Program of Activities
For the Spring Meeting of the

Mathematical Association of America

Ohio Section

Spring, 2004
University of Cincinnati
Cincinnati, Ohio
March 26-27, 2004

MAA Ohio Section

Program

Friday, March 26, 2004

12:00—4:30	Registration, book exhibits	Max Kade Center, Room 736, Old Chemistry Building
12:00—1:25	Student problem-solving team competition	Braunstein Hall, Room 301

12:15—1:15	• Committee Meetings:
	  ○ CONCUR
	  ○ CONSACT
	  ○ CONSTUM
	  ○ CONTEAL
	  ○ Program Committee
	• Meeting of Department Liaisons
		
		Braunstein Hall, Room 326
		Braunstein Hall, Room 324
		Braunstein Hall, Room 316
		Braunstein Hall, Room 312
		Braunstein Hall, Room 309
		Braunstein Hall, Room 300

1:30—1:45	Welcome & announcements	Old Chemistry, Room 525
1:45—2:45	Invited address: **"Touring a Torus"** Joe Gallian, University of Minnesota Duluth	Old Chemistry, Room 525
2:45—3:10	Break & refreshments	Old Chemistry, Room 804
3:10—4:05	Invited address: **"Sagebrush, Turtles, and Snowflakes"** Judy Holdener, Kenyon College	Old Chemistry, Room 525
4:20—6:20	• **Contributed Paper Sessions** • **Special Session on the Fibonacci Numbers** • Executive Committee Meeting	Braunstein Hall, Rooms 300, 312, 316, 324, 326, 309 Braunstein Hall, Room 301 Old Chemistry, Room 803
6:30—6:45	• Social Time	Great Hall, Tangeman Center
6:45—7:35	• Banquet	Great Hall, Tangeman Center
	• Student pizza party and SET® tournament	Max Kade Center, Room736, Old Chemistry Building
7:35—8:00	Dessert (faculty and students)	Great Hall, Tangeman Center
8:00—8:45	After-dinner talk: **"Breaking Drivers' License Codes"** Joe Gallian	Great Hall, Tangeman Center
8:45	Business meeting and presentation of	Great Hall, Tangeman Center

teaching award

Saturday, March 27

8:00—10:30	Registration, book exhibits	Max Kade Center, Room 736, Old Chemistry Building
8:00—8:45	Coffee & donuts	Old Chemistry, Room 804
8:00—8:45	Meeting of student leaders	Braunstein Hall, Room 312
8:50—8:55	Announcements	Lindner Hall Room 112
8:55—9:55	Retiring President's address: **"Music and the Time-Frequency Analysis of Wavelets"** Dale Mugler, University of Akron	Lindner Hall Room 112
9:55—10:20	Break & refreshments	Old Chemistry, Room 804
10:20—11:55	**Contributed paper sessions**	Braunstein Hall, Rooms 300, 312, 316, 324, 326, 309
12:00—1:00	Invited address: **"Breaking the Enigma"** J. Kevin Colligan, National Security Agency	Lindner Hall Room 112
1:00	Closing remarks	

Abstracts of Invited Addresses

Speaker: Joe Gallian, University of Minnesota Duluth
Title: *Touring a Torus*
Abstract: This talk concerns the problem of traversing an *m* by *n* directed grid embedded on a torus so that each vertex is visited exactly once before returning to the starting position. We include an application to computer graphics that became the image on the Mathematics Awareness 2003 poster.

Speaker: Judy Holdener, Kenyon College
Title: *Sagebrush, Turtles, and Snowflakes*
Abstract: In this talk I will describe a three-year period of interesting mathematical excursions involving Kenyon undergraduates, a workshop in Kansas, and ultimately the study of *turtle sequences*. A turtle sequence is a word constructed from an alphabet of two letters: F, which represents the forward motion of a turtle in the plane, and L, which represents a counterclockwise turn. I will investigate such sequences and establish links between the combinatoric properties of words and the geometric properties of the curves they generate. In particular, I will classify periodic turtle sequences in terms of their closure (or the lack thereof). At the end of my talk, you will see that the title I have chosen actually has some relevance.

Speaker: Joe Gallian, University of Minnesota Duluth
Title: *Breaking Drivers' License Codes*
Abstract: Many states use complicated algorithms or formulas to assign drivers' license numbers but keep the method confidential. Just for the fun of it, Professor Gallian attempted to figure out how the states code their license numbers. In this talk he will discuss how he was able to break the codes for several of the states. The talk illustrates an important problem-solving technique that is not emphasized in mathematics classes. It also teaches the lesson that sometimes things done just for the sake of curiosity can have applications.

Speaker: Dale Mugler, University of Akron
Title: *Music and the Time-Frequency Analysis of Wavelets*
Abstract: What makes the sound of a horn playing a middle C seem different from the sound of a flute playing the same note? Nearly everyone likes to listen to some kind of music, but rarely do we think of a piece we listen to as a time-frequency function. Fourier analysis, based on sines and cosines of different frequencies, has been used for many years to analyze the spectrum of a signal. But there is a relatively new mathematical tool that has taken over in many related areas, and that involves the theory of wavelets. Wavelets provide a basis made of functions that are non-zero only on a small time interval, yet represent very general functions. This talk will introduce the theory of wavelets and many of its applications, including the new JPEG 2000 standard

for image compression, but will concentrate on time-frequency plots of musical instruments.

Speaker: J. Kevin Colligan, National Security Agency
Title: *Breaking the Enigma*
Abstract: Recent books and movies have made the public widely aware of the existence of the German Enigma cipher machine during World War II, and of the role that reading Enigma messages played in saving Allied lives and shortening the war. Most people credit an intelligent and determined band of British mathematicians who worked at Bletchley Park with this work. Fewer people are aware, however, of the prior work by three innovative and brilliant Polish mathematicians on this same problem. In fact, this trio laid the mathematical foundation for the breaking of the Enigma, and made them the first to break the early Enigma machines. Newton's comment about standing on the shoulders of giants truly applies here, with the shoulders in this case being those of these Poles. This talk will put this Polish effort in an historical perspective, and describe the mathematics behind the first successful attack on the Enigma.

Brief Biographies of Invited Speakers

Joseph Gallian, University of Minnesota Duluth

Joseph Gallian received his Ph.D. from Notre Dame, and has been at the University of Minnesota Duluth since 1972. He has been the recipient of numerous honors, including the MAA's Deborah and Franklin Tepper Haimo Award for Distinguished College or University Teaching, the Trevor Evans Award for exposition, and the Carl B. Allendoerfer Award for exposition, to name just a few.

