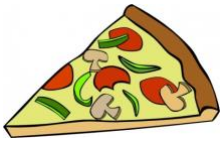
Department of Mathematics

March 3, 2025

UNDERGRADUATE MATH SEMINAR

Professor Leila Khatami

This week's math seminar will be last one of the winter term! Let's thank **Professors Brenda Johnson** and **Christina Tønnesen-Friedman** for organizing a wonderful series of talks.



DATE: **THURSDAY, March 6**

Time & **12:30 – Refreshments in Bailey 204**

Location: **12:50 – 1:45** Seminar in **Bailey 207**

In this seminar, **Professor Leila Khatami**, an algebraist in the Union College Math Department will present the following talk:

Title: A Game of Commuting Matrices

Abstract: One of the first things we learn about matrix multiplication is that it is not commutative; that is, if A and B are two square matrices of the same size, in general AB is not equal to BA. However, some pairs of matrices do commute. For example, if one of the matrices is the identity or zero matrix, or if A and B are the same, then AB = BA. This leads to a natural question: which pairs of matrices commute? More specifically, given a matrix, can we characterize matrices that commute with it? In this talk, we explore this question through the lens of a mathematical game, which can help us understand some key tools used in studying this problem.

Pieces from Thesis, by Ledia Hoxhaj

Ledia wrote her senior thesis this past fall under the guidance of ***Professor Phanuel Mariano.***

This past fall, I had the invaluable opportunity to work on my senior thesis under the guidance of Professor Phanuel Mariano. My research focused on the Black-Scholes Model, a fundamental mathematical framework for pricing European-style options. Developed by Fischer Black, Myron Scholes, and Robert Merton, this model remains one of the most widely used methods for option pricing. It provides a theoretical estimate of derivative values by incorporating key factors such as time and market risk.

I chose this project based on my experience as an analyst at Marix Asset Advisors during my summer internship, where I was introduced to the financial industry. I had the privilege of working with an excellent mentor and a supportive team, which deepened my interest in finance and quantitative modeling.

Completing a one-term thesis presented significant challenges, particularly in balancing a full course load while selecting a topic, conducting research, drafting multiple versions, and finalizing my work within a limited timeframe. However, the experience greatly enhanced my time management skills and reinforced my ability to work under tight deadlines.

Now that my senior project is complete, I appreciate the opportunity to have explored a topic of personal and professional interest in an academic setting. Writing a thesis allows students to engage deeply with a subject beyond standard coursework while benefiting from faculty guidance. For future students, I strongly recommend selecting a topic they are genuinely passionate about, as it makes the process more engaging. Additionally, conducting preliminary research before the term begins can provide a strong foundation and help streamline the writing process.

Math Clubbing!

The **Association for Women in Mathematics (AWM)** will be holding its last meeting of the winter term **Thursday, March 6** at **3:00pm** in the **Math Common Room, Bailey 204**. All are welcome!

Turn the page there's more!

Spring Term Registration Is This Week

The math department is offering many wonderful courses beyond the calculus sequence that are suitable for math majors and minors.

- **Math 199** is the department's "bridge course," intended to help students make the transition from computationally oriented courses to more theoretical proof-writing courses. It is a **required** course for all math majors and minors that is *usually* taken *after* a student has taken Math 115. This is a WAC-R course, too! *199-01 MWF 10:30-11:35, and 199-02 MWF 11:45-12:50.*
- **Math 228** (Probability Theory). This course is an introduction to probability theory intended for math majors and minors. The focus of this course will be on both the theoretical aspects of probability and problem solving. The prerequisites are Math 197 or Math 199, and Math 117, which may be taken concurrently. NOTE: this course is not open to students who have passed Math 128 and vice versa. *MWF 10:30-11:35.*
- **Math 332** (Abstract Algebra 1) is a beautiful course that generalizes what you know about algebra in the integers and real numbers to a more abstract setting. The main objects of study in this course are groups, rings, and fields. This course is required for the major. The prerequisite for this course is one of Math 219, 221, 224, 228, 235, or 248 or permission from the chair. *MW: 11:45-12:50.*
- **Math 334** (Partial Differential Equations) Analytic and numerical methods will be introduced to examine the solutions of elliptic, parabolic and hyperbolic types of PDEs. Real-world examples and applications include signal, image and video processing, medical imaging, heat conduction, wave traveling, and so on. Prerequisites: MTH 234 or (MTH 130 and MTH 199). *MWF 1:50-2:55.*
- **Math 448** (Differential Geometry). Calculus meets Geometry! A study of curves and surfaces in 3-space. Topics include arc length, curvature, torsion, the Frenet frame, the first and second fundamental forms, normal curvature, and Gaussian curvature. The prerequisites are Math 117 and 340. Students pursuing honors in the major should strongly consider taking this course. *MW 3:05-4:45.*
- **Statistics 164** (Strategies of Experimentation) Students will learn different experimental design options when experimenting with multiple variables as well as analytic methods. *MWF 11:45-12:50.*
- **Statistics 364** (Big Data Analytics). Learn techniques to analyze large data sets using statistical programming languages. This is a great course for those considering further study or careers in statistics, data science, machine learning, computer science, econometrics, or related disciplines. *MWF 9:15-10:20.*

HRUMC – Saturday, April 5, 2025

The Union College Math Department will be hosting this year's Hudson River Undergraduate Mathematics Conference (HRUMC) on **Saturday, April 5th**.

This day-long conference will feature 15-minute talks *primarily by students*, a keynote address by **Professor Álvaro Lozano-Robledo** from the University of Connecticut entitled "***Math in the Age of Social Media***", and lunch panels themed for students: "Making the Most of One's Undergraduate Mathematics Experience" and "What can I do with a math degree?"

Conference registration and talk/abstract submission is through the HRUMC website, HRUMC (or just google it!)

- To volunteer at the conference, contact any of the three students on the HRUMC steering committee as soon as possible: **Audrey Benson** (bensona2@union.edu), **Frankie Morone** (moronef@union.edu), **Tremaine Richardson** (richardt@union.edu)
- To present a talk (based on summer research, a thesis, a project, or problem you enjoyed, etc.) contact a math faculty member to sponsor it. Then register by **March 16.**
- To simply attend, register by **March 31**.