Program of Activities
For the 93rd Annual Meeting of the

Mathematical Association of America

Ohio Section

Spring 2009
Bowling Green State University
Bowling Green, Ohio
April 3-4, 2009

MAA Ohio Section

Program

Friday, April 3

Noon-4:30	Registration	Olscamp Hall 101A
12:00-1:20	Student Team Competition	BTSU 308
12:15-1:15	Committee Meetings:	
	CONCUR	BTSU 306
	CONSACT	BTSU 307
	CONTEAL	BTSU 309
1:00-4:30	Vendor and Book Exhibits	Olscamp Hall 101A
1:30-1:45	Welcome & Announcements	Olscamp Hall 101B
1:45-2:45	Invited Address: **"Jared Mansfield: Ohio's First Mathematician"** *Fred Rickey, United States Military Academy*	Olscamp Hall 101B
2:45-3:15	Break	Olscamp Hall 101A
3:25-5:20	**Contributed Paper Sessions**	BTSU 208, 307, 309, 314, 315, 316
3:25-5:20	Executive Committee meeting	BTSU 306
5:30-6:30	Invited Address: **"Canoe Do Math?"** *Vickie Van Dresar, Ashland University*	Olscamp Hall 111
6:30-8:00	Student Pizza Party and Graduate School Panel Discussion	BTSU 308
6:45-8:00	Banquet	BTSU 228
8:10-9:00	After-Dinner Talk: **"Street Mathematics: And What We Can Learn From It"** *Keith Devlin, Stanford University*	Olscamp Hall 111
9:00	**Business Meeting and Presentation of Teaching Award**	Olscamp Hall 111

Saturday, April 4

8:00-10:15	Registration	Olscamp Hall 101A
8:00-10:15	Vendor and Book Exhibitions	Olscamp Hall 101A
8:00-8:50	Coffee and pastries	Olscamp Hall 101A
8:05-8:40	Executive Committee meeting continuation (if necessary)	Olscamp 120
8:05-8:40	Liaisons' and Department Chairs' Meeting	Olscamp 119
8:50-8:55	Announcements	Olscamp Hall 101B
8:55-9:55	Invited Address: **"Good News Everyone! Mathematical Morsels from The Simpsons and Futurama"** *Sarah Greenwald, Appalachian State University*	Olscamp Hall 101B
9:55	Announcement of Student Competition Winners	Olscamp Hall 101B
9:55-10:15	Break	Olscamp Hall 101A
10:25-11:40	**Contributed Paper Sessions**	Olscamp 119,120, 121, 203, 205, 206, 209,211
11:50-12:50	Invited Address: **"When Mathematics Changed Us"** *Keith Devlin, Stanford University*	Olscamp Hall 101B
12:50	**Closing Remarks**	Olscamp Hall 101B

Abstracts of Invited Addresses

Friday

Speaker: Fred Rickey
Title: *Jared Mansfield: Ohio's First Mathematician*
Abstract: Jared Mansfield (1759-1830) was educated at Yale, taught school in New Haven and Philadelphia, and wrote Essays, Mathematical and Physical (1801). These came to the attention of President Thomas Jefferson who appointed him the first faculty member at the military academy at West Point. He stayed but 18 months till Jefferson appointed him Surveyor General of the United States. Thus began his career in Ohio. He was responsible for setting up the survey in Ohio and the Northwest Territory. In 1812 he returned East and became Professor of Natural and Experimental Philosophy at West Point. We will reveal Mansfield's colorful personality and his contributions to Ohio.

Speaker: Vickie Van Dresar
Title: *Canoe Do Math?*
Abstract: My husband and I have taken many canoe trips in Alaska and in various areas of the North East (including Algonquin Park in Canada). This talk will look at several areas of mathematics that can be useful for planning and participating in a canoe trip. We will look at problems ranging from how much weight can safely be carried in a canoe (volume and displacement) to how to paddle safely (if not foolishly) across a lake in the middle of a storm (vector analysis).

Speaker: Keith Devlin
Title: *Street Mathematics: And What We Can Learn From It*
Abstract: Many studies have found that when ordinary people need basic mathematics in a real-world context, they pick it up easily and become skilled at its use. They do not in general use the methods they were taught in school, nor does their real-world use of math show any signs of influencing their performance in the math class. What is going on here, and what could we learn from it when it comes to teaching math?

Saturday

Speaker: Sarah Greenwald
Title: *Good News Everyone! Mathematical Morsels from The Simpsons and Futurama*
Abstract: Did you know that The Simpsons and Futurama contain hundreds of humorous mathematical and scientific references? What curious mathematical object is used as a bottle for beer in the 31st century? What happens when Homer tries to emulate Thomas Edison? What is the significance of the number 1729? The only prerequisite for this talk is an open mind, so come find out!

We'll explore the mathematical content and educational value of some favorite moments along with the motivations and backgrounds of the writers during an interactive talk. Popular culture can reveal, reflect, and even shape how society views mathematics, and with careful consideration of the benefits and challenges, these programs can be an ideal source of fun ways to introduce important concepts and to reduce math anxiety. In the process we'll look at related, recent work in geometry and computational number theory so a calculator and writing utensil will be useful. For more information, check out SimpsonsMath.com and FuturamaMath.com

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Speaker: Keith Devlin
Title: *When Mathematics Changed Us*
Abstract: At three distinct stages in the development of modern society, a mathematical development changed — in a fundamental, dramatic, and revolutionary way — how people understand the world and live their lives. (A fourth such change may be taking place during our lifetime, but only history will say if this is really the case.) Those advances occurred around 5,000 B.C., in the 16th century, and in the 17th century. Devlin will look at how human life and cognition changed on each of those three occasions, with the main focus being risk management and the view of the future that effective risk-management techniques enable.

Based on Devlin's latest book The Unfinished Game: Pascal, Fermat and the Seventeenth Century Letter that Made the World Modern, Basic Books 2008.