Joe has been extremely active in the MAA, having served as the national coordinator for Mathematics Awareness Month in 2003, and as Associate Editor for Mathematics Magazine, the American Mathematical Monthly, and MAA OnLine. He has also served as Co-director of Project NExT since 1998, and has recently completed a term as Second Vice President of the MAA.

Professor Gallian has published 86 scholarly articles, and is also widely known for his book *Contemporary Abstract Algebra*, now in its 5th edition with Houghton Mifflin. He has run the highly successful Duluth Summer Undergraduate Research Program at UMD since 1977, and has served as supervisor of over 100 student-written papers that have been
accepted for publication in mainstream journals.

Joe is one of the most popular mathematics speakers in the nation, having delivered eight invited addresses at national meetings, forty invited addresses at MAA section meetings, and over 200 minicourses.

Judy Holdener, Kenyon College

Judy Holdener received her B.S. in mathematics at Kent State University and both her M.S. and Ph.D. in mathematics at the University of Illinois in Urbana-Champaign. After teaching for three years at the U.S. Air Force Academy in Colorado Springs, Judy returned to the Buckeye State. She has been teaching at Kenyon College in Gambier, OH since 1997. Judy's research interests reside in the areas of algebra and number theory, and she enjoys getting undergraduates involved in her work whenever possible.

Dale Mugler, University of Akron

Dale Mugler has done much of his mathematical work with people who have been active in the MAA. He did his doctoral work at Northwestern University in complex function theory under the direction of R.P. Boas, who served terms as Editor of the *American Mathematical Monthly* and as President of the MAA. During the fourteen years he spent at Santa Clara University, he worked with G. A. Alexanderson, who is also a past president of the MAA.

Dale has been on the faculty at the University of Akron since 1989. He was awarded the Ohio Section Teaching Award in 1993, and has served as a CONSTUM member and chair. He also served on the MAA national Committee on Student Activities and on the national MAA Task Force that updated the "Guidelines for Programs and Departments in Undergraduate Mathematical Sciences," a report that can be viewed at http://www.maa.org/guidelines/guidelines.html.

Professor Mugler currently serves as the Director of the University Honors Program at the University of Akron and has a joint appointment in Applied Mathematics and Biomedical Engineering. He has published twenty-three articles in established journals, and edited a book, *Lion Hunting and Other Mathematical Pursuits*, that was published by the MAA.

J. Kevin Colligan, National Security Agency

J. Kevin Colligan holds an Honors B.S. Magna Cum Laude and Phi Beta Kappa honors from Saint Louis University and an M.A. from the University of Wisconsin, all in mathematics. He taught mathematics at Vianney High School in St. Louis County and has taught occasional courses at the National Security Agency over the last 30 years.

Kevin was instrumental in starting NSA's education outreach programs in 1987; spent a sabbatical year at the National Academy of Sciences' Mathematical Sciences Education Board; is a reviewer for NCTM's "Mathematics Teacher"; and was a member of the Board of Governors of the Mathematical Association of America. In 1999, he received the Saint Louis University College of Arts and Sciences Alumni Merit Award. He loves to teach.

Having decided that 15 years as a manager was enough (perhaps by an order of magnitude (or two)), Kevin returned to technical pursuits seven years ago, and was accepted into the NSA Senior Technical Development Program in 1999. Since 1997 he has focused on protocols used to support cryptographic functions in products and standards. Being at heart a bit-brain, he loves this stuff.

He delights in his New Orleans-born and bred wife and their 13-year-old son. He enjoys and does not have enough time for golf, softball, Go, walks with his wife, programming, and double crostics.

Acknowledgements

The Ohio Section would like to thank the faculty and staff of the Mathematics Department at the University of Cincinnati, for their efforts in hosting this meeting. Special thanks go to Chuck Groetsch, the Chair of the Local Arrangements Committee.

The Section also wishes to thank John Carroll University for providing the funds to print this program, as well as the exhibitors for their support of the meeting.

Calendar of Coming Events

The Ohio Section Summer Short Course is scheduled for **June 2-4, 2004**, at Ohio Northern University. Colin Adams will present the course on ***Teaching and Doing Knot Theory***. For information and registration, please visit the short course web site: http://www.onu.edu/a+s/math/NewFiles/maa/shortcourse.htm

The MAA's summer MathFest will be in Providence, Rhode Island, **August 12-14, 2004**. See the April, 2004, edition of FOCUS for details.

The fall meeting of the Ohio Section will be held at John Carroll University on **October 22-23, 2004**, in the new $66 million Dolan Center for Science and Technology.

Contributed Paper Session Schedule for Friday, March 26, 2004

All rooms are in Braunstein Hall

	Room 312	Room 316	Room 309	Room 324
Time	Session Chair: Aparna Higgins	Session Chair: Leo Schneider	Session Chair: Wiebke Diestelkamp	Session Chair: Juan Bes
4:20—4:35	***The Hat Problem and Some Variations*** Abstract 1 Marepalli Rao Univ of Cincinnati	***Implications of Ohio's New K-12 Mathematics Standards*** Abstract 2 Joan Leitzel Ohio State (retired) and Ohio Department of Education	***The Intersection of Hilbert and Fibonacci*** Abstract 3 Thomas Dence Ashland Univ	***The Skewed Double Exponential Distribution*** Abstract 4 Keshav Jagannathan Bowling Green St Univ
4:40—4:55	***Continuity and Differentiability of the Ruler Function*** Abstract 7 Ken Gasser Ashland Univ	***PMET: Preparing Mathematicians to Educate Teachers.*** Abstract 8 Olaf Stackelberg Kent St Univ-Kent	***Parameter Search Problem*** Abstract 9 Sabrina Blakeman Univ of Cincinnati	***An application of Sperner's Lemma to fair rental division*** Abstract 10 Annmarie Thomas Cleveland St Univ
5:00—5:15	***Infinite Polite Speech and Morse-Thue Seq.*** Abstract 13 Carol Schumacher Kenyon Coll	***Interesting Problems on the 2004 AMC-12 Exams*** Abstract 14 David Stenson John Carroll Univ	***Rational Points on Elliptic Curves*** Abstract 15 Jenise Smalley Ashland Univ	***Can a Ball Bounce Forever*** Abstract 16 Jason Slaby Ashland Univ
5:25—5:40	***An Algebraic Exploration of the German Enigma Machine*** Abstract 19 Sarah Nieman The Univ of Akron	***Transforming the MAA into a Soccer Ball*** Abstract 20 Julie Iammarino John Carroll Univ	***Need a fake ID or credit card? Your Math department can help.*** Abstract 21 Tarika Mansukhani Denison Univ	***The Fiat-Shamir Zero-Knoweldge Protcol*** Abstract 22 Melissa Krzywicki Cleveland St Univ
5:45—6:00	***An Alternate Approach to Differential Equations*** Abstract 25 Patricia Garmirian Denison Univ	***The alphabet is trivial*** Abstract 26 Catherine Pullin Univ of Cincinnati	***Why you need group theory before you make fake credit cards*** Abstract 27 Laura Berger Denison Univ	***Life at the NSA--an interactive conversation*** Abstract 28 J. Kevin Colligan National Security Agency
6:05—6:20	***Pebbling On Directed Graphs*** Abstract 31 Gayatri Gunda Univ of Dayton	***Arc Length and Surface Area – Are we on the same page?*** Abstract 32 Mark Walters Miami Univ-Oxford	***Arithmetic properties of some partial sums*** Abstract 33 Nathan Baxter Ohio Northern Univ	

