

MATH EM@TICS

“All the ν 's fit to print”

Department of Mathematics | Ithaca College

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ν_0 : Welcome

Welcome, everyone, to the 2020-2021 academic year! We are excited for the return of our sophomore, junior, and senior majors, and we are delighted to add five first-year math majors to the department. We are also fortunate to have two new and talented faculty members join us: Dr. Joash Geteregechi and Dr. Peter Maceli.

The faculty have been preparing for round 1.5 of remote instruction, spending substantial portions of the summer learning new ways to engage and teach you. We are eager to try some new things in the

“classroom”. Let us know how we are doing!

We will be reaching out to you with opportunities to hear from your peers about their summer research and internship activities and to participate in remote social activities. We'll need to maintain community, even in the face of this remote semester, so share your ideas with us!

Stay well, and connect with us at some events this fall! We cannot wait to be back face-to-face with you as soon as possible.

Dave Brown, chairperson

ν_1 : Students Doing Summer Research

Spurred on by the continuing restrictions from the pandemic, mathematics research and collaboration moved online this summer. In addition to the many new mathematical vistas uncovered for exploration and the discoveries made therein, mathematicians found a truly great new resource in the online landscape: the infinite whiteboard. (Or chalkboard, in dark mode.)

Jake Brown '22 participated in the Rochester Institute of Technology (RIT) REU in Extremal Graph Theory and Dynamical Systems this summer with Prof. Nishant Malik, PhD student Kamal Rana, and undergraduate Adam Giammarese, all of whom are from RIT. Their project used network theory to analyze the evolution of the Amazon rain forest's importance in the global climate and the consequences of its deforestation. Jake used the knowledge he gained from his class in graph theory, as well as his experience with Python, to write code to not only construct networks from global temperature data, but to in turn analyze those networks and their properties. Jake and his co-researchers have written and submitted an abstract to present (virtually) at the JMM conference in January 2021 and are currently working on a paper to submit to publication.

Dylan Costa '21 worked on math research in the Summer Scholars program at Ithaca College via zoom with his collaborator Prof. Megan Martinez. They worked on a project in the area of linear recurrences which can be explicitly written out using a formula such as the Fibonacci sequence. The main objective throughout the summer was to determine when these sequences had a ratio of consecutive terms that converged as the index of the terms increased: such as the golden ratio for the Fibonacci Sequence. Dylan used knowledge from linear algebra and abstract algebra as well as running example recurrences through various Mathematica. These results from the summer and previous research courses taken during Fall 2019/Spring 2020 have been compiled into a LaTeX document for the submission for the Summer Scholars Program.

Over the summer spent in quarantine, **Alexandra Dyszewski '22** had the great opportunity to work virtually with Prof. Brown from Ithaca College's mathematics department through the Summer Scholars program to explore a few properties of ternary fractal trees. Using Spyder (a Python IDE), knowledge about series, and some basic linear algebra, Alexandra investigated the relationships and patterns of three-branched fractal trees, both with and without symmetry, that create a canopy of self-contact. Alexandra hopes to continue working with Prof. Brown in future semesters exploring more aspects of asymmetry, pruning and dimensions of ternary fractal trees.

Rachel King '21 worked remotely through the Summer Scholars program at IC. She was fortunate to work with Prof. Matt Thomas on using a new markup language, **Doenet ML** to create a website of interactive math applets. This is part of a project to develop a distributed open educational network (Doenet). Rachel reviewed several topics from calculus 1 and calculus 2 to brainstorm ideas for different applets and to implement that material in each applet.

Joan Mattle '22 worked on summer research at the Michigan State University for 8 weeks this summer via zoom. She worked with collaborators Kristen Hallas from CSU-Fullerton and Deanna Perez from UT-Rio Grande Valley and was mentored by Prof. Aklilu Zeleke. The focus of the research was on recursive polynomials. After learning from articles such as *The Limit of Golden Numbers is 3/2* by G.A. Moore, they defined their recurrence to research. The main goal of the research was to prove the maximum root of the polynomials produced by the recurrence using monotonicity and boundedness. Further, they found Binet forms, matrix representations, interesting sequences, and Pascal triangles. Joan used knowledge

from linear algebra and discrete mathematics as well as learned how to use the program Maple. The group has a nine-page manuscript they are revising before submitting for publication.

