Program of Activities

For the 2023 Spring Meeting of the

Mathematical Association of America

Ohio Section

Spring 2023

Baldwin Wallace University

Berea, Ohio

March 31 - April 1, 2023

MAA Ohio Section
Spring 2023 Program

Friday, March 31

12:00 – 4:00	Registration	CIG Atrium
12:00 – 1:00	Committee Meetings (if needed)	
	CONCUR (Curriculum)	KNOW 108
	CONSACT (Section Activities)	KNOW 110
	CONTEAL(Teacher Education & Licensure)	KNOW 126
12:00 – 1:20	CONSTUM Student Team Competition	CIG 105-108
1:00 – 4:00	Vendor & Book Exhibits	CIG Atrium
1:15 – 1:30	Welcome and Announcements	CIG 112-114
1:30 – 2:30	CONCUR Sponsored Panel: **"College Credit Plus (CCP) : A Bird's Eye View"** Becky Harr, Tena Roepke, Glen Lobo	CIG 112-114
2:30 – 2:50	Break	CIG Atrium
2:50 – 3:50	Invited Address **"Feel the Wrath of Math: The Journey of a Competitive Mathematician"** Pamela Warton	CIG 112-114
4:00 – 5:15	Contributed Paper Sessions	KNOW 107-109, 112
5:15 – 6:00	Social Time	CIG Atrium
5:30 – 6:30	Student Pizza Party	CIG 107-108
6:00 – 7:00	Banquet	CIG 112-114
7:00 – 8:00	Invited Address **"Take a Walk with Me"** Anastasia Chavez	CIG 112-114

CIG = Center for Innovation and Growth
KNOW = Knowlton Center

Saturday, April 1

8:00 – 10:00	Registration	CIG Atrium
8:00 – 10:00	Book Vendors & Exhibits	CIG Atrium
8:00 – 9:25	Coffee and Pastries	CIG Atrium
8:50 – 9:25	Committee on Local Arrangements	CIG 103
9:25 – 9:35	Welcome and Announcements	CIG 112-114
9:35 – 10:35	Invited address **"Matroids, Positroids, and Beyond!"** Anastasia Chavez	CIG 112-114
10:35 – 10:50	Break	CIG Atrium
10:50 – 11:45	Contributed Papers Sessions	KNOW 107, 109, 112
11:45 – 12:00	Break	CIG Atrium
12:00 – 1:00	Invited address **"Making a career by putting numbers in boxes "** Michael Schroeder	CIG 112-114
1:00-1:10	Closing Remarks	CIG 112-114

Abstracts of Invited Addresses
Friday

Panelists: Becky Harr, Ohio Department of Higher Education;
                         Tena Roepke, Ohio Northern University;
                         Glen Lobo, Sinclair Community College

Title: College Credit Plus (CCP): A bird's eye view

Abstract: The panel will feature three experts who will share their insights on different aspects of CCP. After each panelist shares their insights, there will be an opportunity for discussion with the audience.

Likely discussion points for this panel:

- What is CCP?
- How does it work?
- Policies?
- Oversight?
- How can it be improved?

Please plan to attend this event to share your experiences and get insights on CCP. The Committee on Curriculum (CONCUR) especially encourages CCP instructors, coordinators, and students to participate, as your input and perspectives will greatly contribute to the event's success. Don't miss this opportunity to engage in a valuable conversation about CCP and its impact on education.

Speaker: Pamela Warton, University of Findlay

Title: Feel the Wrath of Math: The Journey of a Competitive Mathematician

Abstract: Many undergraduate research projects have been completed with my students over the years. I would typically let the students pick the topic, but it had to sound enjoyable to both of us. Some of my favorites will be highlighted in this talk with detail about a few of the projects that combined my love of math, gaming, and computers. This includes (in order of difficulty) Nim, Monopoly, and a Lumosity game called Pirate's Passage. The talk will end with an open-ended question for someone to tackle with similar interests.

