2015 Joint Meetings

Of The

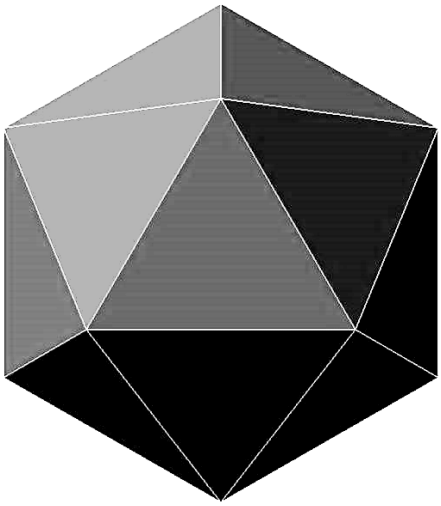
Florida Section

Of The

Mathematical Association of America

And The

Florida Two-Year College Mathematics Association



Eckerd College

January 23 - 24, 2015

Florida Section of the Mathematical Association of America

2014 – 2015

Governor	Jacci White, Saint Leo University
President	Scott Hochwald, UNF
Past President	Sidra Van de Car, Valencia College
Vice-President for Programs	Brian Camp, Saint Leo University
Vice-President for Site Selection	Angela Angeleska, University of Tampa
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Florida Two-Year College Mathematics Association

2014 - 2015

President	Ryan Kasha, Valencia College
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Webmaster and President-elect	Altay Özgener, State College of Florida
President-elect	Altay Özgener, State College of Florida

PROGRAM

Friday, January 23, 2015

Committee Meetings

FL – MAA

9:30 - 11:00	Executive Committee Meeting	CMLS-096

FTYCMA

10:00 – 10:50	FTYCMA Officer's Meeting	CMLS-092
11:00 – 12:30	FTYCMA Annual Business Meeting	CMLS-092
12:30 – 1:30	FTYCMA Lunch	CMLS-092

REGISTRATION

11:00 – Registration & Publishers — James Center Lobby

Sign in and browse the displays from several publishing representatives in the CMLS South Wing Lobby.

WELCOME

1:35 – 2:00 Welcoming Remarks — Miller Auditorium

Scott Hochwald, President of FL-MAA
Ryan Kasha, President of FTYCMA
Laura Meacham Keane
Suzan Harrison, Dean of Faculty, Eckerd College

2:00 – 2:50 Plenary Session I — Miller Auditorium

Ruth Charney – George Pólya Lecturer, MAA

An Excursion into the Strange World of Singular Geometry

3:00 – 3:45 Contributed Papers Session I

3:00 – 3:45 — Joni Pirnot, Cathy Panik, and Mary Beth Headlee, State College of Florida — CMLS-099

Get organized, generate enthusiasm, and retain students!

3:00 – 3:45 — Anna Wasilewska and Rebecca Williams, State College of Florida — CMLS-093

Changes You See in MAT 1033 - Part II

3:00 – 3:20 — Alexander Garron – Sandbox Geometry, LLC — CMLS-064

Plane Geometry Construction of G-field Energy Curves

3:00 – 3:20 — Alden Sharp – Florida Atlantic University — CMLS-068

Minimal Completion in Boolean Algebra

3:00 – 3:20 — Kelly Gomes – University of North Florida — CMLS-072

Modeling Gene Assembly by Signed Permutations

3:25 – 3:45 — Mike Nancarrow – Jacksonville University — CMLS-064

An Introductory Mathematical Biology Class for Calculus II Students

3:25 – 3:45 — Anna Little – Jacksonville University — CMLS-068

A Multiscale Spectral Method for Estimating the Number of Clusters

3:25 – 3:45 — Murphy Conn Griffin – University of North Florida — CMLS-072

Topological Properties of Thickened Graphs

4:00 – 4:45 Contributed Papers Session II

4:00 – 4:45 Scott Hochwald – University of North Florida CMLS-099

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4:00 – 4:20 John Coney – Coney Mathematics, Political Economy and Logic CMLS-064

Solving Biquadratics

4:00 – 4:20 Altay Özgener and Robert Shollar CMLS-068
State College of Florida

Fun Facts About Positive Integers

4:00 – 4:20 Katie Bakewell – University of North Florida CMLS-072

Applications of Self Assembly Graphs (Part I)

