UNDERGRADUATE MATH SEMINAR

This week's seminar will be back in its usual location

DATE: **Thursday, May 2**

Time & **12:30pm** – Refreshments in **Bailey 204**

Location: **1:00** – Seminar in **Bailey 207**

In this seminar, **Paulina Volosov** from the **Mathematical Sciences Graduate Program** at **RPI** will present the following talk.

Paulina Volosov

Mathematical Modeling in Computational Neuroscience

Abstract: Computational neuroscience is a field of active research for applied mathematicians. The brain has been actively studied since the second half of the 19th century, but there are still an endless number of unanswered questions about how and why the brain works the way it does.

This presentation will give a basic introduction to some of the questions asked in neuroscience and show how a mathematical model can be built and used to shed light on this complicated biological system. Namely, how can a mathematician attempt to learn about the structure of the brain and networks of neurons? What is it that a mathematical model tries to accomplish? And why is this useful?

Pieces from Theses, by Julia Greene

Julia's thesis was supervised by Professor George Todd

During the fall and winter I had the opportunity to work on my thesis with Professor George Todd as an advisor. My topic was geometric constructions that can be done using a straightedge and compass. I started by exploring the constructability of a pentagon, and then looked at the constructions of a triangle, square, hexagon and octagon. I knew that these specific polygons were constructible, but I needed to be able to classify exactly which n-gons are constructible and which are not. To do this, I needed a lot of abstract algebra and Galois theory, but was eventually able to prove that an n-gon is constructible if and only if $n = 2^k p_1 p_2 \ldots p_t$ where $k \geq 0$ and each p_i is a prime of the form $2^m + 1$.

Next, I did some research on origami construction, which adds a new construction method of folding. To use origami, we must start with 2 distinct points, A and B, and 2 distinct lines, *l* and *m*, such that the points are not lying on the lines. We can then fold one new line that reflects A to a new point on line *l*, and reflects B to a new point on line *m*. This additional construction technique gives us the conclusion that an n-gon is constructible with origami if and only if $n = 2^a 3^b p_1 p_2 \ldots p_t$ where $a, b \geq 0$ and each p_i is a prime of the form $2^m 3^n + 1$.

I then wanted to work backwards to see if I could come up with a new construction axiom that would give the conclusion that an n-gon is constructible with this new axiom if and only if $n = 2^a 3^b 5^c p_1 p_2 \ldots p_t$ where $a, b, c \geq 0$ and each p_i is a prime of the form $2^m 3^n 5^j + 1$. To do this, I needed a construction

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technique that would create the solution to a quintic equation. Eventually, I made an axiom that was similar to the origami axiom but started with 3 points and 3 lines, and I was able to show a specific case where this axiom gave us the solution to a quintic equation.

My advice to any underclass students planning on writing a math thesis is to get familiar with LaTeX and start typing early in the process. From the beginning I typed all of my notes, even though I didn't know exactly what would end up in my final draft. I put most of my early notes in my appendix and I was thankful that I already had them typed. It's much easier to remove things later than to type everything at the end. I would also say don't be afraid to research topics and explore new ideas even if you don't think they directly relate to your topic. I tried looking at elliptic curves, and even though I didn't necessarily need elliptic curves in the end, I learned some interesting concepts that I wouldn't have otherwise.

Math Club

Last week, the Math Club joined with the Physics Club to play a student-written math and physics version of Jeopardy. Participants had a really great time!

Come join the Math Club at its next meeting as it plans it upcoming events for the rest of spring term, and as it starts to consider activities for next year. The next meeting is

Math Club meeting
Wednesday, May 1 at 1:00
Bailey 204, the Math Common Room

Seen on the Roads

Seen Around Bailey

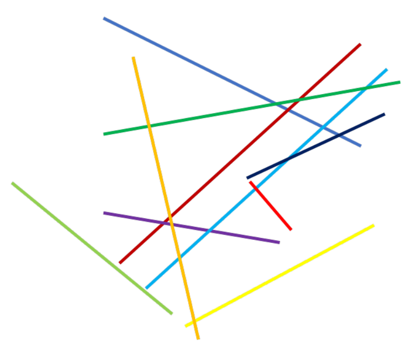
Students taking Math 199 working hard as they collaborate on a homework assignment. And yes, they solved the problem!

Problem(s) of the Newsletter – April 29, 2019

Last week's problem: Unfortunately, no correct solutions to last week's problem were submitted. However, a solution to last week's problem has been posted at the newsletter sites in Bailey Hall.

This week's problem: Here's a cute little problem with a surprisingly fun and familiar(?) answer:

Alice has 10 (straight) sticks. Each stick has an integer length. No matter how hard she tries, she cannot form a triangle using three sticks. What is the shortest possible length of the longest of the 10 sticks?



Professor Friedman (friedmap@union.edu) will accept solutions until midnight Friday, May 3.