Speaker: Anastasia Chavez, St. Mary's College of California
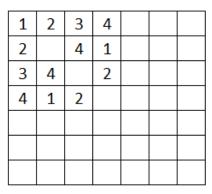**Title:**   Take a Walk with Me

Abstract: It's not unusual for the origin story of a mathematician to begin with "From a young age he showed great mathematical potential" or "I knew early on I loved math". Well, I'm here to offer a different narrative. In hindsight, perhaps both of these statements (in some forgivable way) apply to me too. And yet, as a first generation college student coming from a non-mathematical family, this path I've traveled has surprised me as much as it has dispelled the notion that one must come from math or exude mathematical genius in order to become a mathematician. Moreover, that community, perseverance, and dedication are important factors in determining one's future. I'm excited to share some of my journey to becoming a mathematician, the challenges and successes along the way, and offer an alternative perspective to who a mathematician is and can be.

Speaker: Anastasia Chavez, St. Mary's College of California
Title: Matroids, Positroids, and Beyond!

Abstract: Matroids are a fundamental combinatorial object with connections to many areas of mathematics: algebraic geometry, cluster algebra, coding theory, polytopes, physics ... just to name a few. Introduced in the 1930's, Whitney defined matroids with the desire to abstract linear and graphical dependence. In fact, every graph is associated with a matroid (called graphical) and from every vector configuration arises a representable matroid (over some field F). It has been shown that most matroids are neither graphical or representable, making these two matroid properties rare and highly desired.

A particularly well-behaved family of representable matroids, called positroids, was introduced by Postnikov and shown to have deep connections to the totally nonnegative Grassmannian and particle physics. Moreover, he described several combinatorial objects in bijection with positroids that compactly encodes matroidal data and have been shown to characterize many matroidal properties. With just a few definitions and examples revealing their connections to a variety of fields, you too can begin searching for the matroids living among us.

Speaker: Michael W. Schroeder, Marshall University

Title: Making a career by putting numbers in boxes

Abstract: Pop quiz! Can you fill the empty cells in either of the following grids below with the numbers from the set {1,2,3,4,5,6,7} so that no number appears in a row or column more than once?

1	2	3	4			
2		4	1			
3	4		2			
4	1	2				

1	2	3	4			
2	3	4	1			
3	4		2			
4	1	2				

Since my graduate school days, I have researched objects related to Latin squares which, informally, are grids of numbers in which no symbol is repeated in any row or column (think completed Sudoku puzzles).

Their study has a rich history which significantly predates my own time with them (for example, Euler is credited with coining the term ``Latin square''). In this presentation, we will see a snapshot of the history of ``embedding'' problems – problems which start with a partially completed grid (like the ones above) and ask if it is possible to complete the grid to a Latin square and, in particular, some of my history with these problems.

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Brief Biographies of Invited Speakers

Becky Harr, College Credit Plus

Becky Harr is the College Credit Plus program director at the Ohio Department of Higher Education. In this role, she works closely with the department's legislative and policy team to serve Ohio's students and families. Becky works directly with secondary and higher education professionals to assist with the growing program that offers college credit opportunities for high school students. Previously, Becky served as ODHE's program manager of College Credit Plus. Prior to joining ODHE, Becky served as the director of the Upward Bound Program at Shawnee State University. She brings over 20 years of college-access experience to her role as the CCP Director.

Tena Roepke, Ohio Northern University

Tena Roepke is a Professor of Mathematics at Ohio Northern University where she also serves as the Director of the School of Science, Technology, and Mathematics in the Getty College of Arts & Sciences. She has extensive experience in teaching various courses such as mathematics courses for future engineers and pharmacists and pre-service mathematics and methods courses for prospective teachers in early childhood, middle childhood, and AYA Mathematics licensure programs. She holds degrees from BGSU (B.S., M.Ed., M.A. Mathematics) and The University of Toledo (Ed.D. Curriculum & Instruction).

Glen Lobo, Sinclair Community College

Glen Lobo is a Professor of Mathematics at Sinclair Community College. He has served as the Assistant Chair of the department since 2007, except for a brief period (February 2022 - August 2022) when he served as the Interim Chair while the previous chair transitioned to the Dean role and before a new Chair was appointed. Prior to joining Sinclair, he worked at the University of Dayton and at Ferris State University. He has an M.Sc. in mathematics from the Indian Institute of Technology - Kharagpur and an M.S. in mathematics from the University of Wisconsin-Milwaukee. Glen has also been actively involved in the CONCUR committee of the Ohio MAA for many years.