4:25 – 4:45 Daria Karpenko – University of South Florida CMLS-064

Dynamic Simulation of 1D Cellular Automata with DNA-based Tiles

4:25 – 4:45 Robert Shollar – State College of Florida CMLS-068

Some Different Ways to Sum a Series

4:25 – 4:45 Sudam Surasinghe – University of North Florida CMLS-072

Applications of Self Assembly Graphs (Part II)

4:00 – 4:45 Governor's Session and History of MAA-Florida CMLS-093

Jacci White – Saint Leo University

In addition to the yearly address and update from the Governor, we will share stories of the 50 year history of MAA-Florida. Join us for both current MAA news and past stories of MAA-Florida.

3:00 – 5:00 Student Events CMLS-092

3:00 – 4:00 Student Integration Contest
Come test your integration abilities!

4:00 – 5:00 Student Math Puzzle Contest
Attempt to solve our Sudoku and Ken-Ken puzzles.

4:45 – 5:30 Conference Break

Please visit the textbook publishers in CMLS South Wing Lobby.

5:30 – 6:20 Plenary Session II **Miller Auditorium**

Jenna Carpenter – First Vice President of MAA

Top Secret: Women's Contributions to the History of Computing

6:30 – 7:45 Conference Banquet and Awards Ceremony **James Center Lobby**

Saturday, January 24, 2015

8:35 – 9:45 Contributed Papers Session III

8:35 – 8:55 Colin Defant – University of Florida CMLS-064

A Note About Iterated Arithmetic Functions

8:35 – 8:55 Pulara Mapatuna – University of North Florida CMLS-072

Regularity Preserving Lemma

9:00 – 9:45 Charles Lindsey – Florida Gulf Coast University CMLS-099

Doing Arithmetic in Medieval Europe

9:00 – 9:45 Latrica Williams – St. Petersburg College CMLS-093

Blending vs. Flipping: Should You Blend or Flip Your Math Class?

9:00 – 9:20 Todd Pierce – University of West Florida CMLS-064

Mathematics of Casino Games

9:00 – 9:20 Monika Kiss, Brian Camp and Shawn Weatherford CMLS-068
Saint Leo University

Assessing the Effectiveness of Online Homework in Graphing Abilities and Efficacy in College Algebra: A Preliminary Report

9:00 – 9:20 Matthew Simmons – University of North Florida CMLS-072

Involutively Bordered Words

9:25 – 9:45 Wesley Henderson – University of West Florida CMLS-064

Conic Sections and Communications

9:25 – 9:45 Benjamin Hutz – Florida Institute of Technology CMLS-068

Using Computer Algebra Systems for Undergraduate Research

9:25 – 9:45 Benjamin Webster – University of North Florida CMLS-072

Identifying and Computing Maximal Bond Free Languages

10:00 – 10:45 Contributed Papers Session IV

10:00 – 10:45 Carrie Grant – Flagler College CMLS-099

Online Course Redesign: Using the Best Practices

10:00 – 10:45 Lubomir Markov – Barry University CMLS-093

In Marden's Footsteps: Searching for MVTs in the Complex Domain

10:00 – 10:45 Mike Keller – St. Johns River State College CMLS-092

Discover Patterns by Stacking Cups

10:00 – 10:20 Kelsey Garrett – University of West Florida CMLS-064

Analysis of Health Data using Entropy: HIV and Tuberculosis

10:00 – 10:20 Grayson Jorgenson – Florida Institute of Technology CMLS-068

Computing the Elementary Symmetric Polynomials of the Multiplier Spectra of z^2+c

