

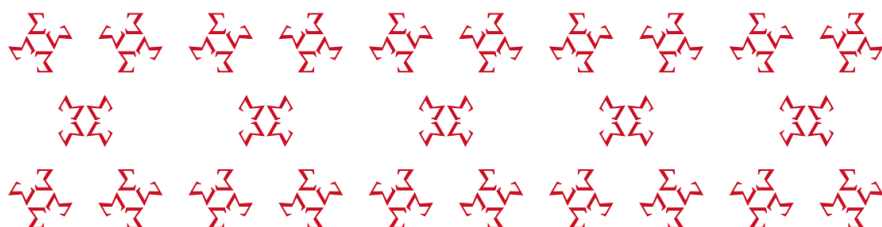


Spring 2019

Newsletter

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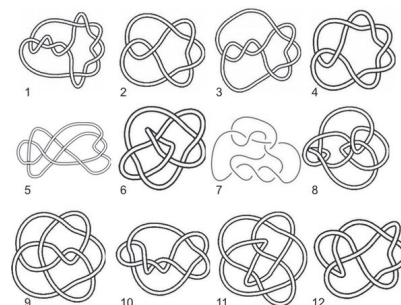


SUM Series is Back!

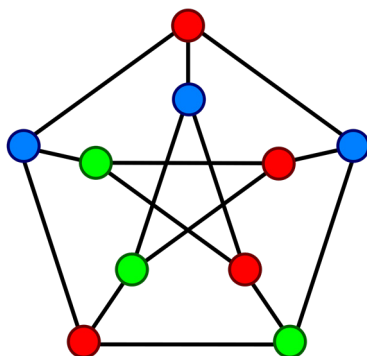
SUM Series features informal talks on mathematical topics organized by Nathan Reading and Cynthia Vinzant. The talks are held Thursdays from 4:30 to 5:20 in SAS 2102 and are accessible to undergraduates in mathematics of all levels. This is a great chance to meet professors and learn about other areas of mathematics. You will have a few minutes to help yourself to pizza before the talk. Below are some examples of previous topics.



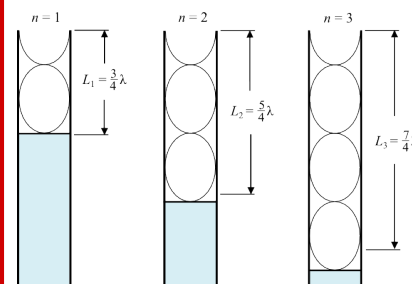
Lie Groups and Fractals



Distinguishing and Untangling Knots



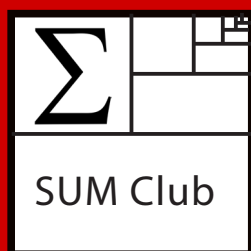
Colorings and Graph Theory



Determining the speed of sound using a beer bottle

Newsletter contacts

Hayley Russell
Beth Mikovitz
Grant Barkley
Kylan Schatz
Noah Jabusch
Peter Girouard
ncsumclub@ncsu.edu

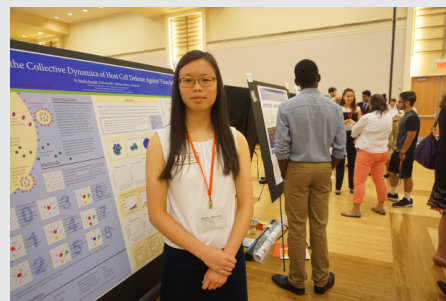


NC State University Spring Research & Creativity Symposium

April 24, 2019 | 12p-4:30p in Talley Student Center Ballroom

Please join us at the 28th Annual NC State University Undergraduate Research & Creativity Spring Symposium where undergraduate students from NC State will share their innovative research and creative works with the campus and community.

Registration Open from March 12, 2018 through April 9, 2018



There will be two sessions of poster only presentations and two concurrent creative works exhibit sessions, both will be judged* by College and Discipline representatives if students choose to have their project judged. The top presentations, as selected by the judges, from the symposium receive a certificate and are invited to a reception by the local chapter of Sigma Xi.

The NC State University Spring Undergraduate Research & Creativity Symposium is open to all undergraduate students that have worked with NC State mentors or who are NC State undergraduate students who have worked with NC State faculty or faculty at other colleges and universities. Participants in formal undergraduate research programs at NC State University are welcome to participate as well. Non-presenters do not need to register.

SHARE YOUR CREATIVE WORKS AT THE SYMPOSIUM!