Brief Biographies of Invited Speakers

Fred Rickey, United States Military Academy

V. Frederick Rickey, a logician turned historian, became Professor of Mathematics at the United States Military Academy, West Point, NY in the summer of 1998. After earning three degrees from the University of Notre Dame (Ph.D. 1968) he went to Bowling Green State University where he rose through the professorial ranks to the rank of Distinguished Teaching Professor Emeritus. He has broad interests in the history of mathematics and is especially interested in the development of the calculus.

Currently he is working on a history of the mathematics department at West Point, a department that traces its history to 1801.

He loves teaching and enjoys giving lectures to mathematicians about the history of their field. He received the first award from the Ohio Section for Distinguished College or University Teaching of Mathematics, and was in the first group to receive a MAA National Awards for teaching.

Vickie Van Dresar, Ashland University

Vickie Van Dresar, joined the Ashland University faculty in 1996. She was the faculty advisor of Ashland University's student chapter of the MAA from 1998 through 2006. She has served the Ohio Section as a member and chair of CONSACT and as a member of the Program Committee. She was chair of the Program Committee in 2004 – 2005 and is President of the Ohio Section for the current year (2008-2009). Vickie earned a BS in Mathematics from Shenandoah University (1981), a MS in Mathematics from the University of Akron (1993), and a Ph.D. in Educational Mathematics from the University of Northern Colorado (1996). She has taught a wide range of classes from Math content courses for early childhood and middle grades majors to Calculus and Numerical Analysis. She is an Associate Professor of Mathematics and just recently returned fulltime to the classroom after serving as the Assistant Provost for Undergraduate Academic Affairs at Ashland University from 2006 - 2008. Vickie resides in Litchfield, OH with her husband, Neil, the "Rocket Scientist."

Keith Devlin, Stanford University

Dr. Keith Devlin is a co-founder and Executive Director of the university's H-STAR institute, a Consulting Professor in the Department of Mathematics, a co-founder of the Stanford Media X research network, and a Senior Researcher at CSLI. He is a World Economic Forum Fellow and a Fellow of the American Association for the Advancement of Science. His current research is focused on the use of different media to teach and communicate mathematics to diverse audiences. He also works on the design of information/reasoning systems for intelligence analysis. Other research interests include: theory of information, models of reasoning, applications of mathematical techniques in the study of communication, and mathematical cognition. He has written 28 books and over 80 published research articles. Recipient of the Pythagoras Prize, the Peano Prize, the Carl Sagan Award, and the Joint Policy Board for Mathematics Communications Award. He is "the Math Guy" on National Public Radio.

Sarah Greenwald, Appalachian State University

Sarah J. Greenwald is an Associate Professor of Mathematics and a Women's Studies core faculty member at Appalachian State University. She received her PhD from the University of Pennsylvania. Her scholarship areas include Riemannian geometry, popular culture as it pertains to mathematics, and women and minorities in mathematics, and she is a 2005 Mathematical Association of America Alder Award winner for distinguished teaching. She is a member of the executive committee of the Association for Women in Mathematics and the editorial board of PRIMUS. She co-created the educational website SimpsonsMath.com with Andrew Nestler. While it is not affiliated with the show, the site was mentioned in the audio commentary of the 7th season of The Simpsons. Her interactive mathematics lecture has been distributed on approximately one million DVDs worldwide as a 25-minute DVD extra for the 20th Century Fox Futurama movie Bender's Big Score and it is listed as "Mind-bending." Dr. Greenwald has spoken about the impacts of scientific popular culture representations on NPR's Science Friday and all over the country.

Contributed Paper Sessions

Friday, April 3 ***= student speaker**

Time	BTSU 208 Session Chair Chris Swanson	BTSU 314 Session Chair Tom Dence	BTSU 315 Session Chair Darryl Nester	Notes
3:25-3:40	*The Sum of Two Cubes in Two Different Ways* Abstract 1 Mark Kaiser* Ashland Univ.	*Condesation Method of Evaluating Determinants* Abstract 2 Shawn Kiss* Ashland Univ.	*Quantum knots* Abstract 3 Jacob Shapiro* Denison Univ.	
3:45-4:00	*The Effect on Return Time by Retarding Forces* Abstract 7 Sean McGraw* Ashland Univ.	*Products of Sines: Trigonometric Identities Involving Constants* Abstract 8 Mollie Sturm* Ashland Univ.	*A math classic: The tale of three links* Abstract 9 Sam Behrend* Denison Univ.	
4:05-4:20	*Euler's Method for Finding Amicable Pairs* Abstract 13 Greg Slutz* Ashland Univ.	*Sending Secrets through a Subliminal Channel* Abstract 14 Stacey Markovich* Ashland Univ.	*Coloring really big graphs in the plane* Abstract 15 Neal Barcelo* Denison Univ.	
4:25-4:40	*Franklin's Magic Circle* Abstract 19 Katelyn Roberts* Ashland Univ.	*Rather "Streaking" Numbers* Abstract 20 Janice Greenblatt* Ashland Univ.	*Sudoku and Binary Integer Programming* Abstract 21 John Holodnak* Ohio Northern University	
4:45-5:00	*Finding the GCD of Two Gaussian Integers* Abstract 25 Teresa Schermerhorn* Ashland Univ.	*Taxicab Version of the Pythagorean Theorem* Abstract 26 Nick Bellanco* Ashland Univ.	*One-time pad and text visualization* Abstract 27 Sharon Binkley* Ohio Northern University	
5:05-5:20	*An Improper Integral and Green's Theorem* Abstract 31 Bruce Pryor* Ashland Univ.	*Particle Accelerators with Vector Calculus* Abstract 32 Ryan O'Dell* Ashland Univ.	*Maze Forensics: Algorithmic "Fingerprints"* Abstract 33 Darryl Nester Bluffton Univ.	