During the summer of 2020, **Jediah Tau '21** used math while conducting astrophysics research via Zoom with his collaborator Brady Elster and his research mentor Prof. Luke Keller from Ithaca College. Tau's role was modeling the Spectral Energy Distribution (a loglog plot of the wavelengths of light emitted and their corresponding levels of intensity) of star HD34282, which is a part of the Small Magellanic Cloud in the Milky Way galaxy. Concepts from multivariable calculus were heavily used as electromagnetic waves propagate through 3-Dimensional Space, which can be modeled in R^3 if desired. Tau and Prof. Keller are currently in the process of writing a paper on this topic to be submitted for publication.

Molly Whitehead '21 did a summer internship on a data and statistical analysis project that is protected by privacy laws until publication. For more information, ask her later this semester!

Jamie Woodworth '22 did some mathematics in their physics research through the H&S Summer Scholars program at IC this past summer. Jamie and their faculty mentor, Prof. Matthew Sullivan, worked on "The Dynamics of Thermal Diffusion", which involved using Python code to numerically solve a system of partial differential equations. Jamie used skills they gained this past spring from COMP171 and their Independent Study in Mathematics with Prof. Seltzer on Super Tic-Tac-Toe to write code that would solve and display those solutions graphically. Jamie plans to continue this research throughout the fall semester.

ν_2 : Connect

We hope you will take time to connect with students and professors in the Math Department outside of your formal classes. Here are some resources and opportunities:

- The **Virtual Lounge** is a place where faculty and students can connect with each other, as if they were in the student lounge on campus. In order to join the project site, go to Sakai/Home/Membership/Joinable Sites, search for IC Math Virtual Lounge, and click join. Once you have joined the site, you can make announcements and see upcoming events in the department. Using the Chat Room tool, you can start a public conversation. Using the Forums tool, you can read, watch, post, and comment on articles you've read and videos you've seen. Make a connection by commenting on what others are posting, or even set up a Zoom call to reach out to a friend.
- We have a **department Facebook page!**
- Colloquia will run this fall on Mondays, 4-5pm. Everyone is welcome and encouraged to attend! The **Math Colloquium schedule** is currently being formed.

ν_3 : A Selection from “Pillow Problems” by Lewis Carroll

This fall semester finds us in unusual times! The following passage by Lewis Carroll, in his introduction to a set of “Pillow Problems”, struck a chord for me, and this issue’s “Extra Credit” problem (below) is taken from that set.

[The reader] will, I hope, feel encouraged... to try the experiment [of thinking about the following problems] for themselves, and find in it as much advantage and comfort as I have done.

The word “comfort” may perhaps sound out of place, in connection with so entirely *intellectual* an occupation; but it will, I think, come home to many who have known what it is to be haunted by some worry subject of thought, which no effort of will is able to banish. Again and again I have said to myself, on lying down at night, after a day embittered by some vexatious matter, “I will *not* think of it any more! I have gone through it all, thoroughly. It can do no good whatever to go through it again. I *will* think of something else!” And in another ten minutes I have found myself, once more, in the very thick of the miserable business, and torturing myself, to no purpose, with all the old troubles.

Now it is not possible—this, I think, all psychologists will admit—by any effort of volition, to carry out the resolution “I will *not* think of so-and-so.” (Witness the common trick, played on a child, of saying “I’ll give you a penny, if you’ll stand in that corner for five minutes, and *not once* think of strawberry-jam.” No human child ever yet won the tempting wager!) But it is possible—as I am most thankful to know—to carry out the resolution “I *will* think of so-and-so.” Once fasten the attention upon a subject so chosen, and you will find that the worrying subject, which you desire to banish, is *practically* annulled. It may recur, from time to time—just looking in at the door, so to speak; but it will find itself so coldly received, and will get so little attention paid to it, that it will, after a while, cease to be any worry at all.

— C.L.D (Lewis Carroll)
May 1893

ν_4 : “Extra Credit”

A and B begin, at 6 a.m. on the same day, to walk along a road in the same direction, B having a start of 14 miles, and each walking from 6 a.m. to 6 p.m. daily. A walks 10 miles, at a uniform pace, the first day, 9, the second, 8 the third, and so on: B walks 2 miles, at a uniform pace, the first day, 4 the second, 6 the third, and so on. When and where are they together?

Send complete answers to Prof. Visscher at dvisscher@ithaca.edu. Correct solutions will be awarded 10 points “extra credit”.

*The school year has arrived at last
in a form that is new and recast:
though not in the room,
we’ll meet you on Zoom.*

—Your fellow math enthusiasts!

—D.V.