From music compositions, to textiles, to architecture design, to photography and much more! The spring undergraduate research symposium will provide those with creative or visual projects to display those works during the event. Students within the arts, textiles and design programs, for which a poster presentation format does not accurately convey the project, will be accepted to choose to exhibit their work. At this time we are unable to accommodate performances or performance art. See the NC State Symposium Page for more details.

*Students may choose to not have their project judged.

Wolfpack Career Chats

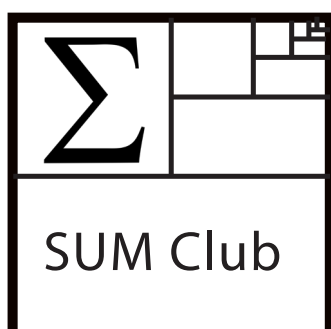
Check out the new iTunes podcast for career tips brought to you by the Career Development Center. Featuring interviews of some cool people on campus such as Justine Hollingshead, Katie Belusa, Debbie Acker, and Marie Williams. This is great for students who are seeking advice about their future career path.

Listen to Wolfpack Career Chats Marie Williams on Leadership from WolfpackCareerChats in Podcasts. www.go.ncsu.edu/WolfpackCareerChats

Join the SUM Club Executive Board

The Society for Undergraduate Mathematics (SUM Club) is a student organization for students with a passion for or professional future in mathematics. We connect math undergrads and provide students with academic and professional development, leadership, and service opportunities. This is accomplished through social and outreach activities, presentations at meetings, career events, and other college- and university-wide involvement. Open to any student, math major or otherwise, we meet on the first Thursday of every month to get to know one another, do math puzzles, play games, learn together, and plan outreach. The club hosts undergraduates, graduate students, and professionals to share their experiences and knowledge, so that we can learn. SUM Club supports the Raleigh community through participation in programs like Service Raleigh and Washington Elementary Math and Science Night. We hope to continue to create a strong undergraduate mathematics community. We would love to have more people involved! Email us at ncsumclub@ncsu.edu with question or to be added to our email list.

We are currently looking for members interested in being part of the executive board next year. Open roles include College of Science Representatives, Treasurer, and Publicity Chair. Deadline to apply for a position is April 5th.



Puzzles!

- 1) Using three 0's and any math operations, make the number 6.
- 2) Using eight 8's and only the operations $+$, $-$, $/$, $*$ make the number 1000.
- 3) Find the area of the red square.



Advanced Mathematics Courses

MA 505 - Linear Programming

11:45 am - 1:00 pm TH

Instructor: Dr. Shu-Cherng Fang

Prerequisite: MA 405

Introduction including: applications to economics and engineering; the simplex and interior-point methods; parametric programming and post-optimality analysis; duality matrix games, linear systems solvability theory and linear systems duality theory; polyhedral sets and cones, including their convexity and separation properties and dual representations; equilibrium prices, Lagrange multipliers, subgradients and sensitivity analysis.

MA 437 - Applications of Algebra

8:30 am - 9:45 am TH

Instructor: Dr. Patricia Hersh

Prerequisite: MA 403 or 407, and MA 405

Error correcting codes, cryptography, crystallography, enumeration techniques, exact solutions of linear equations, and block designs.

MA 546 - Probabilistic and Stochastic Processes I

11:45 am - 1:00 pm TH

Instructor: Dr. Min Kang

Prerequisite: MA 421 and MA 425 or MA 511

Modern introduction to Probability Theory and Stochastic Processes. The choice of material is motivated by applications to problems such as queueing networks, filtering and financial mathematics. Topics include: review of discrete probability and continuous random variables, random walks, markov chains, martingales, stopping times, erodicity, conditional expectations, continuous-time Markov chains, laws of large numbers, central limit theorem and large deviations.

MA 551 - Introduction to Topology

3:00 pm - 4:15 pm TH

Instructor: Dr. Radmila Sazdanovic

Prerequisite: MA 426

Set theory, topological spaces, metric spaces, continuous functions, separation, cardinality properties, product and quotient topologies, compactness, connectedness.

MA 591 - Scientific Programming with Python

1:55 pm - 2:45 pm F

Instructor: Dr. Arvind Saibaba

Prerequisite: Graduate standing or consent of instructor. Some higher level programming background (e.g., C++/MATLAB) is desirable.

Python is a high-level, interpreted language that has emerged as a powerful tool for scientific computing. This 1 credit course will cover software tools required for research in scientific computing. While much of the course will focus on programming in Python, additional topics such as version control, shell scripting, and parallel computing will also be covered. Topics include basics (Variables/Loops/Conditionals/Data Structures), object oriented programming, plotting (matplotlib), and scientific computing packages (NumPy/SciPy).

