

2022 North Central KME Convention Abstracts

• Curves with a particularly distinguished shape

Keynote address: Dr. Michael Jablonski, University of Oklahoma

A recurrent theme in modern mathematics is to find a canonical form or presentation of an object (up to some notion of equivalence). For example, with matrices, we can put them in Jordan canonical form or diagonalize them when they have distinct eigenvalues. In this talk, we will consider geometric objects, in particular curves, and the kinds of canonical or distinguished shapes they may take.

• Poisson Transformations

Speaker: Kyle Brinker, Emporia State University

Faculty Sponsor: Larry Scott

This project seeks to improve the experimental percentage of rejecting the null hypothesis when, in fact, it is true for smaller values of μ in Poisson distributions. Poisson distributions are discrete probability distributions commonly used to determine the number of times an event occurs in a given amount of time. When examining experimental data, the experimental percentage of rejecting the null hypothesis when, in fact, it is true should approximately equal α . However, for smaller values of μ in a Poisson distribution, this experimental percentage tends to be higher than α . Using simulation techniques in SAS software and statistical transformations, this project will attempt to improve this experimental percentage to a value approximately equal to α for small values of μ .

• Philosophical Problems with Real Numbers

Speaker: Rylee Dennis, Pittsburg State University

Faculty Sponsor: Scott Thuong

The concept of real numbers is long withstanding in mathematics. Real numbers are quantities that can be expressed in a finite or infinite decimal and include rational and irrational numbers. For many centuries, mathematicians had a hard time accepting this set of numbers, specifically the irrational ones. In fact, there are people today who still do not accept the concept of real numbers. Mathematician Norman Wildberger is one of those people. He says they are not in fact real at all. His lack of acceptance stems from his issue with the concept of infinity. Without believing in the infinite, irrational numbers cease to exist. Two areas of mathematics that frequently use irrational numbers are trigonometry and calculus. In this talk, we will explore how Wildberger changed mathematics

by inventing ‘Rational Trigonometry’ and ‘Algebraic Calculus’ so that he does not have to accept real numbers.

• **An Exploration of the Tutte Polynomial**

Speaker: Ryan Haller, Washburn University

Faculty Sponsor: Jennifer Wagner

The Tutte Polynomial is a mathematical tool used in Graph Theory. It can be used to describe the connectivity of a graph and determine other useful information about it, such as the number of spanning trees of a graph, the chromatic polynomial, and the number of acyclic orientations of a graph. Here, the Tutte Polynomial will be constructed using the operations of deletion and contraction, and some of its applications will be explored.

• **Circular Projections of Ellipsoids**

Speaker: Peter Russell, Evangel University

Faculty Sponsor: Don Tosh

An ellipsoid is the three dimensional extension of the idea of an ellipse. Written algebraically, the set of points $(x, y, z) \in \mathbb{R}^3$ satisfying the equation

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1, \tag{1}$$

for some choice of $(a, b, c) \in \mathbb{R}^+$, is an ellipsoid centered at $(0, 0, 0)$ with semi axis lengths of a , b , and c . The goal of this paper is to show that it is always possible to rotate a set of points of this form such that their shadow projected onto a plane is a perfect circle.

• **The Magic Zero**

Speaker: Xiaodi Xun, Pittsburg State University

Faculty Sponsor: Cynthia Huffman

Zero is not nothing, but everything. We went a long way to accept zero, and after that, zero has served as a tool that has opened up many new worlds for us. We will present the history of the concept of zero, and how it has influenced mathematics.