Time	BTSU 316 Session Chair Anne Albert	BTSU 307 Session Chair Glen Lobo	BTSU 309 Session Chair Phil Blau	Notes
3:25-3:40	*Characterization of Ford Links* Abstract 4 Axel Brandt* Ohio Northern University	*All Math Software is not Created Equal* Abstract 5 Lisa Rickel Hawkes Learning Systems (Vendor)	*Inference when MLE does not exist* Abstract 6 Deniz Akdemir* Bowling Green State University	
3:45-4:00	*Population Models of the Round Goby* Abstract 10 Jeremy Foster* and Kora Ridings* Univ. of Findlay	*Estimation of technical efficiency of firms* Abstract 11 Ngoc Nguyen* Bowling Green State University	*Betting on the NBA Championship Game* Abstract 12 M B Rao University of Cincinnati	
4:05-4:20	*Winning Strategies of Monopoly* Abstract 16 Erica Keene* and Danielle Rohal* Univ. of Findlay	*Chaotic Linear Operators* Abstract 17 Kevin Rion* Bowling Green State University	*Finding positive solutions to BVP in Time scale* Abstract 18 Olusegun Otunuga* Marshall University	
4:25-4:40	*What's left in the Cantor's Set?* Abstract 22 Joe Paat* Denison Univ.	*Topographical Distance Matrices for Arrays* Abstract 23 Forrest Kaatz Owens Community College	*Pascal's 'Stirling' and Fermat's Gold* Abstract 24 Steve Harnish Bluffton Univ.	
4:45-5:00	*Honesty in Mechanism Design Theory* Abstract 28 Krista Foster* Youngstown State University	*Rotations and translations revisited* Abstract 29 Mihai Caragiu Ohio Northern University	*Dynamics of Composition Operators* Abstract 30 Ozgur Martin* Bowling Green State University	
5:05-5:20	*An Intriguing Limit with Chebyshev in Mind* Abstract 34 W. Ryan Livingston* Youngstown State Univ.		*A Brief Introduction to Hypercyclicity* Abstract 35 Irina Seceleanu* Bowling Green State University	

Contributed Paper Sessions

Saturday, April 4 ***= student speaker**

Time	Olscamp 119 Session Chair Matthew McMullen	Olscamp 120 Session Chair Brian Shelburne	Olscamp 121 Session Chair John Whitaker	Notes
10:25-10:40	*Problem Solving via Stolz-Cesaro* Abstract 36 Matthew Mcmullen Otterbein College	*What if Archimedes had the Mean Value Theorem…* Abstract 37 Brian Shelburne Wittenberg University	*Flatland Geometry* Abstract 38 Robert Short* John Carroll University	
10:45-11:00	*Numerical Considerations in Linear Algebra* Abstract 44 Thomas Hern Bowling Green State University	*On the Ratios of Some Products of Primes* Abstract 45 Thomas Dence Ashland University	*Pell's equation and hypberbolas* Abstract 46 Kaylee Sutton* John Carroll University	
11:05-11:20	*How to Evaluate Difficult Definite Integrals* Abstract 52 Brennan Baker* Kent State University - Tuscarawas	*A Heat Conduction Problem in Laser Ablation* Abstract 53 William Fuller Ohio Northern University	*Numerical Methods and the Rabinovich-Fabrikant Equations* Abstract 54 Clyde Meador* Marshall University	
11:25-11:40	*Binomial Option Pricing* Abstract 60 Jim Nicoulin* Cleveland State University	*K-12 Teacher Preparation (or lack thereof)* Abstract 61 Raymond Heitger Bowling Green State University	*Gödel's Incompleteness* Abstract 62 Thomas Cuchta* Marshall University	

Time	Olscamp 203 Session Chair Phil Blau	Olscamp 205 Session Chair Don Hunt	Olscamp 206 Session Chair Barbara Margolius	Notes
10:25-10:40	*Monkey See, Monkey Do, Monkey Censoring of Type II* Abstract 39 Erica Cross* Youngstown State University	*Hailstones in Tornadoes* Abstract 40 Eric Gossett* Ohio Northern University	*Online Homework - using Flash with WeBWorK* Abstract 41 Barbara Margolius Cleveland State University	
10:45-11:00	*On an Application of the Möbius Inversion Formula* Abstract 47 John Hoffman* Youngstown State University	*The Jacobi Symbol and Cryptography* Abstract 48 Gregory Back* Ohio Northern University	*Revising Ohio's K-12 Mathematics Standards* Abstract 49 Bradford Findell Ohio Department of Education	
11:05-11:20	*Investigation of Neuronal Activity* Abstract 55 Moriah Wright* Youngstown State University	*Annular and Annular-Like Functions* Abstract 56 Joshua Szekely* Ohio Northern University	*Clickers for Calculus II* Abstract 57 Shelly McGee The University of Findlay	
11:25-11:40	*Bolzano's Purely Analytical Proof* Abstract 63 Phil Blau Shawnee State University	*Maxwell's Equations* Abstract 64 Josh Stoffel* Ohio Northern University	*Teaching with digital methods* Abstract 65 Mary Bergs Mercy College of Northwest Ohio	

Time	Olscamp 209 Session Chair Adam Parker	Olscamp 211 Session Chair Jim Albert	Notes
10:25-10:40	*The History of Pi* Abstract 42 Benjamin Merkel* University of Cincinnati	*Probability in the Yell Game* Abstract 43 Christopher Swanson Ashland University	
10:45-11:00	*Mathematical Model of Cartilage Regeneration* Abstract 50 Daniel Marous* Wittenberg University	*Using Sweave to Create Dynamic Reports* Abstract 51 Maria Rizzo Bowling Green State University	
11:05-11:20	*Prefix Reversals of Certain Permutations* Abstract 58 Alyssa Armstrong* Wittenberg University	*Using R in Teaching Applied Probability* Abstract 59 Jim Albert Bowling Green State University	
11:25-11:40	*Solving "Drive Ya Nuts" with Groebner Bases* Abstract 66 Marshall Zarecky* Wittenberg University	*R in the Undergraduate Statistics Classroom* Abstract 67 Jay Kerns Youngstown State University	

Abstracts of Contributed Papers

Friday 3:25 – 3:40

The Sum of Two Cubes in Two Different Ways

Mark Kaiser
Ashland University

Abstract 1: We will be exploring the smallest integers that can be expressed as the sum of two cubes in two different ways. Ramanujuan showed us that numbers that can be expressed in such a way have interesting properties associated with them that we will explore as well in this presentation.