MA 573 - Math Modeling I

11:45 am - 12:35 pm MWF

Instructor: Dr. Alen Alexanderian

Prerequisite: MA 341 and knowledge of high-level programming language.

Introduction to model development for physical and biological applications. Mathematical and statistical aspects of parameter estimation. Compartmental analysis and conservation laws, heat transfer, and population and disease models. Analytic and numerical solution techniques and experimental validation of models. Knowledge of high-level programming languages required.

MA 450 - Methods of Applied Mathematics I

1:30 pm - 2:45 pm TH

Instructor: Dr. Mansoor Haider

Prerequisite: MA 341

Mathematical methods covered include dimensional analysis, asymptotics, continuum modeling and traffic flow analysis. These topics are discussed in the context of applications and real data.

This course is independent of MA 451 Methods of Applied Mathematics II.

Advanced Mathematics Courses

MA 430 - Mathematical Models in Physical Sciences

11:45 am - 1:00 pm TH

Instructor: Dr. Ronald Fulp

This class will focus on a careful and rigorous development of the following topics.

(I) First we will consider a mathematical treatment of Newtonian mechanics which will include the following sub-topics:

Linear Geometry: a development of Euclidean geometry via linear algebra. The purpose of this segment of the course is to develop a careful analysis of the notion of an inertial coordinate frame and a clear idea of what is meant by an inertial observer as a curve of inertial coordinate frames.

A rigorous development of Newton's laws and how they transform in moving inertial frames. A discussion of work, energy, conservation of energy, and central fields

(II) The next topic covered will be a thorough treatment of derivations, vector fields, differential one-forms, line integrals and their properties. These will be applied to Newtonian Mechanics and Thermodynamics

(III) The final topic will be concerned with an axiomatic development of Thermodynamics via the zeroth law, the first law, and the second law. This will include a careful development of the concept of entropy.

If time permits we will show how to obtain Boltzmann's law $S = k \ln(W)$ from a basic molecular model.

MA 444 - Problem Solving

4:30 pm - 5:20 pm W

Instructor: Dr. Tien Nguyen

Analyze the most common problem-solving techniques and illustrate their use by interesting examples from past Putnam and Virginia Tech math competitions. Problem solving methods are divided into groups and taught by professors of the math department. After the lecture, students practice writing the solutions for the assignment and have informal discussions in the next class.

MA 591 Topological Combinatorics

1:30 pm - 2:45 pm MW

Instructor: Dr. Patricia Hersh

Prerequisite: MA 753 desirable

This class will focus on a rich interplay between topology and combinatorics. This will include combinatorial techniques including shellability, discrete Morse theory, and the Quillen Fiber Lemma, among others for computing homotopy type, homology groups and Betti numbers of simplicial complexes and cell complexes. Going in the other direction, we explore how the Mobius function of a partially ordered set is interpreted topologically. We will spend considerable time on hyperplane arrangements and geometric lattices first (from both an enumerative and a topological viewpoint), and then on poset topology more generally later in the semester. Along the way, we will do a quick review of representation theory of the symmetric group, to the extent it will be needed in our study of poset topology. For students who have taken topology and would like to understand things in a very concrete, hands-on way with lots of examples, this course could be useful.

MA 565 - Graph Theory

10:15 am - 11:30 am MW

Instructor: Dr. Blair Sullivan

Introduction to graph theory. Starting from the fundamentals, this course will cover essential theorems and algorithms from across the field of graph theory. Topics will include Connectivity, Matchings, Planar Graphs, Coloring, Directed Graphs, Extremal Problems, Ramsey Theory, Random Graphs, and (time permitting), Structural Graph Theory. Where relevant, applications and algorithmic considerations, including data structures, will be highlighted. Students should be comfortable with formal proofs; some exposure to algorithm complexity (big-O notation) will be helpful, but is not essential coming in.

Pack Essential Resources for Students

NC State and campus partners have developed many programs to support students in need of food, housing, financial, and educational security.

Food and Housing - NC State is dedicated to providing support for those who are food and/or housing insecure. From the Feed the Pack Food Pantry to temporary and emergency housing, there are resources for students across campus.

Financial - Several entities across campus, including the Division of Academic and Student Affairs, offer emergency funds for student emergencies. You can also learn more about on-campus and part-time employment opportunities.

Education - Departments across NC State offer educational support, high impact experiences, and opportunities for research funding and scholarships.

Miscellaneous Campus Resources - Check out <https://dasa.ncsu.edu/pack-essentials/> for resources from free computer software to clothes for an interview, and more.

Student Ombuds Services - If you want to discuss your situation and review available resources in a confidential meeting with the Student Ombuds, you can schedule a face-to-face or phone meeting by calling 919.513.3401.

