

# MATH@TICS

“All the  $\nu$ 's fit to print”

Department of Mathematics | Ithaca College

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## $\nu_0$ : From the Desk of the Chair

As the spring semester progresses and temperatures rise, it's time to plan for September classes. We've put all of our autumn 2024 courses in one place for your convenience. Discover what's coming and get psyched for next fall.

Please have a look at our students' presentations during the upcoming Whalen Symposium. Take the time to support your fellow math majors while also starting to plan your presentation for next year.

We are searching for volunteers to help with Math Exploration Day. We generally have well more than 100 high school students participating from a dozen or more high schools. We could not do this without the support of our outstanding math majors. Please contact us and let us know you'd like to help.

Remember to solve the newsletter problem from Dave Brown, our problem-solving specialist.

*Tom Pfaff, chair*

## $\nu_1$ : Department Calendar

Mon, March 25	<b>Colloquium:</b> Daniel Tjie (IC '17, mathematics and economics), “Working Full-Time While Going to Graduate School”
Thur, March 28	<b>Math Exploration Day</b>
Thur, April 11	<b>Whalen Symposium</b>
April (TBA)	Pi Mu Epsilon Induction
Mon, April 22	<b>Colloquium:</b> Susanne Pumpluen (University of Nottingham), “Nonassociative algebras, applications to coding theory, and how I got there. . . ”

## $\nu_2$ : Upcoming Opportunities

**Math Club:** We hold a variety of meetings that seek to create positive environments and build community for the math enjoyers at Ithaca College. Our recent meetings have included a game night and a Pi Day competition. We meet roughly every other week, with our meetings being held in Williams 310 at 7 pm on Wednesdays. Be sure to check out our flyers on the second floor of Williams to stay up to date on our next meetings. We are always looking for new members!  
—Sarah Wrzos, Math Club President



Math Club game night

**Math Exploration Day:** Are you interested in sharing your fondness with mathematics with high school students? Please volunteer for the 18th annual Math Exploration Day on Thursday, March 28. We need students to help with activities from 11am-12pm and to eat pizza afterwards. Contact Ted Galanthay (tgalanthay@ithaca.edu) if you'd like to volunteer. Volunteers will get a Math Exploration Day t-shirt!



2024 t-shirt design

**Whalen Symposium** The math department will be well represented at the Whalen Symposium this year! Six students will be presenting their mathematics research work: Nino Kiria ("Physician Attitudes Towards Nicotine Delivery Systems and Smoking Cessation Strategies: A Probabilistic Analysis"), Lenley Aikin ("Ancient Indian Methods for Finding Sum of Squares from a Modern Perspective"), Sarah Wrzos ("An Exploration of Magic Squares"), Phuong Ha ("Variations on Kaprekar's Constant"), Kian Broderick ("Fibonacci-Related Recursive Sequences"), and Brianna Bownas ("Exploring Properties and Patterns of Digital Roots"). This is a great opportunity to learn about their work, to see what mathematical research is like, and to support your fellow math students.

**Pi Mu Epsilon:** Pi Mu Epsilon is a national mathematics honor society; the New York Upsilon Chapter was founded at Ithaca College in 1969. Students are eligible for Pi Mu Epsilon by completing two mathematics courses beyond calculus and based on their GPA in mathematics coursework and their overall GPA. This year's induction ceremony is tentatively scheduled for April 15. Be on the look-out for this event to honor the excellent work of our majors and minors!



Pi Mu Epsilon Induction, 2023

**Upcoming colloquia:** The department has two colloquia scheduled for the second half of the spring semester.

On March 25, Daniel Tjie (IC'17) will talk about his experience working full-time while going to graduate school. Daniel has been working as an Economic Database Manager at Haver Analytics in New York City for the past 6 years. While working full-time, Daniel earned his MBA from Fairleigh Dickinson University.

On April 22, Susanne Pumpluen will speak about non-associative algebras and their applications in coding. She writes, "It is well known that the complex numbers can be constructed from the real numbers: they can be viewed as pairs of real numbers, together with a suitable multiplication. We will look at this construction and play with it a bit. ...[These ideas] are employed to build codes used for wireless digital data transmission, e.g. in mobile phones, laptops or portable TVs, or in other areas of coding theory."

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...get more department news and photos at:

 [Ithaca College Mathematics Alumni and Friends](#)

 [ic\\_math](#)

## $\nu_3$ : Fall Courses

Registration for Fall 2024 courses is almost here! The descriptions below are for courses offered this coming fall that you might be interested in.