Pamela Warton, University of Findlay

Dr. Pamela Warton received a Bachelor's of Science with a double major in Computer Science and Mathematics from BGSU in 1981. She started her career at General Motors in Detroit working on Finite Element Modeling and Surfacing applications. She was put in charge of training new programmers and realized how much she enjoyed teaching. She started graduate school in 1988 at BGSU where she received her PhD in 1995 in infinite ordered group theory with a dissertation entitled "Lexicographic Powers of the Real Line". She taught at BGSU for five years, but moved to Siena Heights University after becoming disgruntled with large class sizes. She ended up at The University of Findlay in 2006. She began the Euler Math Club and applied for and was awarded a charter for the Ohio Tau section of Pi Mu Epsilon, a mathematics honor society. She served on at least one million committees, and she served as chair of the department from 2009 to 2017. She also served as the secretary of the Ohio section of the MAA for many years. She retired in August of 2022. Her greatest joy was teaching, doing undergraduate research projects, and getting to know her students and making a difference in their lives.

Anastasia Chavez, St. Mary's College of California

Anastasia Chavez is an Assistant Professor of Mathematics at Saint Mary's College of California. Born and raised in California, she transferred from the Santa Rosa Junior College and earned a bachelors in applied mathematics and masters in mathematics from San Francisco State University. After earning her Ph.D. in enumerative and algebraic combinatorics with an emphasis in matroid theory from the University of California, Berkeley, Anastasia was a Huneke Fellow at the Mathematical Sciences Research Institute and Presidents' Postdoctoral Fellow, NSF Mathematical Sciences Research Postdoctoral Fellow, and Krener Assistant professor at the University of California, Davis.

As a math educator and researcher, Anastasia aims to nurture the math ability that exists in every person. In and out of the classroom, she hopes to inspire the confidence to be curious, explore the unknown, and search for solutions that lead to even more meaningful questions. When Anastasia puts the math books down, you'll most likely find her hiking, camping, and exploring nature with her partner, two kids, and furry friends.

Michael W. Schroeder, Marshall University

Michael W. Schroeder is an Associate Professor of Mathematics at Marshall University in Huntington, West Virginia (the southern-most point in the Ohio section!). He received his bachelor's and master's degrees in mathematics from the University of Florida and his Ph.D. from the University of Wisconsin, Madison. His area of research is broadly combinatorics, but largely focuses on problems related to Latin squares and graph decompositions. Michael has received university-wide awards for both his teaching and research at Marshall. He has been active in the MAA since 2011, and in the past has served as a local host liaison and program committee chair. Currently, he serves as a co-organizer of the section's Project NExT and the current webmaster. Michael is also a past participant of PIC Math, an MAA-sponsored program which provides faculty development toward sponsoring community-driven, data-driven research projects for math majors.

Contributed Paper Sessions

*denotes undergraduate student
Friday, March 31
4:00—5:15

Time	**Session A** **Session Chair:** Anup Lamichhane **Room:** KNOW 107
4:00 – 4:15	***An exponential approach to solve ill-conditioned linear system in positive-definite kernel-based approximations*** Abstract 1 Anup Lamichhane Ohio Northern University
4:20 – 4:35	***A new Online Educational Resource (OER) for Linear Algebra*** Abstract 2 Paul Zachlin Lakeland Community College Anna Davis Ohio Dominican University
4:40 – 4:55	***An inequality inspired by a problem of minimal probability*** Abstract 3 Anda Stan* Ohio State University – Columbus

Friday, March 31
4:00—5:15

Time	Session B **Session Chair:** Michael Schroeder **Room:** KNOW 109
4:00 – 4:15	***Applying Computational Resources to the Down-Arrow Problem*** Abstract 4 Johnathan Koch Youngstown State University
4:20 – 4:35	***Stolz-Cesaro Theorem and Its Application to Summing Powers of Consecutive Integers*** Abstract 5 Qiqi Ding* Ohio State University – Columbus
4:40 – 4:55	***Oresme, Oresme*** Abstract 6 Phil Blau Shawnee State University

Friday, March 31
4:00—5:15

Time	Session C **Session Chair:** Zijian Diao **Room:** KNOW 108
4:00 – 4:15	***Trials in Mastery Grading*** Abstract 7 Melissa Dennison Baldwin Wallace University
4:20 – 4:35	***A Study of Mathematics Success Rates and Learning Amid a Pandemic*** Abstract 8 Amy Osborne Antioch College
4:40 – 4:55	***Step-By-Step Guided Calculus Problem Solving*** Abstract 9 Austin Swack Hawkes Learning
5:00 – 5:15	***Reducing Your Stress When Grading Final Exams*** Abstract 10 David Cusick Marshall University