Kwangil Koh Lecture: Illuminating a Mathematical Landscape

April 2 | 4:30 pm - 5:30 pm

Turn on a light in the middle of a room: Is every spot illuminated? If the room is a complicated labyrinth, then probably not, but what if the walls of the room are mirrors? Amie Wilkinson of the University of Chicago will deliver the NC State Department of Mathematics Kwangil Koh Lecture on Mathematics in Our Time through an exploration of the hidden corners of a mirrored room using the mathematical tools developed by Fields Medalist Maryam Mirzakhani and her collaborators. The journey will take the audience through billiard tables and special kinds of surfaces resembling faceted donuts with many holes.

This lecture is free and open to the public, and registration is not required. A reception preceding the lecture will begin at 4 p.m. in the SAS Hall atrium.

Amie Wilkinson is a professor of mathematics at the University of Chicago. Her research focuses on smooth dynamical systems and the interplay between dynamics and other structures in pure mathematics — geometric, statistical, topological and algebraic.

Student Excellence Award

The Student Excellence Award honors a senior who is considered a student leader and actively pursues leadership roles within the college and across NC State through community service, philanthropy, campus involvement, research or in the classroom. This year's award was presented to two students:

Kaylie Kirkwood is a senior majoring in chemistry. She is an award-winning undergraduate researcher who has already coauthored a paper published in an academic journal. She is also a College of Sciences student ambassador, an event coordinator for the North Carolina Science Olympiad and a writing intern in the college's marketing and communications office.

Jason Thompson is a senior majoring in statistics and applied mathematics. He has been president of the Sports Analytics Club for three years, and active membership has more than doubled under his leadership. He is also a College of Sciences student ambassador and an active member of the NC State Chorale.

Math Honors Program

Currently we have 38 students participating in the Math Honors Program. Lately a little less than 15% of math graduates complete the Math Honors Program and about 90% of those students go on to excellent graduate schools or find great jobs. Schools they have attended include Berkeley, Princeton, Stanford, MIT, Cornell, NYU and UCLA. Math honors students have received 25 NSF Fellowships AND 3 DoD Fellowships for graduate school as well as 9 Goldwater Scholarships, 1 Churchill Scholarship and 3 Gates Fellowships. Besides taking a number of challenging advanced Mathematics courses, Math Honors students also do research either at NC State or in a summer REU Program (Research Experience for Undergraduates) nationwide. More than 30 students have completed a study abroad program focusing on Mathematics, either at the BSM Program (Budapest Semesters in Mathematics) or the MiM Program (Math in Moscow Program).

Participation in REUs, BSM, MiM and doing undergraduate research in mathematics has helped greatly the success of honors students getting accepted into numerous excellent graduate schools. Dr. Min Kang is happy to talk to any student interested in undergraduate research opportunity in Mathematics – stop by her office in SAS 4114 or email her at kang@math.ncsu.edu for an appointment. More information about the program can be found on the Math Honors website at <https://math.sciences.ncsu.edu/undergraduate/undergraduate-programs/math-honors-program/>

Graduates of the Math Honors Program!

Erin Beaton
Bryan Chu
Ethan Dudley
Hayley Russell
Jaye Sudweek

Welcome to the Math Honors Program!

Gabriel Bisti	Emma Jager
Ryan Brandt	Everett Meekins
Ryan Bunn	Sreeram Venkat
Natalie Cody	Sam Weninger
Pavan Dayal	Evan Wyse
Clayton Hansen	

Sonia Kovalesky Day

The Association for Women in Mathematics at NC State is sponsoring its sixth annual Sonia Kovalevsky Day for 7th and 8th grade girls to have fun, meet other girls and learn more about math. Workshops are run by current mathematics graduate students and will cover topics including school bus geometry and rational tangles. The keynote speaker will be Dr. Cynthia Vinzant of the Mathematics Department. In honor of Sonia Kovalevsky, the first female to receive a Ph.D. in mathematics, SK Days are hosted nationwide to encourage young females to take part in the mathematical sciences.



Puzzle Solutions

- 1) $(0! + 0! + 0!)$
- 2) There are at least 7 different ways: $888+88+8+8+8$, $(8(8(8+8)-(8+8)/8))-8$, $(888-8) + 8 \times (8+8) - 8$, $((8 \times (8+8)) - ((8+8+8)/8)) \times 8$, $((8 \times (8+8)) - ((88/8)-8)) \times 8$, $(8888-888)/8$, $8(8 \times 8 + 8 \times 8) - 8 - 8$
- 3) 42 cm^2