Lewis Carroll's Condensation Method of Evaluating Determinants

Shawn Kiss
Ashland University

Abstract 2: Lewis Carroll, a.k.a. Charles Dodgson discovered a way to evaluate determinants that cuts out a lot of work when solving them by hand. He used Jacobi's Theorem that stated that the determinant of an adjugate matrix equals the determinant of the interior of the original matrix times the determinant of the original matrix, to show that there is a method involving a way to condense down a square matrix and to work towards finding the determinants by dividing by the interior of found matrices.

Quantum knots

Jacob Shapiro
Denison University

Abstract 3: In 2008, Lomanaco and Kauffman presented a definition of a quantum knot system that is founded on knots represented by tile mosaics. Quantum knot systems are intended to represent physical quantum systems. First, we will give a review of knot theory and then work from this base to detail how the tile mosaics compose a quantum knot system. Then we will discuss physical applications for quantum knot systems and some purely mathematical open questions about how knots can be represented by the mosaics. This presentation is appropriate for a general audience.

Characterization of Ford Links

Axel Brandt
Ohio Northern University

Abstract 4: We will examine a class of links (knots) known as Ford Links using standard techniques of knot theory. The defining properties and various characteristics of these links will be discussed.

All Math Software is not Created Equal: What's the Difference?

Lisa Rickel
Hawkes Learning Systems (Vendor)

Abstract 5: The use of technology has become increasingly implemented in Mathematics courses, but what makes one software system different from another? Hawkes Learning Systems (HLS) is a unique program that is proven to be more effective in improving student performance. Discover how HLS's differences make it the perfect solution for student success!

What if a maximum likelihood estimator does not exist: Inference and model identification using maximum product of spacings

Deniz Akdemir
Bowling Green State University

Abstract 6: The likelihood principle and its extensions like likelihood ratio test, Akaike information criterion is not useful when the likelihood function is unbounded. In these situations maximum product of spacings approach can be used. In this talk, we introduce the maximum product of spacings approach to parameter estimation. We also present a new model identification criterion based on this estimation method. "Australian Athletes Data", "Drum Measurements Data" are analyzed and some simulation results are given to illustrate the usefulness of this method and the related model selection criterion. With Professor Arjun K.Gupta

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Friday 3:45 – 4:00

Air Resistance: The Effects on Return Time by Retarding Forces

Sean McGraw
Ashland University

Abstract 7: If a ball is thrown into the air, it will take a certain amount of time to return to the ground. When we consider air resistance against the ball, will the retarding force make the ball return to the ground sooner or later than a ball unaffected by drag? This talks seeks to investigate the problem.

Products of Sines: Trigonometric Identities Involving Constants

Mollie Sturm
Ashland University

Abstract 8: Not only do there exist trigonometric identities that consist of variables, but there also exist numerous identities consisting of constants. Using just two basic trigonometric functions involving only the sine and cosine functions, a string of theorems can be created that connect in various ways to give a very interesting result. These theorems, also, each consist of a geometric interpretation, which again involve strictly the sine and cosine functions.

A math classic: The tale of three links

Sam Behrend
Denison University

Abstract 9: Recently there has been considerable work on the linking properties of spatial graphs, spurred by Conway and Gordon seminal result regarding K_6. Specifically, they were able to prove that K_6 was intrinsically linked – every embedding of K_6 contains at least one two-component link. Flapan, et. al. proved that the minimal number of vertices needed for a triple link (links with three components) is 10. In the same article they provided a non-straight-edge embedding of K_9 without a triple link. In this work we consider triple links in the more restrictive geometric setting of straight-edge embeddings. Straight-edge embeddings are relevant to molecular chemists who synthesize knotted molecules – atoms and their bonds resemble straight-edge graphs. We establish results that determine when certain linear subgraphs of K_10 are triple linked. This talk is intended for a general audience.

Investigating the Potential Mathematical Models of the Invasive Round Goby in Lake Erie

Jeremy Foster and Kora Ridings
University of Findlay

Abstract 10: Using empirical data from the Western Basin of Lake Erie, this presentation will chronicle our attempts to create a mathematical model of the population of the invasive round goby and some competing species.

Estimation of technical efficiency of firms

Ngoc Nguyen
Bowling Green State University

Abstract 11: The stochastic frontier analysis (Aigner et al., 1977, Meeusen and van de Broeck, 1977) has been widely used to estimate technical efficiency of firms. The basic idea lies in the introduction of a composite error term consisting of a random noise v and an inefficiency term u. Technical efficiency of each firm is then estimated by utilizing distributional assumptions on the two error components. In the literature, v is usually assumed to be normally distributed and the distribution of u can be half normal, exponential, truncated normal or Gamma. In this study, we will consider other possibilities for distributions of v and u which includes heavy tailed distributions since large amount of financial data is not normal. Then the Maximum Likelihood and Method of Moment Estimation are used for the estimation of the technical efficiency. Finally we apply the models for a real data set.

Betting on the NBA Championship Game

M B Rao
University of Cincinnati

Abstract 12: The NBA season is in full swing. Soon sixteen teams, eight from each conference, will qualify. The odds of winning the championship will be posted on the internet. I want to bet on who wins the championship. I have a simple strategy. I use mathematics and matrix algebra. I never failed to make money in the past. I want to share the strategy I have with you.