Friday, March 31
4:00—5:15

Time	Session D **Session Chair:** Jillian Stupiansky **Room:** KNOW 112
4:00 – 4:15	***Development of African Countries: In-Depth Analysis of the Effects of Colonialism*** Abstract 11 Ludiah Bagakas* Cleveland State University
4:20 – 4:35	***A mathematical model of the Hemlock Woolly Adelgid infestation in the Smoky Mountains*** Abstract 12 Jillian Stupiansky John Carroll University
4:40 – 4:55	***Analyzing the Interlibrary Loan System*** Abstract 13 Kailin Breedlove*, Moore Bright*, Parker Stevens* Baldwin Wallace University
5:00 – 5:15	***Poetry and Mathematics?*** Abstract 14 Brian Shelburne Wittenberg University

Saturday, April 1
10:50—11:45

Time	Session E **Session Chair:** Axel Brandt **Room:** KNOW 107
10:50 – 11:05	*Positive solutions to one-dimensional double phase problems* Abstract 15 Byungjae Son Ohio Northern University
11:10 – 11:25	*The monotonical dependence, on the volatility of the return rate, of the expected value of a European option* Abstract 16 Aurel I. Stan Ohio State University – Marion
11:30 – 11:45	*Comparison Between the Black-Scholes and Heston Models* Abstract 17 Mahamoud Musleh* Cleveland State University

Saturday, April 1
10:50—11:45

Time	Session F **Session Chair:** Gordon Swain **Room:** KNOW 109
10:50 – 11:05	***Markoving a Deck of Cards*** Abstract 18 Gordon Swain Ashland University
11:10 – 11:25	***How to divide the raise pool*** Abstract 19 Zijian Diao Ohio University – Eastern
11:30 – 11:45	***Tales from the Monte Carlo Laboratory*** Abstract 20 Aaron Montgomery Baldwin Wallace University

Saturday, April 1
10:50—11:45

Time	Session G **Session Chair:** Lisa Stelmarski **Room:** KNOW 112
10:50 – 11:05	***A Variation on DNA Self-Assembly*** Abstract 21 Justine Appolonia* Youngstown State University
11:10 – 11:25	***Harmonious Labelings and DNA Self-Assembly*** Abstract 22 Devan Miller* Youngstown State University
11:30 – 11:45	***Network Analysis of the Paris and Tokyo Subway Systems*** Abstract 23 Travis Schauer Youngstown State University

Abstracts of Contributed Papers

Friday 4:00 – 5:15

An exponential approach to solve ill-conditioned linear system in positive-definite kernel-based approximations

Anup Lamichhane

Ohio Northern University

Abstract 1: Recently, an exponential approach has been introduced in literature to solve highly ill-conditioned linear systems. We investigate this approach to deal with the ill-conditioned linear system resulting from a kernel-based approximations method.

A new Online Educational Resource (OER) for Linear Algebra

Paul Zachlin

Lakeland Community College

Anna Davis

Ohio Dominican University

Abstract 2: This talk presents a new open-source interactive linear algebra text for an introductory course. The text uses explorations, auto-graded questions, Octave exercises, and embedded GeoGebra interactives to engage students and to develop their intuition. This talk highlights particular sections of the book that demonstrate some of its interactive features. The book is freely available at https://ximera.osu.edu/oerlinalg

An inequality inspired by a problem of minimal probability

Anda Stan*

Ohio State University – Columbus

Abstract 3: A classic problem says that if we equip the set of integers with a probability distribution, and we extract at random three integers with replacement, then the probability that their sum is divisible by 3 is at least 1/4. We look at a proof of this result and improve on the algebraic inequality resulting from this fact.

Applying Computational Resources to the Down-Arrow Problem

Johnathan Koch

Youngstown State University

Abstract 4: The down-arrow Ramsey set of a graph reports all edge-induced subgraphs which are present in arbitrary red-blue edge colorings of a graph. Calculating this set is computationally prohibitive with the resources commonly available to graph theorists and academics. Presented is work on the development of a Python script to generate the down-arrow Ramsey set of a graph through efficient memory management and parallel computing methodologies in addition to new results on complete bipartite graphs.