Contributed Paper Session Schedule for Friday, March 26, 2004

All rooms are in Braunstein Hall

	Room 326	Room 300	Room 301
Time	Session Chair: Brian Shelburne	Session Chair: Angela Spalsbury	Special Session on the Fibonacci Numbers
4:20—4:35	***The Five Quadrable Lunes*** Abstract 5 Brian Shelburne Wittenberg Univ	***A Different Approach to a 2003 Putnam Problem*** Abstract 6 Joe Kolenick Youngstown St Univ	***Generalized Fibonacci Polynomials*** Thomas E. Price Univ of Akron
4:40—4:55	***An Introduction to Relative Difference Sets*** Abstract 11 Paul Carmany Ashland Univ	***Geoboards, Gaussian Integers, and Pythagorean Triples*** Abstract 12 Don Hunt Ohio Northern Univ	
5:00—5:15	***Integer Construction by Induction*** Abstract 17 Anthony Fressola Denison Univ	***Projectile Motion on an Incline Plane*** Abstract 18 Tom Cochran Youngstown St Univ	***Properties of Generalized Fibonacci Polynomials*** Lori McDonnell Univ of Akron
5:25—5:40	***A Bifurcation of X'= [[a,b][c,d]]x*** Abstract 23 Steven Spriggs Shawnee StateUniv	***Advanced Compass and Straightedge Constructions (The Problem of Apollonius)*** Abstract 24 Mark Clausing Ohio Northern Univ	***Integrals*** Ben Polovick Univ of Akron
5:45—6:00	***Parrondo's Paradox*** Abstract 29 John Tekus, Jr Ashland Univ	***Looking at the World through the "i"'s of Complex Numbers*** Abstract 30 Melissa Marshall Youngstown St Univ	***Entangled Lucas Numbers*** Mihai Caragiu Ohio Northern Univ
6:05—6:20	***Crystallographic Fractal Tilings*** Abstract 34 Maria Salcedo Youngstown St Univ	***Finite generalized quadrangles ... twenty years later*** Abstract 35 Mark Miller Marietta College	***A New Combinatorial Proof of a Fibonacci Identity*** Jimmy Smith Capital Univ

Contributed Paper Session Schedule for Saturday, March 27, 2004

All rooms are in Braunstein Hall

	Room 309	Room 312	Room 300
Time	Session Chair: Mark Miller	Session Chair: Mary Bergs	Session Chair: Irina Chernikova
10:20—10:35	***Mastering Scientific WorkPlace using Online Instruction*** Abstract 36 Thomas Price The Univ of Akron	***Deranged Series*** Abstract 37 Tempress Jackson John Carroll Univ	***Matrix Functions Made Easy*** Abstract 38 William Fuller Ohio Northern Univ
10:40—10:55	***How to draw with LaTex: Simple graphing commands*** Abstract 42 Keshav Jagannathan Bowling Green State University	***Computer-generated Tessellations of the Hyperbolic Plane*** Abstract 43 Dmitry Brant Cleveland St Univ	***Coding Messages*** Abstract 44 Carly Grey John Carroll Univ
11:00—11:15	***Data Analysis as a Rationale for College Algebra*** Abstract 48 Dale Winter Bowling Green St Univ	***Simulation of Rotation Systems*** Abstract 49 Alexios Laios Cleveland St Univ	***How'd you do that? The mathematics behind the magic*** Abstract 50 Colleen Hughes Denison Univ
11:20—11:35	***e is a transcendental number*** Abstract 54 David Stroup Cleveland St Univ	***Do I Have a Thumb Twin?*** Abstract 55 Christopher Ryan Univ of Dayton	***The Wronskians Are Coming!*** Abstract 56 Jennifer Bakisae John Carroll Univ
11:40—11:55	***The Dual of a Problem from Fermat and its Generalization*** Abstract 60 John Michel Marietta College	***Tricutting*** Abstract 61 Russ Smucker Muskingum College	***Counting Components of Human Links*** Abstract 62 Christopher Swanson Ashland Univ

Contributed Paper Session Schedule for Saturday, March 27, 2004

All rooms are in Braunstein Hall

	Room 324	Room 326	Room 316
Time	Session Chair: Bill Friel	Session Chair: Vickie VanDresar	Session Chair: Bill Higgins
10:20—10:35	***Neural Networks for Function Approximation, Optimization and Pattern Classification*** Abstract 39 Duncan Lowne Cleveland St Univ	***Getting (Back?) To Normal*** Abstract 40 David Cusick Marshall Univ	***A New Axiomatic Geometry: Cylindrical (or Periodic) Geometry*** Abstract 41 Elizabeth Ehret Denison Univ
10:40—10:55	***Bizarre Bases*** Abstract 45 Darren Wick Ashland Univ	***Modeling Calls for Service to an Urban Police Department*** Abstract 46 Lillian Batizy Cleveland St Univ	***Phi, Phyllotaxis, and the Fibonacci Series*** Abstract 47 Richard Edwards Ashland Univ
11:00—11:15	***Exponents*** Abstract 51 Michael McGowan John Carroll Univ	***Fatal Attraction*** Abstract 52 Chris Stoffer Ashland Univ	***The Winner's Curse and Sincere Bidding in Auctions*** Abstract 53 Rania Mansour Cleveland St Univ
11:20—11:35	***On primorial primes*** Abstract 57 Kristine Patton Ohio Northern Univ	***Are circles the best shape ever?*** Abstract 58 R. Narayan Choudury Denison Univ	***An Introduction to Wavelets*** Abstract 59 Stephanie Barille Amy Kuceyeski Mount Union College
11:40—11:55	***Dictatorship vs. democracy: What represents the will of the people?*** Abstract 63 Bill Froehlich Denison Univ	***I Seem To Have Lost My Prime*** Abstract 64 Jay Follett Ashland Univ	***Color Perception and Linear Algebra*** Abstract 65 Becky Grove Youngstown St Univ

Abstracts of Contributed Papers

Friday 4:20—4:35

The Hat Problem and Some Variations

Marepalli Rao
Faculty, University of Cincinnati

Abstract Number: 1. The Hat Problem has been making rounds in Mathematics and Statistics departments for quite some time all over the world. The presentation will begin with a brief outline of the problem and then some variations of the problem will be detailed. Applications to computational biology will be broached.