Friday 4:05 – 4:20

Euler's Method for Finding Amicable Pairs

Greg Slutz
Ashland University

Abstract 13: This talk will give a brief history of amicable numbers and will describe the method that Leonhard Euler used to find new amicable pairs of numbers. Using this method, Euler was able to increase the number of known amicable pairs twenty-fold.

Sending Secrets through a Subliminal Channel

Stacey Markovich
Ashland University

Abstract 14: Have you ever wondered how you could send a message without letting anyone but the intended recipient know the contents of the message? Using a subliminal channel, two people can send messages to each other without having to worry about being deceived by a third party.

Coloring really big graphs in the plane

Neal Barcelo
Denison University

Abstract 15: Suppose we have a graph whose vertices are points in the xy-plane and two vertices are connected by an edge if they are a distance of 1 unit apart. What is the minimum number of colors needed so that each vertex is assigned a color, but no two vertices sharing an edge have the same color? We will show that surprisingly a small number of colors suffice. We will also provide a related open question. This presentation is intended for a general audience.

Winning Strategies of Monopoly

Erica Keene and Danielle Rohal
University of Findlay

Abstract 16: This presentation will investigate different strategies for winning the game of Monopoly by creating a mathematical model of the game using Markov Chains.

Chaotic Linear Operators

Kevin Rion
Bowling Green State University

Abstract 17: It is well known that in Devaney's definition of chaos the property of being sensitive to initial conditions is redundant. Banks showed that transitivity and a dense set of periodic points gives us this property. We share a result of Godefroy and Shapiro that for linear operators the transitivity of the operator alone implies the sensitive dependence on initial conditions.

Finding positive solutions to BVP in Time scale

Olusegun Otunuga
Marshall University

Abstract 18: Finding suitable conditions in which a Boundary value differential equation will have positive solutions in Time Scale.

Friday 4:25 – 4:40

Franklin's Magic Circle

Katelyn Roberts
Ashland University

Abstract 19: This presentation will describe the numerous properties of Benjamin Franklin's magic circle and the procedures involved in creating one. These circles combine interlocking, concentric circles which are created using five steps and are formed from one of Franklin's 8x8 magic squares.

Rather "Streaking" Numbers: an introduction to Long Run Theory and how it interprets world records

Janice Greenblatt
Ashland University

Abstract 20: Throughout time, we have heard of astronomical records and lengthy streaks in sports, casinos, elections, and more. Furthermore, we have witnessed that one person whom EVERYTHING always goes right for, and patted the backs of those who just CANNOT get a break. But are these people REALLY walking proof that some are just born under a better star? Are these records REALLY so far fetched? What if you were told that these "amazing" records and people were actually mathematical expectations? Would you still be a believer? That's where long run predictions come into play. Please come and experience a "mathematical destruction" of all of your superstars and superstitions.

Solving Sudoku Puzzles with Binary Integer Programming

John Holodnak
Ohio Northern University

Abstract 21: We develop a method for solving Sudoku puzzles using binary integer programming. Frontline System's Premium Solver for Excel is used to solve the puzzle. The puzzle's similarity, but non-compatibility, to a standard L.P. Assignment Problem is also discussed, as well as the decision to use binary integer programming instead of linear programming.

Sifting through the dust - what's left in the Cantor Set?

Joe Paat
Denison University

Abstract 22: The Cantor Set represents a paradox in the field of Topology. It is constructed by the collection of points that remain after a unit interval has its middle thirds iteratively removed countably many times. Interestingly, this set is uncountable, but unlike most other uncountable sets, the Cantor Set has a Lebesgue measure of 0! A question of interest is what numbers exist in the set? Clearly the rational endpoints remain, but what about something like ¼? We will show that one can characterize every rational number that lives in the set. We will also pose several open questions. This talk is intended for a general audience.

Topographical Distance Matrices for Arrays

Forrest Kaatz
Owens Community College

Abstract 23: The topographical Wiener index is calculated for two-dimensional graphs describing porous arrays. For tiling in the plane, we model hexagonal, triangular, and square arrays and compare with topological formulas for the Wiener index derived from the distance matrix. The normalized Wiener indices of C4, T13, and O(4), for hexagonal, triangular, and square arrays are 0.993, 0.995, and 0.985, respectively, indicating that the arrays have smaller bond lengths near the center of the array, since these contribute more to the Wiener index. The normalized Perron root (the first eigenvalue), calculated from distance/distance matrices describes an order parameter, which takes values from [0,1]. The distributions of the normalized distances for nearest neighbor coordinates are determined from the porous arrays. The distributions range from normal to skewed (right) to bimodal depending on the array.

Traveling with Fibonacci towards Pascal's 'Stirling' and Fermat's Gold: equivalents, theorems and questions

Steve Harnish
Bluffton University

Abstract 24: In 1202 Leonardo Pisano posed simple questions about travelers which motivate our consideration of initial and middle sums of sequences. We then pose several equivalent statements about these sums, orthogonal vectors, bin sorting and number theory. The equivalences derive from theorems for Pascal's triangle and in return raise some of their own questions for the history of mathematics.

Friday 4:45 – 5:00

A Paper and Pencil Algorithm for finding the GCD of Two Gaussian Integers

Teresa Schermerhorn
Ashland University

Abstract 25: Based on an article from the Two-Year College Mathematics Journal, this talk will start with the definition of a Gaussian Integer. We will then explore the general algorithm for finding the GCD of two Gaussian Integers. We will then test this algorithm and discover its effectiveness and results.

Taxicab Version of the Pythagorean Theorem

Nick Bellanco
Ashland University

Abstract 26: Taxicab metric will be explored and compared to Euclidean metric. From this, the common Euclidean Pythagorean Theorem will be re-examined using the taxicab metric. Four distinct cases of the taxicab version of the Pythagorean Theorem will be examined.