Stolz-Cesaro Theorem and Its Application to Summing Powers of Consecutive Integers

Qiqi Ding*

Ohio State University – Columbus

Abstract 5: We prove first that given any two sequences $(a_n)_{n>0}$ and $(b_n)_{n>0}$, with the second sequence increasing to infinity, the inferior and superior limits of their ratios are squeezed by the inferior and superior limits of the ratios of their increments. As a corollary, we obtain Stolz-Cesaro theorem. We apply this theorem to prove that when summing up the p powers of the first n natural numbers, the coefficient of n^p, in the resulting formula, is always equal to 1/2, regardless of the positive value of p.

Oresme, Oresme

Phil Blau

Shawnee State University

Abstract 6: ORESME is an acronym for a reading group that looks at original source materials in mathematics. The group took its name from Nicole Oresme (1323-1382). For its 25th anniversary, the group read some of Oresme's work on the "latitude or forms," a geometric visualization that may (or may not) been a precursor of graphical representation of functions, and a proof that the harmonic series diverges. This talk will discuss these, along the benefits I have gotten from my participation in the ORESME reading group.

Trials in Mastery Grading

Melissa Dennison

Baldwin Wallace University

Abstract 7: For the past 5 years I've taught a variety of courses while trying out a variety of different mastery grading plans. In this talk I'll discuss how I used mastery grading in my courses, why I adopted these changes, and the impact that mastery grading has had on my teaching and my students.

A Study of Mathematics Success Rates and Learning Amid a Pandemic

Amy Osborne

Antioch College

Abstract 8: This presentation will discuss findings from research on mathematics course success during the pandemic. Although the initial findings of this research did not find a statistically significant difference in final course grades prior to and during the pandemic, further disaggregating the data resulted in a better understanding of the effects on student success during the pandemic and highlighted some of the inequities presented in other literature on the Pandemic. The findings and information on first-generation, BIPOC, and Pell-eligible students in first-year mathematics courses, remedial, quantitative reasoning, and college algebra will be presented.

Step-By-Step Guided Calculus Problem Solving

Austin Swack

Hawkes Learning

Abstract 9: Explore Calculus through a mastery-based homework & testing software featuring over 43,000 algorithmically generated questions and a powerful LaTex-based Question Builder tool for faculty. Save time grading and receive detailed analytics on question-based performance while the software provides error-specific feedback and guides students through interactive step-by-step problem-solving tutorials. *Win one of three $25 Gift Cards!*

Reducing Your Stress When Grading Final Exams

David Cusick

Marshall University

Abstract 10: Sound familiar? You have a large pile of finals to grade by hand but only a short time window before your grades will be due! Maybe this can help. Prepare in advance, use more information, and know when enough is enough. I will suggest how I did all that before becoming an emeritus. You can do it too.

Development of African Countries: In-Depth Analysis of the Effects of Colonialism

Ludiah Bagakas*

Cleveland State University

Abstract 11: Africa is very rich in history and culture. Unfortunately, across the world it is seen as primitive, monolithic and especially impoverished. Although poverty rates in Africa are relatively high in comparison to the rest of the world, there is a lot of history and truth behind this fact that society neglects. We use statistics to evaluate whether or not there is an association between poverty rates in African countries and a series of covariates.

A mathematical model of the Hemlock Woolly Adelgid infestation in the Smoky Mountains

Jillian Stupiansky

John Carroll University

Abstract 12: An insect known as the Hemlock Woolly Adelgid has caused incredible devastation of hemlock trees in the Great Smoky Mountains. A modification of the SIR model has been used to model this infestation. We'll discuss the biological background and motivation and development of the model. The calculation of the basic reproduction number, R_0, as well as theoretical results and simulations related to R_0, will also be presented.

Analyzing the Interlibrary Loan System

Kailin Breedlove*, Moore Bright*, Parker Stevens*

Baldwin Wallace University

Abstract 13: Senior students had the opportunity to partner with the State Library of Ohio to examine and model the interlibrary loan system.

Poetry and Mathematics?

Brian Shelburne

Wittenberg University

Abstract 14: I was asked to "review" the mathematics for a collection of poems based on mathematics. The result: *Manifold: poetry of mathematics* (3: A Toas Press) by E. R. Lutken. The talk will present a selection of the poems showing either where mathematics enhances the understanding of the poem, or how the poem presents a deeper insight into mathematics.