Implications of Ohio's New K-12 Mathematics Standards

Joan Leitzel
Retired Faculty, Ohio State and Ohio Department of Education

Abstract Number: 2. Ohio's new Academic Content Standards strengthen the mathematics curriculum in grades K-12 significantly. Implementing the new Standards creates a special problem in the upper elementary and middle grades where teachers are now expected to introduce basic ideas of algebra, lay the foundations of geometry, and explore problems in data analysis and probability. A high percentage of Ohio's teachers of mathematics in grades 5-8 are certified as elementary generalists; they are now being asked to teach mathematics they were not prepared to teach. This talk will look at possible roles Mathematics Departments in Ohio's colleges and universities might play in addressing the need to "retool" large numbers of elementary and middle grade teachers of mathematics.

The Intersection of Hilbert and Fibonacci

Thomas Dence
Faculty, Ashland University

Abstract Number: 3. An interesting result, of an elementary nature, forms a link, of great significance between these two famous names in mathematics.

Skewed Double Exponential Distribution: An Introduction

Keshav Jagannathan
Graduate Student, Bowling Green State University

Abstract Number: 4. For modelling heavy-tailed, non-symmetric data, we introduce two skewed double exponential distributions, SDE1 and SDE2. SDE1 is defined in terms of mixtures of exponential and double exponential distributions, while SDE2 is defined as the product of the scaled c.d.f and p.d.f of a double exponential distribution. Multi-parameter versions of the two distributions are introduced along with basic properties, characteristic functions, kth moments, skewness and kurtosis. We show, graphically, how changing the parameters affects the skewness and kurtosis of the distributions. (This work is done jointly with Prof. A.K Gupta and Prof. Truc T. Nguyen at BGSU)

The Five Quadrable Lunes

Brian Shelburne
Faculty, Wittenberg University

Abstract Number: 5. A lune, the crescent shaped area formed by the intersection of two circles, is quadrable if it is possible to construct a square with the same area using only straight-edge and compass. Hippocrates of Chios (ca. 430 BCE) is credited with discovering three such Lunes; two more were discovered in the 18th century. In the 20th century Tschebatorev and Dorodnov proved there were only five. This talk will examine the equation used to derive the five cases and present as examples the two cases which are not normally seen.

A Different Approach to a 2003 Putnam Problem

Joe Kolenick
Student, Youngstown State University

Abstract Number: 6. This talk will present a solution to problem B3 of the 2003 Putnam exam using de Polignac's formula about primes dividing n factorial as well as using a change of summations technique.

Friday 4:40—4:55

Continuity and Differentiability of the Ruler Function

Ken Gasser
Student, Ashland University

Abstract Number: 7. This talk will look at the piecewise defined function commonly known as the Ruler Function. The speaker will discuss some of the analytic properties of this function. Continuity will be examined using the formal definition and epsilon-delta proofs. The talk will then focus primarily on the differentiability of this function. This discussion will contain a proof-by-contradiction using the definition of derivative. Sequences and Euclid's proof that there is no largest prime number will be used in the argument. This talk is suitable for those who have had an introductory analysis course.

PMET: Preparing Mathematicians to Educate Teachers.

Olaf Stackelberg
Retired Faculty, Kent State University

Abstract Number: 8. I will briefly describe the national NSF funded MAA project PMET, and answer questions which may arise.

Numerical Methods for the Parameter Search Problem in Neuron Models

Sabrina Blakeman
Student, University of Cincinnati

Abstract Number: 9. Here we develop and discuss a method to find the unknown parameters of a system of differential equations with appropriate initial conditions so that the solution exhibits a certain desired behavior. A multi-dimensional method is given, with examples of a one-dimensional and two-dimensional parameter search. Our focus is on Hodgkin-Huxley type models of the electrical activity of neurons and, in particular, we apply our multi-dimensional

method is to a Morris-Lecar model to find the various conductances. The overall goal of this method is to minimize the difference between the solution and a curve that has the desired properties (e.g. the same period and value at a certain time). This minimization is achieved via a shooting method and steepest descent approach. We discuss both the theoretical and computational aspects of this method. A theorem for a one-dimensional/one parameter model is given as well as an algorithm for the method. Our results indicate that this method does converge to a correct set of parameters given a reasonably accurate initial guess of the parameter(s). Other limitations and pitfalls of this method will be discussed, as well as ideas for future parameter search problems.

An application of Sperner's Lemma to fair rental division

Annmarie Thomas
Student, Cleveland State University

Abstract Number: 10. The central topic will be an application of Sperner's Lemma and concepts of fair division, which will provide methods with which rent and rooms in an apartment can be assigned in such a way as to leave the occupants envy-free of another occupant's assigned rent and living space. An understanding of Sperner's Lemma for Triangles will firstly be established. Concepts related to fair division, such as cake-cutting, will then be presented and applied to the situation at hand.

An Introduction to Relative Difference Sets

Paul Carmany
Student, Ashland University

Abstract Number: 11. Many people have differences with their set of relatives, but not as many know about relative difference sets. This topic incorporates elements of discrete mathematics and abstract algebra, but should be accessible to all with a standard mathematics background. This introduction to relative difference sets will culminate with the presentation of two new (8,8,8,1) relative difference sets discovered last summer at a Research Experience for Undergraduates at Central Michigan University.