One-time pad and text visualization

Sharon Binkley
Ohio Northern University

Abstract 27: This talk will be an introduction to some typical methods of randomized encryption, especially the one-time pad cipher, introduced by Vernan in 1917. We show how one can use MATLAB for one-time pad encryption and we present various "random" walk representation of a few fragments in classical English literature.

Is Honesty the Best Policy? An Introduction to Mechanism Design Theory

Krista Foster
Youngstown State University

Abstract 28: Mechanism design theory is a branch of game theory that considers how to implement solutions to problems that involve multiple self-interested individuals, each with private information about their preferences. The results of the theory, which have numerous applications, show that cooperation between the participants is generally optimal. This presentation will provide a background of game theory while introducing the concepts of mechanism design theory.

Rotations and translations revisited

Mihai Caragiu
Ohio Northern University

Abstract 29: By using a series of elementary plane geometry problems, we will illustrate the general result stating that the composition of a number of plane rotations of angles adding up to an integer multiple of 2*pi is a plane translation. We will discuss the case of collinear rotation centers, the case in which the rotation centers form a regular polygon, a general connection with discrete Fourier transforms, and also a limit case in which the number of rotation centers goes to infinity.

Dynamics of Composition Operators

Ozgur Martin
Bowling Green State University

Abstract 30: An intriguing result of G. D. Birkhoff states that there exists an entire function f whose translates f(z + n), n > 0, can approximate any entire function, uniformly on compacts sets. Many developments and extensions have been made in several directions, including the one by Seidel and Walsh to the case of non-Euclidean translations on the space of analytic functions on the unit disc. In this talk, we survey these universality results providing a unifying approach and some new extensions.

Friday 5:05-5:20

An Improper Integral and Green's Theorem

Bruce Pryor
Ashland University

Abstract 31: This talk will focus on integrating an improper integral using the multi-variable vector calculus concept of Green's Theorem. A short refresher of improper integration will be covered followed by the Green's Theorem solution of an improper integral. The talk will conclude with a look at the absolute integrability of the function used in the Green's Theorem segment.

Particle Accelerators with Vector Calculus

Ryan O'Dell
Ashland University

Abstract 32: In search of Higg's particle, particle accelerators have advanced, and the electric and magnetic fields can be explained using vector calculus concepts such as divergence and curl.

Maze Forensics: Looking for Algorithmic "Fingerprints"

Darryl Nester
Bluffton University

Abstract 33: The algorithm used to create a maze has an effect on the "character" of that maze. For some algorithms, that character might be readily visible through casual observation, while for others, it might be more subtle. Can we examine a maze and make an educated guess as to what algorithm created it? We'll consider some of the measurements we might make to quantify a maze's characteristics, and compare the "profiles" of several different algorithms.

Chebyshev, the Prime Number Theorem and an Intriguing Limit

W. Ryan Livingston
Youngstown State University

Abstract 34: The purpose of this talk is to present the solution to the limit as n goes to infinity of the nth root of the least common multiple of the integers 1, 2, …, n. We consider the techniques and results needed to evaluate the limit. First, the technique of partial integration is introduced. Then a few lemmas are presented and proved which lead to the solution. Chebyshev's methods used in his pursuit of the Prime Number Theorem will be reviewed and modified as the basis of this result.

A Brief Introduction to Hypercyclicity

Irina Seceleanu
Bowling Green State University

Abstract 35: Hypercyclicity is the study of linear operators that possess a dense orbit. In this talk we relate the concept of hypercyclicity to the theory of topological dynamics, chaos and the Invariant Subspace Problem. Furthermore we present a few results that illustrate why hypercyclicity is such an interesting phenomenon.

Saturday 10:25 – 10:40

The Stolz-Cesaro Theorem, An Underused Problem-solving Technique

Matthew Mcmullen
Otterbein College

Abstract 36: Every undergraduate math student knows and loves l'Hospital's Rule, often to a fault! It is curious, then, that l'Hospital's discrete cousin, the Stolz-Cesaro Theorem, is relatively unknown. We will discuss this undervalued problem-solving technique and show how it can be used to solve many limit problems in the literature, from the Putnam Competition to the "Monthly." Problem enthusiasts of all skill levels are welcome.

What if Archimedes had the Mean Value Theorem…

Brian Shelburne
Wittenberg University

Abstract 37: In doing some class prep in the history of mathematics I got interested in Archimedes' proof showing that the area under a parabola was 4/3rd times the area of the inscribed triangle, a result any first year calculus student could easily show. But Archimedes proved the result without the calculus which made his approach interesting. I also observed that the first proposition cited in his proof followed directly from the Mean Value Theorem which led me to the question "What if Archimedes had the Mean Value Theorem and he used it to find the area under the parabola?"

Flatland Geometry

Robert Short
John Carroll University

Abstract 38: In Flatland, females are line segments, and males are n-sided regular polygons. When they produce a new male it has n + 1 sides. What happens as n approaches infinity?

Monkey See, Monkey Do, Monkey Censoring of Type II

Erica Cross
Youngstown State University

Abstract 39: In many real world applications, experimental conditions impose censoring on data. Censoring imposes a dependence structure on the data which renders mathematically intractable sampling distributions of many commonly used statistics. We examine the sampling distribution of the sample correlation coefficient when data arising from a bivariate normal model has been subjected to Type II censoring. We propose two approximation approaches to this distribution and examine the goodness of fit of each.

Behavior of particles in circular vorticial flow with Magnus effect

Eric Gossett
Ohio Northern University

Abstract 40: In this presentation a phenomenological model of the behavior of hailstones in cyclonic storms is discussed. The equations of motion for the drag-free case are solved using rotating frames. An animation of the solution will be included.

