that $2024 = 4^2 + 6^2 + 6^2 + 44^2$, you can convince someone else of this fact just by showing them that equation. But what if the problem is as follows?

PROBLEM: Show that *every* positive integer is a sum of four squares.

How could you convince someone that you solved *that*? It would not be enough to communicate representations of integers up to 100, 1000, or 10^{100}, as there are infinitely many numbers beyond any of these limits. What is needed here is a logical argument, starting from points both parties can agree upon, and which proceeds in a manner that both parties endorse. This is what is meant by **mathematical proof**. The goal of this class is to introduce you to the art and science of writing mathematical proofs.

(The above PROBLEM describes a famous result from Number Theory, which is MATH 4400.)

COURSE STRUCTURE

This class is, unapologetically, structured to emphasize *active learning*. Active learning is the crazy idea is that you learn mathematics best by doing mathematics, not by hearing someone else talk about it. Just as you hone your athletic abilities not by sitting on the bench but by getting out in the field and running after the sportsball, you hone your mathletic abilities not by listening to me lecture but by solving math problems.

What does this mean in practice? If you haven't taken other classes that emphasize active learning, you should expect a different kind of classroom experience. Rather than spending 50 minutes on lecture each time we meet, a typical day will start with a brief mini-lecture, recapping the readings --- **readings you are expected to have completed outside of class**. (You should expect to have regular assigned readings.) The rest of our time together will usually be devoted to problem solving with your classmates, in groups --- with occasional assistance from myself, when necessary. I may occasionally call on you to present solutions; this means that you can expect oral feedback both from myself and from your classmates.

This way of learning mathematics may require you to step out of your comfort zone.

This is a big ask. In return, I promise to do my best to provide you with a supportive environment. It's OK to find something difficult or confusing. That's part of learning mathematics, and the struggle is present at every level, perhaps even more so the further you advance. (I myself am confused almost all of the time.) Please help me out by doing your best to be show support to your classmates. Aim your comments to be thoughtful, respectful, and constructive.

Finally, I would like to encourage you to use me as a resource, and to stop by office hours (mine and those of the TA) when you have questions. Those might be questions about the reading, questions about class activities, or questions about a past or present homework assignment.

TEXTBOOK (FREE!)

Introduction to Proof

Ron Taylor

We will aim to cover all five chapters.

It is always a good idea when learning a subject to consult multiple sources. Different authors have different styles, some of which will sing to your soul more or less than others. For the material we will cover two free online options are Book of Proof by Hammack and Mathematical Reasoning: Writing and Proof by Sundstrom. (These are optional additional resources; you are not expected or required to look at them.)

EXAM DATES

There are two in-class midterm exams as well as a final exam.

Midterm #1: Friday, Sept. 20

Midterm #2: Friday, Nov. 1

Final exam: Wed, December 11, 12:00 - 3:00 PM (location TBA)

No make-up exams will be given. The final exam is **cumulative**.

ATTENDANCE/ HOMEWORK /EXAM POLICIES

Your grade is made up of the following weighted components:

Each midterm: 20% (total of 40%)

Homework: 25%

Final exam: 35%

You are expected to participate in class. In particular, attendance in this course is **required**. More than four unexcused absences may result in you being withdrawn from the course. Keep me posted whenever you have a conflict that requires you to miss class and this should not be an issue.

All exams are in-class, closed book, and closed notes.

Homework will be collected in class regularly (every week or two). Late homework will not be accepted. If you have a need to turn in HW early, that can be arranged. HW problems are graded out of 10 points. You will be given an opportunity to correct your assignments and recover up to 9 of the 10 points. For this, you **must** turn in your revisions to our TA within 1 week of the date the assignment is returned to you. **This opportunity is only open to students who turned in a first version of the problems on time.** Your lowest homework score will be dropped at the end of the semester.

On homework, collaboration is allowed and in fact is very much encouraged. Mathematics wouldn't be nearly as much fun if we couldn't talk about it with other people! However, copying (from a textbook or another student), web searches, and use of AI tools (such as ChatGPT) are not allowed, and you are required to write your own final solutions independently. Keep in mind that by entering UGA, you have already agreed to abide by the UGA Honor code described in detail at https://honesty.uga.edu/Academic-Honesty-Policy/Student-Honor-Code/.

In practice, what this means that you may discuss homework problems and their

solutions with your classmates (and with me at office hours!), but you may not turn in a solution unless you understand it yourself. A reasonable rule of thumb is that you should be able to explain your solutions verbally to me (in all their gory detail) if requested to do so.

SPECIAL ACCOMMODATIONS

Students with disabilities who may require special accommodations should talk to me as soon as possible. Appropriate documentation concerning disabilities may be required. For further information, please visit the Disabilities Resource Center page.

MENTAL HEALTH AND WELLNESS

If you or someone you know needs assistance, you are encouraged to contact Student Care and Outreach in the Division of Student Affairs at 706-542-8479 or visit https://sco.uga.edu. They will help you navigate any difficult circumstances you may be facing by connecting you with the appropriate resources or services. UGA has several resources for a student seeking mental health services (https://caps.uga.edu/well-being-prevention-programs-mental-health/) or crisis support (https://healthcenter.uga.edu/emergencies/).

FERPA NOTICE

The Federal Family Educational Rights and Privacy Act (FERPA) grants students certain information privacy rights. See the registrar's explanation at reg.uga.edu/general-information/ferpa/. FERPA allows disclosure of directory information (name, address, telephone, email, major, activities, degrees, awards, prior schools), unless requested in a written letter to the registrar.

DISCLAIMER

The course syllabus is a general plan for the course; deviations announced to the class by the instructor may be necessary.