

Welcome to the Math Department Newsletter

The math department publishes a weekly newsletter to inform its readership about events in the math department, resources and opportunities for students interested in math, and news from the greater mathematical community. The newsletter is distributed via email and is also posted on the math department's website, <https://www.union.edu/mathematics> under the Activities tab.

If you would like to contribute to the newsletter, or you have ideas for the newsletter, or you would like to be added to our mailing list, please email **Professor Paul Friedman** at friedmap@union.edu.

Undergraduate Math Seminar

Professors Jeff Hatley and **Roger Hoerl** are coordinating this fall's Undergraduate Mathematics Seminar, a weekly series of ~45-minute talks about math – current research, famous older problems, interesting topics from fields outside of the standard curriculum, ... The seminars will typically be on Thursdays during common lunch, with pizza beforehand.

DATE: **THURSDAY, September 17**

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

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



Professor
Asimina Hamakiotes

In this seminar, **Professor Asimina Hamakiotes**, a professor at **Fordham University** whose research interests lie in number theory and algebra, will present the following talk.

Title: Sums of Powers by L'Hôpital's Rule

Abstract: For a positive integer d , let

$$p_d(n) = 0^d + 1^d + \dots + n^d$$

i.e., $p_d(n)$ is the sum of the first d -th powers up to n . It is well known that $p_d(n)$ is a polynomial of degree $d + 1$ in n . While this is usually proved by induction, once d is not small it is a challenge as one needs to know the polynomial for the inductive step. In this talk, we show how this difficulty can be bypassed by giving a simple proof that $p_d(n)$ is a polynomial of degree $d + 1$ in n by using L'Hôpital's rule, and show how we can then determine the coefficients by Cramer's rule.

Do You Enjoy Solving (Math) Problems? Join the Club!

If you enjoy working on interesting and challenging math problems and would like to face those challenges with a group of like-minded students, then **join the Union Problem-Solving Group!**

Professor Grant Moles will be leading weekly problem-solving sessions, **Thursdays, 3:30-5:00pm** in **Bailey 104** starting **September 17**. One goal of these sessions is to prepare students for the "The Putnam Exam" on December 5, 2026. This is the preeminent math competition for undergraduates in the United States and Canada. In this contest, participants will spend 6 hours (across two three-hour sittings) trying to solve 12 problems. The problems are *quite challenging*, but not specialized. In other words, they are accessible to students who may or may not have taken advanced courses. *Even if you are not interested in competitions, feel free to join the problem-solving sessions!*

Sample problem from the 2025 contest: Suppose that each point in the Cartesian plane is colored either red or green, subject to the following condition: For every three noncollinear points A, B, C of the same color, the center of the circle passing through A, B , and C is also this color. Prove that all points of the plane are the same color.

There's more ... turn the page!

BREAKING NEWS!

(The following is an excerpt from [Quanta Magazine](#).)

AI Has Solved One of Math's \$1 Million Millennium Prize Problems

Mathematicians at OpenAI showed that the Navier-Stokes equations, which describe how fluids flow, can sometimes “blow up.” But the massive result is not without controversy.

On the morning of Tuesday, September 8, mathematicians at OpenAI announced that a group of 10,000 autonomous AI agents under their direction, running on an advanced model not available to the public, had found a “singularity” in the Navier-Stokes equations in three dimensions - thus resolving one of the [six remaining Millennium Prize Problems](#) posed in 2000 by the Clay Mathematics Institute, each of which carries a \$1 million prize. Their result has been formally checked in the programming language Lean, giving mathematicians confidence that it is indeed correct.

If the result holds up to further scrutiny, it is, by a significant margin, the most important mathematical proof to have been arrived at by an artificial-intelligence model to date, possibly marking a fundamental turning point in how mathematicians tackle difficult problems.

This particular difficult problem deals with differential equations, which express relationships between changing quantities. They are arguably the single most important mathematical tool for explaining the world around us. As a rule, they are easy to write down and hard to solve.

The Navier-Stokes equations are differential equations that use Newton's second law of motion to describe how fluids, from ocean currents to air flows, behave. They were first written down in the mid-19th century, and have been central to the study of fluid mechanics ever since. But one basic question about the equations has persisted: Are their solutions always well-behaved? Or can their solutions evolve over time so that some infinitesimally small part of the fluid begins to flow infinitely quickly, creating a so-called singularity?

The OpenAI announcement of this long-sought singularity came 12 hours after an announcement from Tristan Buckmaster at New York University that he, together with Levent Alpöge at Anthropic, had resolved several closely related problems with help from a variety of AI models, including those of OpenAI.

Both AI-enabled teams relied heavily on work by Diego Córdoba of the Institute for Mathematical Sciences in Madrid and Luis Martínez-Zoroa of CUNEF University, researchers who had developed a strategy to attack the problem that radically departed from the methods most mathematicians were using.

“I was thrilled that the problem was solved,” said Charles Fefferman of Princeton University, who wrote the Clay Institute’s official description of the Navier-Stokes problem. The heroes of the story, he said, are Córdoba and Martínez-Zoroa. As Buckmaster wrote in a statement announcing his results, “Let me make plain what I have said to colleagues in private: in view of this body of work, I believe Luis Martínez-Zoroa deserves a Fields Medal.

For more about this remarkable advancement in the prowess of AI, see the [Quanta Magazine](#) article.

Calculus Help Center: free calculus tutoring!

The Calculus Help Center (CHC) offers **free, drop-in, peer tutoring** in calculus courses through Math 117, Sunday through Thursday, 7:30-10:00pm in the SORUM HOUSE seminar room.