Online Homework - the upcoming marriage of Flash and WeBWorK

Barbara Margolius
Cleveland State University

Abstract 41: The online homework system WeBWorK has been around since 1995. It was originally developed at the University of Rochester by mathematics professors Michael Gage and Arnold Pizer. It is now supported by teams of developers at several institutions and is used in a variety of subjects. WeBWorK provides students with immediate feedback as to the correctness of their answers. Students are encouraged to make multiple attempts until they succeed. Flash is a multimedia platform designed to create animation and interactivity on the web. More than 95% of computers worldwide are equipped with the Flash Player. This talk is about embedding Flash content in WeBWorK problems. Several examples will be presented. WeBWorK is free. There is a National Problem Library of more than 12,000 questions. Also free. The Flash WeBWorK interface is not yet available but will be soon.

The History of Pi

Benjamin Merkel
University of Cincinnati

Abstract 42: For my senior capstone project this year, I wrote a paper on the history of pi: how the number was approximated throughout the years and the mathematicians who approximated it. For a presentation, I would outline the processes that mathematicians like Archimedes and Newton used to calculate pi as well as some of the problems and drama surrounding the number throughout history. Points of interest would include: Egyptian's approximation of pi, Archimede's inscribing of regular polygons, Newton's binomial theorem, the problem of squaring a circle, and the proof of pi being a transcendental number.

Probability in the Yell Game

Christopher Swanson
Ashland University

Abstract 43: Two years ago while on a mission trip with youth from my church, I was introduced to the Yell Game. Players stood in a circle, closed their eyes, and on the count of three, opened their eyes, looking directly at another player. If two players were looking directly at each other, they yelled and were out of the game. During one round of this game, everyone looked up and no one yelled, for no two people were looking directly at each other. Someone asked, "What is the probability of this happening?" and I knew I would have to solve this problem. In this talk, I will present probabilistic results related to the Yell Game at a level appropriate for undergraduates, who I encourage to attend.

Saturday 10:45 – 11:00

Numerical Considerations in Linear Algebra

Thomas Hern
Bowling Green State University

Abstract 44: These are often ignored, but they quite often play an unavoidable role. We will look at linear systems (or inverses or least squares) and a simple baseball example; and we will also briefly visit eigenvalues, with a reference to the Google Page Rank matrix.

On the Ratios of Some Products of Primes

Thomas Dence
Ashland University

Abstract 45: Consider the set S consisting of the first one million primes. Let's partition S into two sets A, B, and let p denote the product of all the primes in A and let q denote the product of all the primes in B. Is it possible to get p and q close together?

Pell's equation and hypberbolas

Kaylee Sutton
John Carroll University

Abstract 46: Pell's equation is a problem in number theory that can be used to approximate square roots of primes using hyperbolas. We will discuss which primes work the best for these approximations. We will also mention interesting connections between a couple of Pell's equations and triangular numbers.

On an Application of the Möbius Inversion Formula

John Hoffman
Youngstown State University

Abstract 47: In this talk we will explore the Möbius Function, the Möbius Inversion Formula and an application to determining the number of irreducible polynomials of degree n over a finite field.

The Jacobi Symbol and Cryptography

Gregory Back
Ohio Northern University

Abstract 48: Much of modern cryptography is based on the problem of factoring large numbers into their prime factors. The Jacobi symbol is a key component of both the Solovay-Strassen primality test and the Goldwasser-Micali cryptosystem. Although both have been largely superseded, they demonstrate useful properties of probabilistic primality testing and public key encryption, each of which serves as part of the foundation on which modern secure communication is built. We will explore the properties of the Jacobi symbol as well as its applications to these cryptographic protocols.

Revising Ohio's K-12 Mathematics Standards: Involving Higher Education

Bradford Findell
Ohio Department of Education

Abstract 49: The Ohio Legislature is proposing that Ohio's Academic Content Standards in mathematics be revised by June of 2010. This talk will describe the planning that is underway at the Ohio Department of Education, the process for revision, and various ways that Ohio Section of the MAA can be involved. If you are involved in placement policies, or if you teach introductory or dual enrollment courses, please consider becoming involved.

Mathematical Modeling of Cartilage Regeneration via Hydrogel

Daniel Marous
Wittenberg University

Abstract 50: Articular cartilage, found around bones and joints, is a dense connective tissue comprised of chondrocyte cells and extracellular matrix. An unhealthy aging process or extensive injury can render the cartilage naturally irreparable. One possible repair technique involves regenerating cartilage by injecting hydrogel, a biocompatible scaffolding material, seeded with chondrocytes into the damaged area. In this project, we present and discuss a mathematical model for cartilage regeneration via hydrogel, using a system of ordinary differential equations.

Using Sweave to Create Dynamic Reports

Maria Rizzo
Bowling Green State University

Abstract 51: Sweave is a tool provided in R to create dynamic reports. The master document is written in latex with sections of R code embedded. When run through R, all data analysis output (tables, graphs, etc.) is created on the fly and inserted into a final latex document. The report can be automatically updated if data or analysis change, which allows for truly reproducible research.

Saturday 11:05 – 11:20

Some Powerful Properties to Evaluate Definite Integrals

Brennan Baker
Kent State University - Tuscarawas

Abstract 52: In this talk I would like to prove some properties of the definite integrals, which are not taught in Calculus I course. These properties are very helpful in evaluating some very difficult definite integrals. Without the help of these properties, it would be very difficult to evaluate these definite integrals.

A Heat Conduction Problem in Laser Ablation

William Fuller
Ohio Northern University

Abstract 53: Laser ablation of the saphenous vein involves using laser-tipped probes to produce photothermal effects in the vein. In this presentation we consider the effects of laser-induced thermal heating and conduction on the vein wall. We formulate and solve the relevant two-dimensional heat conduction problem. The solution resolves an aspect of a controversy involving the mechanism of the medical procedure.

Numerical Methods and the Rabinovich-Fabrikant Equations

Clyde Meador
Marshall University

Abstract 54: The Rabinovich-Fabrikant equations are a system of three ordinary differential equations with three variables and two constant parameters. They are a lesser-known system and more difficult to study numerically. Two fourth-order methods have been implemented with MATLAB for the study of this system, and compared to research in the literature.