Geoboards, Gaussian Integers, and Pythagorean Triples

Don Hunt
Faculty, Ohio Northern University

Abstract Number: 12. A common teaching aid used for the past several decades in elementary schools is the (square) geoboard. Questions about polygons involving area, perimeter, the Pythagorean Theorem, etc. can be investigated on the geoboard. Two possible questions one might ask are a) “Can an equilateral triangle be created on the geoboard using its pegs as the vertices?” and b) “Can (non-trivial) squares be created on the geoboard?” The answer to the first question is no while the answer to the second question is yes. In this talk we will revisit these two question in a more general setting, namely on a three-dimensional geoboard! In the process we will uncover an interesting relationship between squares on a 3-D geoboard, gaussian integers and pythagorean triples.

Friday, 5:00—5:15

Infinite Polite Speeches, Konig's Theorem, and the Morse-Thue Sequence

Carol Schumacher
Faculty, Kenyon Coll

Abstract Number: 13. The talk will begin with a whimsical discussion of an island where the residents don't care what you say as long as you say it politely. (They also have a very limited vocabulary!) We will use this amusing tale to prove Konig's theorem and to establish the aperiodicity of the Morse-Thue Sequence. If time permits, we will connect these ideas to aperiodic tilings.

Interesting Problems on the 2004 AMC-12 Exams

David Stenson
Faculty, John Carroll University

Abstract Number: 14. In February nearly 15,000 Ohio high school students participated in the American Mathematics Competitions level 12 and level 10 examinations. Many of these students will be in our classrooms in the next few years. Some of the problems that caused them difficulty will be presented.

Rational Points on Elliptic Curves

Jenise Smalley
Student, Ashland University

Abstract Number: 15. Using work done this past summer at the REU at the University of Utah as a foundation, the speaker will present an introduction to the study of elliptic curves. We will study the distribution of the number of rational points on elliptic curves over the finite field $Zp = Z/(pZ)$ and discuss the symmetry of histograms modeling this distribution. We will also look at how isomorphism classes and j-invariants are related, as well as introduce some related applications of elliptic curves. This talk is suitable for those who have taken undergraduate mathematics courses.

Can a Ball Bounce Forever

Jason Slaby
Student, Ashland University

Abstract Number: 16. We begin by asking the question about whether a ball will bounce forever, if, when dropped from a certain height, it rebounds to half of the distance it originally fell from. I will derive the equations to model this problem and will analyze the solutions.

Integer Construction by Induction

Anthony Fressola
Student, Denison University

Abstract Number: 17. In 1889, Giuseppe Peano inductively defined the natural numbers by using the empty set along with a successor function. The natural numbers can be defined inductively primarily because they are well-ordered. Although it would seem reasonable to describe sets containing the natural numbers inductively, such as the integers and rational

numbers, traditional approaches have not done so. These systems have traditionally been defined as equivalence classes of natural numbers. One reason may be that the integers and rationals are not well-ordered under the usual ordering. This leaves us with an intriguing question: Can the integers and rationals be described inductively? Here we present one possible well-ordering that allows us to define the integers inductively. Using several inductive definitions, we are able to prove the common additive properties of the integers.

Projectile Motion on an Incline Plane

Tom Cochran
Student, Youngstown State University

Abstract Number: 18. The launch angle required to fire a projectile the farthest distance over a horizontal surface is 45 degrees. What is the launch angle to fire the projectile farthest up an incline surface? Will it remain 45 degrees or is it a new value?

Friday 5:25—5:40

An Algebraic Exploration of the German Enigma Machine

Sarah Nieman
Graduate Student, The University of Akron

Abstract Number: 19. The components of the German Enigma Machine can be broken down into a series of permutations. We will demonstrate how this can be done and use these properties to answer some questions about the algebraic effectiveness of the machine.

Transforming the MAA into a Soccer Ball

Julie Iammarino
Student, John Carroll University

Abstract Number: 20. After showing how to make a soccer ball out of the MAA, generalizations of the geometric properties will be explored.

Need a fake ID or credit card? Your Math department can help.

Tarika Mansukhani
Student, Denison University

Abstract Number: 21. Almost all identification numbers use check digits for error detection. Different manufacturers have the product identification numbers satisfy different conditions to make scanning devices fast and reliable. A common code people encounter is that of the UPC scheme. Schemes like this usually consist of 12 digits; the first 11 indicate broad product categories, particular products in that category and the actual product itself. The last is the check digit that must satisfy the stipulated conditions in order to verify the product. Usually these conditions are simple modular arithmetic equations. Credit card companies use a somewhat more complicated scheme so that fakes may be readily detected. The main goal for all schemes is to at least detect the two most common errors, single digit errors and transpositions of adjacent digits. Using two check digits improves error detection as does choosing a prime as the modulus number. In the talk, we will investigate these error detection schemes and see which companies are using them.

The Fiat-Shamir Zero-Knoweldge Protcol

Melissa Krzywicki
Student, Cleveland State University

Abstract Number: 22. A group of thieves have created a fake ATM and have placed it in a shopping mall. An unsuspecting person come to the machine in order to withdrawal money. The individual puts their card in the machine and is prompted to enter their PIN number. After entering the number a message comes on the screen informing the individual that the transaction cannot be completed. However, the machine has downloaded and stored all of the users information, including the PIN number. The thieves then take that information and created cards that they use to "clean out" the person's account. This talk will discuss the Fiat-Shamir Protocol, which is a way of giving out secret information that cannot be reused by an eavesdropper.

A Bifurcation in the 4-Parameter Family of Linear Systems Given by X'=[[a,b][c,d]]x

Steven Spriggs
Student, Shawnee State University

Abstract Number: 23. My presentation is over my Senior Research Project based in Ordinary Differential Equations. I started with a 2 by 2 matrix [[a,b][c,d]] and solved for the straight-line solutions in the general form. After solving for the general cases I am able to tell what kind of graph I have for any four values of a,b,c,d. I wanted to graph the cases but since we are unable to graph in 4-dimensions this is impossible. I then decided to hold the values of a and b fixed and vary the values of c and d to get 2-dimensional graphs in the ab-plane. I discovered some very interesting properties of c depending on the value it has. Simply put, when we graph in terms of the function b, a bifurcation occurs at c. My talk will focus on the bifurcation at c.

Advanced Compass and Straightedge Constructions (The Problem of Apollonius)

Mark Clausing
Student, Ohio Northern University

Abstract Number: 24. Classical geometric constructions using a compass and straightedge is a topic often studied in high school and college curriculum. In this talk I will present several advanced constructions, from The Problem of Apollonius.

