UNDERGRADUATE MATH SEMINAR

Come join us for the last undergraduate math seminar of this academic year.

DATE: Thursday, May 27

Time: 1:20 – 2:15

Zoom: https://union.zoom.us/j/92591304428

In this week's seminar, **Professor Greg Malen** of the **Union College Math Department** will present the following talk:

Professor Greg Malen

Title: High-Dimensional Holeyominoes and Hyperbolic Polyforms

Abstract: A polyomino is a finite ``rook-connected'' subset of squares on an infinite chessboard, which one can imagine is constructed by taking individual square tiles and gluing them together along their edges. In this talk, I will be considering extremal properties of these structures with respect to the requirement that a fixed number of squares is arranged such that their edges bound a maximal number of holes. These ``holeyominoes'' tend towards beautiful symmetries and efficient geometric properties. Building on earlier results with squares in 2-dimensional Euclidean space, I will present new asymptotic bounds for the maximum number of holes which can be bounded by n d-dimensional cubes in d-dimensional Euclidean space. Furthermore, we will look at on-going efforts to find similar results in the hyperbolic plane for subsets of a $\{p, q\}$ tiling, where q regular p-gons meet at every vertex.

Calculus Help Center: Tutoring Positions Available, Fall 2021

The Math Department is now accepting applications for vacant Calculus Help Center (CHC) tutoring positions. Tutors in the fall work in the CHC one fixed night per week, Sunday through Thursday, from 7:30-10:00pm.

Qualifications: Calculus through Math 115 with grades of no less than A-. Preference will be given to students who
- have also completed Math 117 (with a grade of no less than A-),
- are declared math majors,
- are considering becoming a math teacher or pursuing graduate work in mathematics, and
- have other tutoring experience (not necessary, though).

To apply for a position, send an email to Professor Paul Friedman (friedmap@union.edu) expressing your interest, listing your mathematical background, including coursework (term, professor, and grade) and tutoring experience (if any), and discussing why you think you would be a good tutor.

Application deadline: Friday, May 28 at NOON.

Senior Writing and Pieces from Theses

*This week's contribution is from **Zijie Hu** who wrote a two-term honors thesis this past fall and winter under the direction of **Professor Christina Tønnesen-Friedman**. To learn more about Zijie's work, you can view his Steinmetz presentation.*

I completed my senior thesis under the guidance of Professor Tønnesen-Friedman over the course of the past fall and winter terms. My topic of research is related to Riemann Surfaces, a field that

relates complex analysis and topology a lot. This writing let me apply the knowledge that I had gained from previous courses in a synthetic way. For example, at the end of my thesis, I introduce the definitions related to Hurwitz's Formula, prove Hurwitz's Formula and apply Hurwitz's Formula to a Fermat Curve. In general, I am really thankful for this writing experience because it encapsulates the main point of what I have learned in complex analysis (and what I am learning in topology now) and lets me apply that knowledge into this other topic in differential geometry, Riemann Surfaces.

I think my whole thesis process could be divided into two stages. The first stage is learning while the second stage is applying your knowledge to construct a thesis. Here are some tips that can help you in different stages. At the very beginning, it is important to note that reading math is not like reading novels. The pace should be slowed down. Make sure you understand the definitions and can apply those definitions to prove different theorems and propositions. Also, it is important to hold the general picture of the reading so that you can understand the relationship between different propositions and theorems. Exercises and practice problems are good ways to test your understanding of the related materials. On the other hand, at the beginning, it is important to review some of the old notes that you have learned before. Also, make sure you read a lot of supplementary readings carefully and figure out how those materials relate to your major reading.

At the second stage, since there will be a winter break if you are writing your thesis over two terms, it is helpful for you to review the knowledge again, figuring out what is important and what is not important so that this process can provide a direction to what you need to write. Writing the thesis for me is analogous to preparing lecture notes. When you start writing the thesis, organize your time wisely, and make sure you finish each week's goal on time so that you have time to revise and set a new goal for next week. If there are questions on any materials, feel free to ask your advisor in good time.

The topic of Riemann Surfaces is not only a place to develop more beautiful results using the knowledge of complex analysis but also a place that has a lot of fully studied results waiting for you to learn. Indeed, I know this thesis writing is only an introductory thesis and there is a long, hard but beautiful, way to go next, but it provides a good chance to review my skill on what I have learned in the past four years. Although sometimes there are challenges on some parts, after the "puzzles" are placed together in a nice and constructive way, the result is wonderful and unforgettable. In the end, I really need to thank the guidance of Professor Tønnesen-Friedman because I could not have accomplished this thesis-writing without her help in providing me the plans and resources, suggestions of my exercises and my writing, answering my questions, and for encouraging and supporting me when I had hard times on those challenging concepts.

Steinmetz Symposium Presentations Are Now Available!

Student art, videos, posters, performances, and more, for the 31st annual Charles Proteus Steinmetz Symposium are now available online at STEINMETZ 2021. In the section for Oral Presentations, you can find many math talks (listed below) in the 1:00pm session. Enjoy! And congratulations to all of the student contributors!

- Calculus of Variations, by **Di Wu**
- Circle Packing and the Math of Social Distancing, by **My Nguyen**
- Exploring the Art Gallery Theorem and Variations, by **Tina Tully**
- Introduction of Hurwitz's Formula, by **Zijie Hu**
- Manifolds and Riemannian Geometry, by **Daniel Resnick**