### **11200 Calculus II**

**Prof. Visscher**

Calculus of functions of one variable. Topics include limits, continuity, derivatives, applications of derivatives (problems of motion, graphing, and optimization), antiderivatives, and an introduction to the definite integral. Functions covered include polynomial, rational, exponential, logarithmic, trigonometric, and piecewise-defined functions.

4 cr.; MWF 1PM, R 1:10PM

### **15900 Introduction to R**

**Prof. Brown**

Interested in learning how to use technology for mathematical problem-solving? In this 1-credit course, we tackle fun problems using technology. For Fall 2024, we'll focus attention on implementing algorithms from cryptography. No prior experience with programming is needed.

1 cr.; W 3PM

### **18700 Applied Linear Algebra**

**Prof. Visscher, Galanthay**

Linear algebra is a foundational organizational and computational tool for dealing with a lot of information all at once. It is used in many modern and growing fields, such as data science, machine learning, statistics, and computer science. This course is an introduction to the objects and tools of linear algebra, with an emphasis on applications. We will study vectors, norm, and angle; linear independence and orthonormal sets; their applications to document analysis; clustering and the k-means algorithm; matrices; left and right inverses and solving matrix equations; QR factorization; least-squares and model fitting. Computation, both operationally and its relationship with real-world problems, will be central to this course.

3 cr.; MWF 12PM or MWF 2PM

### **21100 Calculus III**

**Prof. Moore**

This course is an extension of the ideas and tools of differential and integral calculus to 2 and 3 dimensions, with a view toward further generalizing to *even higher dimensions*(!). We will study the geometry of vectors and some of the structures of a vector space, and develop calculus tools for studying number- and vector-valued functions of multiple variables. If you like calculus, physics, stretching your mind to visualize mathematics, or some combination of these, then this course is for you!

4 cr.; MWF 1PM, R 1:10PM

### **21600 Statistical Analysis**

**Prof. Pfaff**

We are surrounded by data! We interpret these data to draw conclusions and make decisions about politics, health, education, and many other subjects. The heart of statistics—and the main focus of this course—is drawing inferences about populations based on data in samples. This course is designed to help you decide how to collect and organize data, how to use computer simulation techniques to draw inferences and make decisions based on your data, and to explore the mathematical underpinnings of the statistical theory. The course will culminate in a statistical study that you design and implement, including obtaining a sample and writing a technical report.

3 cr.; MWF 12PM

### **24600 Intermediate Statistics**

**Prof. Geteregechi**

With every passing day, the world around us is getting increasingly complex. People are discovering relationships among variables that were previously thought to be unrelated. What this means is that society needs people with the right knowledge and skills for understanding the complexities of the world that we live in today. This course will introduce you to various multivariate analysis techniques that will boost your statistical knowledge. You will also learn about methods that do not rely on specific distributions like the normal distribution as well as other useful techniques like bootstrapping. All these will be done with the use of the popular environment R.

3 cr.; MWF 2PM

**26200 Ethnomathematics****Prof. Yürekli**

Ethnomathematics investigates the connections between mathematics, culture, historical traditions, and sociocultural roots. By examining mathematical concepts that arise from various world cultures, it recognizes the contributions made by non-Western societies to the history of mathematics and explores mathematical thinking that goes beyond traditional Western mathematics. This course aims to familiarize students with the role of mathematics in diverse societies and how it intersects with other fields such as history, linguistics, fine arts, and architecture. Furthermore, it highlights how underrepresented groups can build self-confidence and cultivate an interest in mathematics by exploring their cultural heritage.

3 cr.; MWF 11AM

**30300 Abstract Algebra****Prof. Wiesner**

Abstract Algebra emerged from the study of many different mathematical questions: studying number systems, solving equations, understanding symmetry. Mathematicians have found that these different questions have much in common, and progress has been made on them by generalizing and abstracting. This has led to the modern field of Algebra. In this class, we will focus on one piece of this story: the algebraic structures known as groups. Along the way, we'll consider complex numbers, modular arithmetic, and permutation groups; and we'll spend a lot of time exploring examples, making conjectures, and developing proofs.

4 cr.; MWF 11AM, R 10:50AM

**32100 Graph Theory and Combinatorics****Prof. Maceli**

Have you ever wondered how many ways there are to assemble an ice cream sundae? Or the most efficient way to plan a multi-city trip? Or why bunny reproduction has a lot in common with floor tilings? Graph Theory and Combinatorics has the answer to all these things! Graph Theory is the study of "connections" and introduces tools to be able to answer useful questions about those connections. Combinatorics focuses on "discrete structures" overall (discrete structures = things that can be counted with the integers), how to count them, and how they relate to each other. Do fractions ever get you down? Then Graph Theory and Combinatorics might be right for you! Topics in graph theory include basic properties of graphs, Eulerian trails, Hamilton chains, trees, and may include the chromatic polynomial, planar graphs, and the independence number. Topics in combinatorics include the pigeonhole principle, permutations and combinations, the binomial theorem, and may include generating functions, Catalan numbers, and Stirling numbers.

