

## UNDERGRADUATE MATH SEMINAR

The next seminar will be one day later in the week and down the hallway from its usual day and location!

**DATE:** **Friday, November 1**

**Time &** **12:30 pm** – Pizza and drinks

**Location:** **1:00 pm** – Seminar in **Bailey 201**

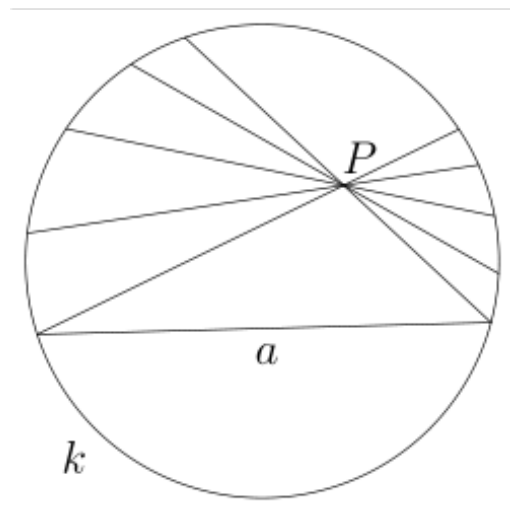


Professor Ellen Gasparovic

In this week's seminar, **Professor Ellen Gasparovic** from the Department of Mathematics at **Union College** will deliver the following talk:

### Title: The Strange New Universe of Hyperbolic Geometry

**Abstract:** The fifth postulate in Euclid's *Elements* states that, in a plane, given a line  $l$  and a point  $P$  not on  $l$ , there is exactly one line through  $P$  that is parallel to  $l$ . Although this is an axiom in Euclidean geometry, what happens when you don't assume that the so-called "parallel postulate" holds? The answer is that beautiful non-Euclidean geometries emerge, such as that of the hyperbolic plane (what mathematician Janos Bolyai referred to as a "strange new universe"). In this talk, we will learn about what it means for lines to be "parallel" or "ultra-parallel" in this strange new setting, with an eye toward classifying all distance-preserving transformations using the Klein disk model for the hyperbolic plane.



### Math Club and AWM to Host Dinner and Discussion

Math Club and Union's chapter of The Association of Women in Mathematics (AWM) will be hosting a **Dinner and Discussion** on **Tuesday, October 29** in the **Green House Great Room**. The topic under discussion is "What it's like to be a math major and a woman in math." Many of the women math professors and current math majors will be there. Come and join the conversation.

And Union will be catering the dinner!

Calculus midterm coming up? WeBWork Woes?  
Go to the **CALCULUS HELP CENTER!**  
Sunday – Thursday, 7:30 – 10:00pm  
Sorum House Seminar Room

### Petitioning

Don't forget to accept (or decline) your course petitions on WebAdvising  
Tuesday, October 29 – Thursday, October 31

## With Category Theory, Mathematics Escapes From Equality

In the October 10, 2019 issue of the online math and science magazine, Quanta Magazine, Kevin Hartnett has a wonderfully written article, "[With Category Theory, Mathematics Escapes From Equality](#)," with an opening teaser: *"Two monumental works have led many mathematicians to avoid the equal sign. Their goal: Rebuild the foundations of the discipline upon the looser relationship of 'equivalence.' The process has not always gone smoothly."* The article describes a relatively recent revolution that is occurring in some branches of modern mathematics, originating from what are called "infinity categories." The first few paragraphs of that article are reprinted here (without permission...), hoping to inspire the interested reader to read the entire article online.

*"The equal sign is the bedrock of mathematics. It seems to make an entirely fundamental and uncontroversial statement: These things are exactly the same.*

*"But there is a growing community of mathematicians who regard the equal sign as math's original error. They see it as a veneer that hides important complexities in the way quantities are related — complexities that could unlock solutions to an enormous number of problems. They want to reformulate mathematics in the looser language of equivalence.*

*"We came up with this notion of equality," said Jonathan Campbell of Duke University. 'It should have been equivalence all along.'*

*"The most prominent figure in this community is Jacob Lurie. In July, Lurie, 41, left his tenured post at Harvard University for a faculty position at the Institute for Advanced Study in Princeton, New Jersey, home to many of the most revered mathematicians in the world.*

*"Lurie's ideas are sweeping on a scale rarely seen in any field. Through his books, which span thousands of dense, technical pages, he has constructed a strikingly different way to understand some of the most essential concepts in math by moving beyond the equal sign. 'I just think he felt this was the correct way to think about mathematics,' said Michael Hopkins, a mathematician at Harvard and Lurie's graduate school adviser.*

*"Lurie published his first book, [Higher Topos Theory](#), in 2009. The 944-page volume serves as a manual for how to interpret established areas of mathematics in the new language of "infinity categories." In the years since, Lurie's ideas have moved into an increasingly wide range of mathematical disciplines. Many mathematicians view them as indispensable to the future of the field. 'No one goes back once they've learned infinity categories,' said John Francis of Northwestern University."*

## Problem of the Newsletter – October 28, 2019

**Last week's problem:** Congratulations to **Son Nguyen '23** for submitting a correct solution to last week's problem ... and a couple of extensions of the problem. You can view his work on the newsletter sites in Bailey Hall.

**This week's problem:** Prove that a triangle in the plane whose vertices have integer coordinates cannot be equilateral.

**Professor Friedman** ([friedmap@union.edu](mailto:friedmap@union.edu)) will accept solutions until noon on Friday, November 1.