Saturday 10:50 – 11:45

Positive solutions to one-dimensional double phase problems

Byungjae Son

Ohio Northern University

Abstract 15: In this talk, we discuss the existence and multiplicity of positive solutions to one-dimensional generalized double-phase problems, describing models for strongly anisotropic materials. We use the Krasnoselskii-type fixed point theorem to get the results.

The monotonical dependence, on the volatility of the return rate, of the expected value of a European option

Aurel I. Stan

Ohio State University – Marion

Abstract 16: Karamata inequality uses the Abel summation method to extend the classic Jensen inequality. We review first the proof of Karamata inequality with weights for convex functions. Then, we apply this inequality, to prove that the expected value of a European call option, in the Binomial Model, increases as the the volatility of the return rate increases.

(This is a joint work with my former student Yuxuan Tao).

Comparison Between the Black-Scholes and Heston Models

Mahamoud Musleh*
Cleveland State University

Abstract 17: The Black-Scholes Model is a mathematical model for estimating the values of financial derivatives. Its success relies on five parameters and many assumptions. One of the most important assumptions and drawbacks is that the volatility of the underlying asset must be constant, which is never seen within market data. The Heston Model remedies this shortcoming by representing volatility as a stochastic process. In doing so, the Heston Model can provide more accurate estimations**.**

Markoving a Deck of Cards

Gordon Swain
Ashland University

Abstract 18: In games where moves between spaces are determined by drawing a card, the probabilities of moving between spaces change depending on the current state of the deck. On the other hand, moves determined by a roll of dice or a spinner have fixed transition probabilities and a Markov process calculation can give the expected length of the game. Inspired by the game Sorry!, we explore various ways of assigning transition probabilities for a small, simple game with cards, and compare their Markov-predicted game length to the average length of many computer simulated games.

How to divide the raise pool

Zijian Diao
Ohio University – Eastern

Abstract 19: It is common practice to evaluate faculty by rating them numerically in all parts of their workload, such as teaching and research. Many institutions also use these ratings to decide faculty raises. The obvious method is to allot faculty shares of raise pool according to their contributions in the total rating. In this talk, I will highlight several pitfalls of this method, including one reminiscent of the Simpson's paradox, and suggest a better alternative.

Tales from the Monte Carlo Laboratory

Aaron Montgomery

Baldwin Wallace University

Abstract 20: We will give an overview of Monte Carlo simulations and the role they can play in an undergraduate probability or statistics curriculum; we will place particular emphasis on their pedagogical strengths and weaknesses. This talk is intended to be accessible to anyone who enjoys probability or statistics at any level.

A Variation on DNA Self-Assembly

Justine Appolonia*

Youngstown State University

Abstract 21: Constructing synthetic self-assembling DNA structures can lead to more effective treatments and diagnosis of diseases. One way to model this process is with graph structures. We can imagine strands of DNA as branches meeting at a single point, called a vertex. When these strands bond, they form an edge. We investigate how these strands bond under increasingly restrictive constraints, and through a graph theoretic lens.

Harmonious Labelings and DNA Self-Assembly

Devan Miller*

Youngstown State University

Abstract 22: Modeling self-assembling DNA structures is a rapidly growing area due to improvements in nanotechnology. Many are using graph structures to model the DNA branches and using a form of graph labeling in order to minimize how the branches bond in a specified way and under increasingly restrictive constraints. This type of labeling has many connections to Harmonious labeling, a popular topic in graph theory. We investigate this connection in a new type of graph labeling.

Network Analysis of the Paris and Tokyo Subway Systems

Travis Schauer

Youngstown State University

Abstract 23: This presentation applies network analysis to the subway systems of Paris and Tokyo to gain insights that might help improve their efficiency and sustainability. The study explores various aspects of network science, comparing different metrics with a focus on centrality scores. Additionally, the chromatic number of both networks is found to be 3. The findings can help inform transportation planning and policy.

Save this Date!

2023 Fall Meeting of Ohio Section of the MAA
Ohio University – Lancaster
October 20 – 21

Stay informed about the activities of the Ohio Section of the Mathematical Association of America by visiting the website https://www.ohio.maa.org/ or scanning the QR code below.