Friday 5:45—6:00

An Alternate Approach to Differential Equations

Patricia Garmirian
Student, Denison University

Abstract Number: 25. A main topic in the undergraduate mathematics curriculum is the study of linear systems of differential equations. In a typical undergraduate differential equations course, students use the method of variation of parameters to solve these equations. This process involves finding the eigenvalues and eigenvectors of a matrix A and then computing the exponential of this matrix. In contrast, the decomposition method assumes a series solution. This alternate method for solving linear systems of differential equations is accessible to undergraduate students with knowledge of basic calculus and matrix algebra.

The alphabet is trivial

Catherine Pullin
Graduate Student, University of Cincinnati
Abstract Number: 26. By treating the English alphabet as a group one can show that all letters are actually the same. Therefore the alphabet becomes the trivial group consisting of just one element.

Why you need group theory before you make fake credit cards

Laura Berger
Student, Denison University
Abstract Number: 27. Modular arithmetic equations play a key role in error detection of identification numbers. The use of check digits in these identification numbers not only detects when there is an error in the number, but can also correct the erroneous digit(s). These schemes can usually detect all single digit errors and all transpositions of numbers next to each other. These are the two most common errors. An even more effective scheme can be developed using noncommutative arithmetic. Such group theoretic schemes eliminate the possibility of check digits being a two digit number and can detect more errors. In this talk, we will present several of these schemes and indicate which companies are using them. Although this is a complementary talk to Tarika Mansukhani's "Making/detecting fake credit cards with math", it will be self contained.

Life at the NSA--an interactive conversation

J. Kevin Colligan
National Security Agency
Abstract Number: 28. The presenter will share some experiences from his 31 years at the National Security Agency, and field questions from the audience. This session may be of special interest to students who may are contemplating a mathematical career with the government. (This talk will conclude at 6:20.)

Parrondo's Paradox

John Tekus, Jr
Student, Ashland University
Abstract Number: 29. The speaker will present a brief history behind Parrondo's Paradox and then explain via example how the paradox actually occurs. An example involving the probabilities of playing a series of two "losing" games will be developed in order to fully show how Parrondo's Paradox actually does occur.

Looking at the World through the "i"'s of Complex Numbers

Melissa Marshall
Student, Youngstown State University
Abstract Number: 30. This talk will discuss a certain way cartographers can project the earth on to a flat piece of paper using the stereographic projection of complex numbers.

Friday 6:05—6:20

Pebbling On Directed Graphs

Gayatri Gunda
Student, University of Dayton

Abstract Number: 31. A pebbling move on a graph G is defined as the removal of two pebbles from one vertex and the addition of one pebble to an adjacent vertex. The pebbling number f(G) of a connected graph is the least number of pebbles such that any distribution of f(G) pebbles on G allows one pebble to be moved to any specified, but arbitrary vertex. We consider pebbling on directed graphs and study what configurations of directed graphs allow for pebbling to be meaningful. We also discuss the pebbling numbers of certain configurations of directed wheel graphs (Wn) and directed complete graphs (K2n+1) with odd order where n>=2. G is said to be demonic if f(G) = n where n is the order of G. We demonstrate the existence of demonic directed graphs and establish that the upper and lower bounds of the pebbling numbers of the directed graphs is the same as that of the undirected graphs: n<= f(G) <=2^(n-1).

Arc Length and Surface Area – Are we on the same page?

Mark Walters
Student, Miami University-Oxford

Abstract Number: 32. In calculus textbooks, formulas are developed for the length of a curve in the plane and for the area of a surface in three-space. Many textbooks, including Stewart's calculus book that we use at Miami University, take different approaches to these two very similar mathematical situations. One approach connects the dots along a curve to get a polygonal approximation, while the other approximates via tangential considerations. This raises the question of why don't we take the same approach in both situations? We shall look at these differing approaches, compare them, and prove that each leads to the expected mathematical conclusions. Upon doing so, we remain with the curiosity of this common inconsistency.

Arithmetic properties of some partial sums

Nathan Baxter
Student, Ohio Northern University

Abstract Number: 33. It is well known that for n>1 the n-th partial sum of the harmonic series cannot be an integer. By using p-adic exponents as well as some classical results involving the distribution of primes, we will investigate other arithmetic properties of the partial sums of some special series.

Crystallographic Fractal Tilings

Maria Salcedo
Student, Youngstown State University

Abstract Number: 34. This talk will discuss what fractals are and how they can be generated to tile the plane, as well as categorization of fractal tilings into the seventeen crystallographic groups.

Finite generalized quadrangles ... twenty years later

Mark Miller
Faculty, Marietta College

Abstract Number: 35. Much of the work in the field of geometry has centered around the parallel postulate: In a Euclidean plane, given a line L and a point p not on L, there is a unique line through p which does not meet L. One variation on this gives rise to what are called generalized quadrangles (GQ). In GQ, given a line L and a point p not on L there is a unique line through p which does meet L. A GQ is said to be finite of order (s, t) provided each line contains s+1 points and each point lies on t+1 lines. (One can think of GQ as abstractions of rectangular grids.) The only book dedicated solely to the topic of GQ was coauthored by S.E. Payne at Miami University and J.A. Thas at the University of Ghent in 1984. As part of the twentieth anniversary of the publication of this book, we consider some of the advances that have been made over the past two decades.

Saturday 10:20—10:35

Mastering Scientific WorkPlace using Online Instruction

Thomas Price
Faculty, The University of Akron

Abstract Number: 36. Scientific WorkPlace is a sophisticated, WYSIWYG (almost everywhere), scientific word processor that produces typeset quality symbols and text. It also contains an interactive Computer Algebra System with graphing and random exam building capabilities. Last fall I taught a course on this software package using video lecture files distributed to students over the Internet. In this talk I will describe the specific methodologies used to communicate with the students, discuss the strategy I used to access the students, present my and the students' view of the effectiveness of this course, and outline my thoughts on the future of using videos and the internet as an instructional medium.

Deranged Series

Tempress Jackson
Student, John Carroll University

Abstract Number: 37. Many times, our calculus course reduces the study of series, their convergence and their sums, to simple formulas. I will show how to find the sums of certain arrangements of conditionally convergent series, an interesting topic that is rarely covered in calculus courses.

Matrix Functions Made Easy

William Fuller
Faculty, Ohio Northern University

Abstract Number: 38. Recently there has been interest in methods of teaching matrix exponentials with a minimum of prerequisites. In this talk a conceptually direct approach to analytic functions of matrices will be outlined and explicit formulas for low-dimensional cases given.