3 cr.; MWF 3PM

**34800 Data Science with R****Prof. Maceli**

Modern data science brings together programming, statistics, and mathematical skills to understand the world. The course focuses on data visualization and modeling, while also covering topics related to data management and programming in the R environment. Students use theory together with programming and statistical methods to develop the capacity to create new and unique models, visualizations, and/or solutions in data-based multidisciplinary investigations into problems from a variety of fields.

3 cr.; MWF 12PM

**39700 Junior Seminar****Profs. Galanthay and Martinez**

Junior Seminar in Mathematics is a course designed for college undergraduates who are interested in conducting research in mathematics. This seminar will provide students with the opportunity to work closely with a faculty mentor on a research project in an area of mathematics of their choice. Through this seminar, students will develop the skills necessary to conduct independent research in mathematics, including literature review, problem formulation, proof construction, and mathematical modeling. They will also gain experience in presenting their mathematical findings to a wider audience, including their peers and faculty members.

In addition to individual research projects, the seminar will include group discussions and presentations on various mathematical research topics, as well as training sessions on mathematical writing and presentation skills. The seminar will also provide students with the opportunity to network with other undergraduate mathematics researchers and potential graduate school advisors. At the end of the semester, students will

present their mathematical research findings at a public seminar. This course is an excellent opportunity for students to gain valuable research experience in mathematics and prepare for future academic endeavors in mathematics or related fields. 1 cr.; T 2:35PM

**48000 Connections in Advanced Math**  
3 cr.; MWF 2PM

**Prof. Moore**

### $\nu_4$ : What's the Problem... with Professor Brown

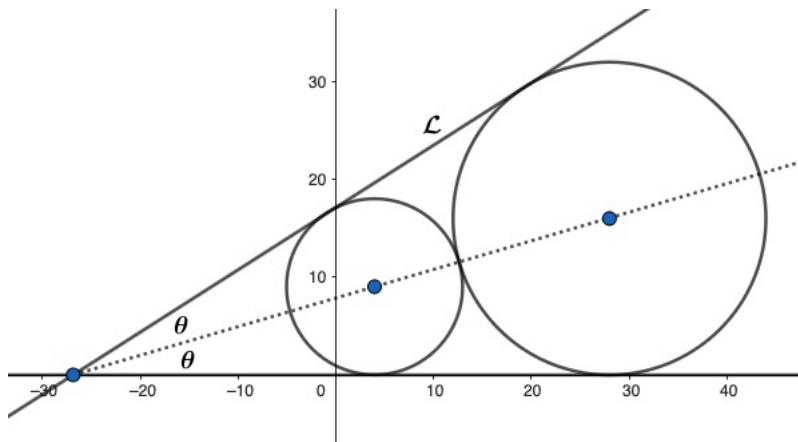
Let  $\mathcal{U}$  be the union of all discs of radius 1 that cover the unit interval  $[0, 1] \subset \mathbb{R}^2$ . What is the area of  $\mathcal{U}$ ?

Send complete answers to Professor Brown at [dabrown@ithaca.edu](mailto:dabrown@ithaca.edu). Those submitting correct answers will have their names printed in the following newsletter. People who correctly solve all problems from Volume 4 of the newsletter will receive a special prize at the end of the year.

*Solution to Prof. Brown's previous problem:*

First, note that the line through the centers of the circles bisects the angle where the two common tangent lines ( $x$ -axis and the line  $\mathcal{L}$ ) meet. The line through the centers of the circle is given by  $y = \frac{7}{24}x + \frac{47}{6}$ . The  $x$ -intercept of this line is  $x = -\frac{188}{7}$ , and if  $\theta$  is the angle that the line through the centers makes with the  $x$ -axis, then  $\tan(\theta) = \frac{7}{24}$ . So, the  $y$ -intercept of  $\mathcal{L}$  is:

$$\frac{188}{7} \tan(2\theta) = \frac{188}{7} \frac{2 \tan(\theta)}{1 - \tan^2(\theta)} = \frac{188}{7} \frac{2 \cdot (7/24)}{1 - (7/24)^2} = \frac{9024}{527}.$$



*Honor role (solvers from Issue 2):*

Kian Broderick - current student

Earth Sonrod - current student

Sarah Wrzos - current student