Investigation of Neuronal Activity in a 2-dimensional Dynamical System Model.

Moriah Wright
Youngstown State University

Abstract 55: We introduce the Hodgkin-Huxley equations, which consist of a 4-dimensional system of differential equations that form the basis for the mathematical modeling of neurons. Then we consider a biophysically based, 2-dimensional reduced model and use dynamical systems techniques to investigate different activity patterns that result as parameters are varied.

Annular and Annular-Like Functions

Joshua Szekely
Ohio Northern University

Abstract 56: There exist a certain class of functions which are analytic in the unit disk of the complex plane known as annular functions. These functions can be considered annular or strongly annular functions depending upon a defining characteristic related to Jordan curves in the function's domain. Various properties of these functions have been developed and proven, some of which give very interesting results, including the fact that such functions have countably infinitely many zeros. The notion of an annular function can be extended by shifting the domain from the unit disk to the complex plane, giving rise to the idea of an annular-like function. Several of the properties of annular functions extend to annular-like functions easily, whereas others are more difficult, and some properties do not have annular-like counterparts at all. Examples of each type of function will be examined.

Clickers for Calculus II

Shelly McGee
The University of Findlay

Abstract 57: I will be sharing my success story with using an Audience Response System, "clickers," in my calculus II classroom this semester to improve student learning. I will describe the demographics of my class, and factors that I think have contributed to the overall enjoyment of the students in the course by comparing them with a class of elementary statistics students where the success, if there is any, is far below that of the calculus II students. I will present my strategy and philosophy for using clickers as well as specific slides I have used in class.

Flipping Pancakes: Prefix Reversals of Certain Permutations

Alyssa Armstrong
Wittenberg University

Abstract 58: Bill Gates and Christos Papadimitriou created an algorithm in 1979 that improved the lower bound of the Pancake Problem. This problem concerns the minimum number of moves needed to order a random stack of differently-sized pancakes using restricted moves. Mathematically, this problem translates to flipping prefixes of permutations until the identity permutation is achieved. While Gates and Papadimitriou characterized a permutation based on blocks, I consider a transposition decomposition and define a set of algorithms that require fewer reversals than Gates' algorithm in certain cases.

Using R in Teaching Applied Probability

Jim Albert
Bowling Green State University

Abstract 59: R is a free software environment for statistical computing and graphics. We illustrate using R to communicate concepts in an applied probability course. It is straightforward to use R to simulate probability experiments, perform Markov Chain calculations, and illustrate properties of a Poisson process.

Saturday 11:25 – 11:40

Binomial Option Pricing

Jim Nicoulin
Cleveland State University

Abstract 60: In determining the price of an option relative to the price of the underlying asset, the binomial option pricing model can be used, given the characteristics of the stock or other underlying asset. The binomial option pricing model exhibits the basic economic principles of option pricing by arbitrage methods. While its development may seem basic, it contains as a special limiting case the celebrated Black-Scholes model, which has previously been derived only by much more difficult methods. The binomial option pricing model provides an efficient method for valuing options that may be early-exercised.

K-12 Teacher Preparation (or lack thereof)

Raymond Heitger
Bowling Green State University

Abstract 61: Studies by Liping Ma, The National Council on Teacher Quality, and The Education Schools Project have found that education schools are not properly preparing elementary teachers. I will summarize their results.

Gödel's Incompleteness or: How I Learned to Stop Worrying and Love the Bomb

Thomas Cuchta
Marshall University

Abstract 62: Did your parents raise you with the understanding that every true statement in a formal axiomatic system powerful enough to do multiplication has a proof? They were wrong! This talk will overview the history of the incompleteness theorem and how the theorem itself works. We will investigate consistency of formal systems, primitive recursive functions, and without a doubt, a little bit of mathematical philosophy. This talk will be geared for a general audience!

Bolzano's Purely Analytical Proof

Phil Blau
Shawnee State University

Abstract 63: This talk will give an overview both of Bolzano's 1817 purely analytic proof that between any two values, which give results of opposite sign, there lies at least one real root and of Steve Russ's fine biography of Bolzano.

Maxwell's Equations through the Major Vector Theorems

Josh Stoffel
Ohio Northern University

Abstract 64: Maxwell's Equations are four equations that describe some important principles of the physics of electricity and magnetism. First we briefly explore the physical significance of these equations by looking at their mathematical properties. Then, after a description of Stokes' Theorem and the Divergence Theorem from vector calculus, we bring Maxwell's Equations together to derive the wave equation, a foundational result in the electromagnetic theory of light.

Teaching with digital methods (does not include mathematical software)

Mary Bergs
Mercy College of Northwest Ohio

Abstract 65: There is a push to put classes online. After teaching a class on-line, I began reviewing how information is presented in class. Is there a place for Powerpoint presentations, wikis, and other digital presentation methods in or outside of mathematics classes? I will present my experiences and hope to generate some discussion among the participants.

Describing a Combinatorics Problem with a System of Polynomial Equations

Marshall Zarecky
Wittenberg University

Abstract 66: Many small puzzle games have a combinatorial aspect to them. Instead of using brute force methods to solve these puzzles, we will develop a method to describe the puzzle as a system of polynomial equations, then use Groebner bases to solve that system. Specifically, we will be looking at the game "Drive Ya Nuts" and some of the difficulties in solving this system.

R Commander and Plugins: Using R in the Undergraduate Statistics Classroom

Jay Kerns
Youngstown State University

Abstract 67: The R Commander is a Graphical User Interface (GUI) to the R statistical environment. Recently, functionality has been added to the R Commander which allows contributors to develop specialized "Plugins" which add to the available options for researchers and educators alike. In this talk, we will present the capabilities of the IPSUR plugin, and discuss the successes we have had integrating it into our undergraduate statistics curriculum.