Neural Networks for Function Approximation, Optimization and Pattern Classification

Duncan Lowne
Recent graduate, Cleveland State University

Abstract Number: 39. Function approximation on an arbitrary, non-linear data set is often a complex and computationally intensive task. Parallel distributed processing is a biologically inspired method quite adept at performing function approximation tasks. By emulating a model of a simple nervous system, non-linear n-dimensional functions can be "taught" to recognize a function. Furthermore, minor modifications to this concept lend themselves to such problems as optimization and adaptive pattern classification.

Getting (Back?) To Normal

David Cusick
Faculty, Marshall University

Abstract Number: 40. In Calculus III we study vector-valued functions of one real variable, along with their unit tangent vectors, principal unit normal vectors and the binormal vectors. These form the “Frenet frame” for motion in 3-space. Deriving the normal and binormal vectors is elegant in theory, but it is often awkward and tedious in practice. A small practical improvement is proposed, especially if we want the Frenet frame at just a single point. This talk should be accessible to calculus students who have studied three-dimensional vector geometry, including the cross product.

A New Axiomatic Geometry: Cylindrical (or Periodic) Geometry

Elizabeth Ehret
Student, Denison University

Abstract Number: 41. Historically, new geometries have developed by making changes to current axiom systems and then developing a model that illustrates the new geometry. The most classic example of this is the development of hyperbolic geometry which came from negating Euclid's fifth postulate. This project inverts the process; we start with a geometric object and attempt to find a set of axioms that characterizes the geometry modeled by the object. In this talk we present an axiomatic geometry modeled by geodesics on an infinite cylinder along with the necessary definitions and some basic theorems within the geometry. Several open questions will be posed. This talk is appropriate for anyone who has had high school geometry.

Saturday 10:40—10:55

How to draw with LaTex: Simple graphing commands

Keshav Jagannathan
Graduate Student, Bowling Green State University

Abstract Number: 42. This talk introduces graphing commands and environments in LaTex. We will talk about how to draw lines, circles, axes, grids etc. using only LaTex commands. Time permitting, we will also talk about how to incorporate graphs from other graphing programs into a LaTex document.

Computer-generated Tessellations of the Hyperbolic Plane

Dmitry Brant
Student, Cleveland State University

Abstract Number: 43. We present a computer application that generates graphical representations of uniform tilings (tessellations) on the hyperbolic plane in real time. Programming the application presented the challenge of translating hyperbolic coordinates to coordinates on the Poincaré disk, and then translating to coordinates on the screen. It also presented the challenge of actually enumerating the vertices of the tilings simply based on the Schläfli symbol {p,q}.

Coding Messages

Carly Grey
Student, John Carroll University

Abstract Number: 44. We will discuss Public Key Encryption with a number of examples using small primes to explain the concept.

Bizarre Bases

Darren Wick
Faculty, Ashland University

Abstract Number: 45. The standard bases for the real numbers use an integer b>1 as the base and a set of digits {0,1,...,b-1} as the coefficients. However, negative numbers cannot be represented in these bases without the use of a sign bit. In this talk we investigate bases and digit sets for which every real number can be represented without the need for a sign bit (e.g. negative integer bases and/or negative digits). In particular, we will explore some interesting properties of the set of all numbers with zero integer part. We also present an analogous situation for the complex numbers.

Modeling Calls for Service to an Urban Police Department

Lillian Batizy
Student, Cleveland State University

Abstract Number: 46. I have been working on an ongoing project with at team of representatives from the Cleveland police department and faculty and students at Cleveland State and John Carroll University. The project focuses on developing mathematical, statistical, and sociological models of crime and calls for service in the city of Cleveland. Last summer we worked on cleaning and analyzing the data, which consisted of approximately 5 million calls for service to the city of Cleveland dispatching center. I will present graphical and regression analysis of the frequency of calls that illustrates how time and temperature affects calls for service in the city of Cleveland.

Phi, Phyllotaxis, and the Fibonacci Series

Richard Edwards
Student, Ashland University

Abstract Number: 47. This talk will consider the Golden Ratio, Fibonacci numbers, and their connection with spirals. The speaker will demonstrate the construction of spirals based on

irrational angles. The appearance of spirals in nature based on the Golden Ratio will be discussed. Examples of spirals based on angles of pi and the square root of two will be presented. Convergents of the continued fractions of these irrational numbers will be examined, along with applications to the phyllotaxis phenomena. This talk is suitable for anyone with a basic understanding of discrete mathematics.

Saturday 11:00—11:15

Data Analysis as a Rationale for College Algebra

Dale Winter
Faculty, Bowling Green State University

Abstract Number: 48. In this talk I will describe a new pair of College Algebra courses that use the theme of data analysis to give coherence and meaning to the concepts and techniques of College Algebra. I will give specific examples that demonstrate how the theme of data analysis is used to arrange topics in the course and to determine how topics can be presented in more meaningful ways.

Simulation of Rotation Systems

Alexios Laios
Student, Cleveland State University

Abstract Number: 49. When one studies physics at the undergraduate level, one does not typically study complicated rotational systems. These systems tend involve complicated mathematics that one would not normally see until the graduate level. However, it is possible, given the right backgrounds in both mathematics and physics, to work on the basic problem of a bead moving freely on a rigid hoop of wire rotating at a constant angular velocity. It is in fact my ultimate goal to prepare three different models of this system. The first being the model mentioned above with a vertical symmetric axis of rotation. The other models include adding a physically meaningful frictional force along with changing the axis of rotation to some other angle.

How'd you do that? The mathematics behind the magic

Colleen Hughes
Student, Denison University

Abstract Number: 50. The response that a performer hopes to hear from her audience when the card trick reaches its conclusion is, "How'd you do that?" This presentation will demonstrate that what we usually refer to as card "tricks" is really just the application of elementary mathematics to a collection of 52 2-sided objects with 4 possible categories each ranging from 1 to 13. In this talk I will unmask the mathematics behind these tricks, not as a magician, but as a math student interested in the math behind the magic. This talk requires very basic mathematical understanding and will be of interest to anyone who has ever said, "How'd you do that?"

Exponents

Michael McGowan
Student, John Carroll University

Abstract Number: 51. We will explore three very related Putnam Problems from a long time ago. More recently, new solutions were discussed in three different articles in the Pi Mu Epsilon Journal.

Fatal Attraction

Chris Stoffer
Student, Ashland University

Abstract Number: 52. In this talk we will investigate fatal attractors. Attractors have an amazing appeal that is interesting to mathematicians and people not involved in mathematics alike. A series of repetitive operations on positive integers will attract to a specific number and continue to remain at that number when operations are applied again. The repeated number is called an attractor. The speaker will give examples of such procedures that collapse to a certain value. Proofs will also be given that make use of a “tunnel” and “trap” method. This talk is appropriate for anyone who has taken an undergraduate math course.

