UNDERGRADUATE MATH SEMINAR

The next seminar of the term will be

DATE: ==**THURSDAY, October 4**==

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

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

In this seminar, Union College seniors **Danielle Gregg '19** and **Robert Righi '19** will present a talk about the research they did this past summer under the guidance of **Professor Ellen** Gasparovic. The talk they will present is described below.

Seniors Danielle Gregg and Robert Righi

Title: Math, Music, and Health Science

Abstract: Much recent research has focused on discerning topological and geometric features of data. For example, by observing the "birth" and "death" of holes via an algebraic method known as persistent homology, we can distinguish noise from significant features in data. In analyzing the "shape" of data our research diverges into two separate fields: music and health science. How can one use geometric and topological methods to classify a variety of degenerative diseases of the eye or compare songs within an artist's discography? Come learn about what two Union students researched over the past summer as well as the often non-linear research process.

Updated Math Faculty Photo

During this academic year, the Math Department will be performing a self-study followed by an external review. To kick things off, the math faculty spent a Saturday at Union's Kelly Adirondack Center. Taking a break from the work, they assembled to take an updated group photo. How many professors do you recognize?
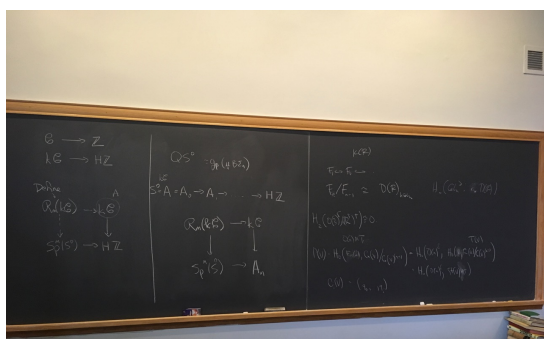
Seen in Bailey Hall …

Front row, L to R: Ehssan Khanmohammadi, Kimmo Rosenthal, Jue Wang, Christina Tønnesen-Friedman, Paul Friedman, Jeff Hatley.

Back row, L to R: Jetjaroen Klangwang, Alan Taylor, Leila Khatami, Jeff Jauregui, Kathryn Lesh, Ellen Gasparovic, Brenda Johnson, Bill Zwicker, Kim Plofker.

Not pictured: Davide Cervone, Roger Hoerl, George Todd

As Easy as ABC? Not so fast!

Have you ever written a proof in Math 199 that you were absolutely certain was correct, only to have it returned to you covered in red ink, and even after reading your professor's remarks, you are still convinced that your proof is valid? You are not alone, as you can see from the following story, based on Ericka Klarreich's article referenced below.

The *abc Conjecture* in Number Theory is somewhat easy to state: suppose *a, b,* and *c* positive integers that satisfy *a+b=c* and do not have any common prime factors, forming an "*abc*-triple". Form the product, *d*, of all of the primes that divide any of *a, b,* or *c*. Now choose any exponent bigger than 1. The conjecture is that there are only finitely many "*abc*-triples" in which *c* is larger than the triple's corresponding *d* raised to the chosen exponent.

In addition to being a difficult (unproven) conjecture, the *abc Conjecture* is considered by some to be one of the most important unsolved problems in Diophantine analysis (as per its Wikipedia entry).

Not too long ago, in 2012, Shinichi Mochizuki, a highly regarded mathematician at Kyoto University, posted papers that claim to prove the *abc* Conjecture. As described by Erika Klarreich in her *Quanta magazine* article, "Titans of Mathematics Clash Over Epic Proof of ABC Conjecture," "his series of papers, which total more than 500 pages, are written in an impenetrable style, and refer back to a further 500 pages or so of previous work by Mochizuki, creating what one mathematician, Brian Conrad of Stanford University, has called 'a series of infinite regress'.

"Between 12 and 18 mathematicians who have studied the proof in depth believe[d] it is correct…., [b]ut only mathematicians in 'Mochizuki's orbit' have vouched for the proof's correctness."

In a report posted online on September 20, 2018, recent Fields medalist Peter Scholze of the University of Bonn and Jacob Stix of Goethe University Frankfort, report that they believe Mochizuki work contains a "serious, unfixable" gap. In particular, they claim that Mochizuki's proof of his "Corollary 3.12" is incorrect and cannot be salvaged using Mochizuki's methodology and ideas. Mochizuki, though, disagrees!

So, who is right? Has the *abc* Conjecture been proven, or is it still open? For more on the drama, read the article!

Problem of the Newsletter – October 1, 2018

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

This week's problem: One more "Fun with Polynomials!" problem. Factor the polynomial below.

$$p(x) = 1 - \frac{x}{1} + \frac{x(x-1)}{1 \cdot 2} - \frac{x(x-1)(x-2)}{1 \cdot 2 \cdot 3} + \cdots + (-1)^n \frac{x(x-1) \cdots (x-n+1)}{1 \cdot 2 \cdot 3 \cdot \cdots \cdot n}$$

(Hint: what are the roots of *p(x)*?)

Professor Friedman (friedmap@union.edu) will accept solutions until midnight on Friday, October 5.