The Winner's Curse and Sincere Bidding in Auctions

Rania Mansour
Student, Cleveland State University

Abstract Number: 53. Single bid auctions are plagued by what is known as the "winner's curse": the person winning the auction may feel that the price paid for the auctioned item was too high, since nobody else was willing to pay that price. This might lead bidders to make "insincere bids", where the amount bid is smaller than the bidder’s estimated value of the item. In this talk, we will discuss alternative auction protocols that attempt to avoid this situation.

Saturday 11:20—11:35

e is a transcendental number

David Stroup
Student, Cleveland State University

Abstract Number: 54. I will show that e is not a natural number using a graphical argument and then elaborate using a series expansion. I will then suggest that e is irrational via the periodicity of its continued fraction, and then prove it is so by contradiction. I will also attempt to incorporate a java program illustrating the periodicity of certain irrational continued fractions. Finally, given Gelfond's theorem, I will show that e is transcendental. (Advised by Prof. Ghatage of Cleveland State University)

Do I Have a Thumb Twin?

Christopher Ryan
Student, University of Dayton

Abstract Number: 55. Popular opinion indicates that every person who has ever lived has a unique thumbprint. However, without applying mathematical rigor to the problem, this

hypothesis is little more than a myth. The focus of this paper is to develop a model to test the hypothesis and to calculate the probability that thumbprints are unique. Furthermore, the model analyzes special limiting cases of the problem. Lastly, the odds of misidentification by way of thumbprint analysis are compared to the odds of misidentification through DNA evidence. The results indicate that both thumbprint and DNA analysis supply individuals with unique identifiers, but a misidentification by DNA is several orders of magnitude less likely.

The Wronskians Are Coming!

Jennifer Bakisae
Student, John Carroll University

Abstract Number: 56. After defining the Wronskian Determinant, we will note a common, but often unobserved, occurrence of Wronskians in Calculus 1. A few applications of Wronskians will be included. Then we will explore identities involving Wronskians and their inter-relation with derivatives. This is a preliminary paper that my advisor says will lead to a remarkable result in differential equations due to that famous problem solver, George Polya.

On primorial primes

Kristine Patton
Student, Ohio Northern University

Abstract Number: 57. A primorial prime is a prime that is one more (or one less) than the product of the first n prime numbers, where n=1,2,3,... We will prove some claims on primorial primes stated in a paper by Turker Ozsari (arXiv:math.NT/0310412v1).

Are circles the best shape ever?

R. Narayan Choudury
Student, Denison University

Abstract Number: 58. If you ever wondered just what it was that made the circle so cool, this is for you. We may not be proving that circles are the best shape ever, but using Green's Theorem and Fourier series, we will prove that a circle encompasses the greatest area possible of any continuous, differentiable, closed curve of a set perimeter. This talk requires a minimal understanding of sequences and multivariable calculus.

An Introduction to Wavelets

Stephanie Barille
Amy Kuceyeski
Students, Mount Union College

Abstract Number: 59. This presentation will introduce basic concepts of Haar and Daubechies wavelets. Applications to denoising and compression of audio signals will also be discussed.

Saturday 11:40—11:55

The Dual of a Problem from Fermat and its Generalization

John Michel
Faculty, Marietta College

Abstract Number: 60. Early in the 17th century, Fermat posed the problem: find the point P in triangle ABC that minimizes the sum of distances from P to the vertices. In 1846, Fasbender formulated and solved a "dual" problem: find the largest equilateral triangle that circumscribes triangle ABC. This could well be the first example of the dual of a nonlinear optimization problem. In this talk, we will first use an applet I wrote to visualize the solution to the Fasbender problem. Then we will use a primal-dual interior point algorithm from modern nonlinear programming to simultaneously solve a generalized version of the Fermat problem and its dual.

Tricutting

Russ Smucker
Faculty, Muskingum College

Abstract Number: 61. Can you cut a quatrilateral in the plane into three pie-shaped regions (with sector angles of 120 degrees) that have the same area? We answer this question. We generalize.

Counting Components of Human Links

Christopher Swanson
Faculty, Ashland University

Abstract Number: 62. Suppose n people randomly join hands to form a human link. An interesting problem is to identify what particular link has been formed. One way to initially attack this problem is to count how many components (knots) are entangled in the human link. I will present a surprisingly simple formula for the expected number of components in a link consisting of n humans, a problem I studied while attending the PREP Workshop on Knot Theory last summer. I will also attempt to answer the question "Why attend the 2004 Summer Short Course 'Teaching and Doing Knot Theory' presented by Colin Adams?" with a more profound response than "Why Knot?" WARNING: This talk will include audience participation that may result in a new record for the densest packing of mathematicians at an Ohio Section MAA meeting. Deodorant and breath mints are recommended, but will not be provided.

Dictatorship vs. democracy: What represents the will of the people?

Bill Froehlich
Student, Denison University

Abstract Number: 63. Are elections really fair? Today ailing countries with poor political institutions such as Iraq and Afghanistan are reconstructed so that they are democracies. Ideally, in a democracy, all citizens are involved in a fair political process. But is a democracy the best possible social welfare function? A brief discussion of Arrow's Theorem will show which possible voting scheme truly represents the will of the people. In his theorem, Arrow creates qualifications that must be reached so that a voting system is perfect. In fact, Arrow's Theorem shows that a dictatorship is the ideal "voting system." Common sense contradicts the notion that

a dictatorship is better than democracy, when in actuality there is no ideal social welfare function. This talk is suited for students of all levels in many subject areas.

I Seem To Have Lost My Prime

Jay Follett
Student, Ashland University

Abstract Number: 64. Determining whether integers are prime is a relatively simple task when an integer is small. However, when integers become larger, it becomes more impractical to check primality by division. Thankfully, tests have been developed to determine whether large integers are prime or not. Methods demonstrated and discussed for determining primality will include the Sieve of Eratosthenes, Pepin test for Fermat's Primes, and the Lucas-Lehmer test for Mersenne Primes. A brief overview of using elliptic curves to prove primality will also be covered.

Color Perception and Linear Algebra

Becky Grove
Student, Youngstown State University

Abstract Number: 65. This talk will discuss the use of matrices to change from red, green, blue color space to cyan, magenta, yellow color space.