10:00 – 10:20 Michael Reynolds – Indian River State College CMLS-072

Assignments in Functional Iteration and a Bridge to Higher Mathematics

10:25 – 10:45 Timothy Dombrowski – Saint Leo University CMLS-064

The Black-Litterman Model: Analyzing the Effects of Contradictory Portfolios

10:25 – 10:45 Joao Alberto de Faria – Florida Institute of Technology CMLS-068

Wheeler K3 Surfaces and SAGE

10:25 – 10:45 Charles Hedges and Felipe Quiroga – Rollins College CMLS-072

A New Graph Recoloring Game

11:00 – 11:45 Contributed Papers Session V

11:00 – 11:45 Michael Mears – State College of Florida CMLS-099

FTYCMA at Age 50: Looking Back at Things We May Have Forgotten

11:00 – 11:45 Warren McGovern – Florida Atlantic University CMLS-093

Group Rings: an undergraduate project

11:00 – 11:20 Carol Warner – Barry University CMLS-064

Using the Principles of Stand-Up Comedy to Engage Your Students

11:00 – 11:20 Daniel Moseley – Jacksonville University CMLS-068

Incorporating iPads in the Classroom

11:00 – 11:20 Thomas Ricard – Saint Leo University CMLS-072

A Musical Interpretation of Pi

11:25 – 11:45 Amy Stein – Florida Atlantic University CMLS-064

Knitting with Matrices

11:25 – 11:45 Yuanchung Sun – Florida Institute of Technology CMLS-068

Mathematical Modeling and Methods of Signal Separations

11:25 – 11:45 Ted Andresen - Honeywell Aerospace & SPC (Retired) CMLS-072

Finding Answers to Real World Problems with Newton-Raphson

11:00 – 11:45 Math Jeopardy! CMLS-092
Monika Kiss – Saint Leo University

12:00 – 12:50 Plenary Session III Miller Auditorium

William Dunham, George Pólya Lecturer, MAA

Two (More) Morsels from Euler

12:50 – 1:00 Closing Remarks
Brian Camp, Saint Leo University

1:00 – 3:00 Luncheon and FL-MAA Business Meeting James Center Lobby

ABSTRACTS

Contributed Papers Session I

Joni Pirnot, Cathy Panik, and Mary Beth Headlee – State College of Florida

Get organized, generate enthusiasm, and retain students!

Three teachers share their strategies for organization, creating and maintaining enthusiasm in the classroom, and student retention. Audience participation will be encouraged.

Anna Wasilewska and Rebecca Williams - State College of Florida

Changes You See in MAT 1033 - Part II

This session will be a continuation of a presentation from MAA - FL Suncoast Regional Meeting XXXIX in December 2014. This will be a roundtable discussion on recent changes to MAT1033 - Intermediate Algebra, given the implementation of Senate 1720. Potential topics include preparedness of students, class formats, and success rates.

Alexander Garron – Sandbox Geometry, LLC

Plane Geometry Construction of G-field Energy Curves

My passion is plane geometry construction of g-field energy curves. I do so by a return to original philosophical pursuits of 'How Move the Planets'. Galileo and Kepler were contemporaries and Galileo renounced Kepler's solution for retrograde motion of Mars convinced planets move in circles and not elliptical orbits. I demonstrate a Galilean perception and prove my geometry constructions using Sir Isaac Newton's Inverse Square Law for the Gravity Field. A mix of HS STEM math and physics that construct an analytic alternate view of g-field mechanics that could not be done without 21st century computer math technology.

Alden Sharp – Florida Atlantic University

Minimal Completion in Boolean Algebra

In a typical introductory course in logic, we learn the meanings of five operators in Boolean algebra: negation ($\neg p$), conjunction ($p \wedge q$), disjunction ($p \vee q$), conditional ($p \rightarrow q$), and biconditional ($p \leftrightarrow q$). These five Boolean operators are enough to construct all possible expressions in Boolean algebra, and this is what we mean when we say a set of operators is *complete*. However, we don't need all five operators in order to be complete; we can simply express $p \leftrightarrow q$ as $(p \rightarrow q) \wedge (q \rightarrow p)$, $p \rightarrow q$ as $\neg(\neg p \wedge q)$, and $p \vee q$ as $\neg(\neg p \wedge \neg q)$. Thus, we can have only negation ($\neg p$) and conjunction ($p \wedge q$) and still be able to construct all possible expressions in Boolean algebra. However, we cannot construct all possible expressions by negation alone, nor by conjunction alone. We then say the set $\{\neg, \wedge\}$ is *minimally complete*, because no proper subset is complete.

We will characterize the minimally complete sets of operators in two-element Boolean algebra.

Kelly Gomes – University of North Florida

Modeling Gene Assembly by Signed Permutations

DNA processing in ciliates, a very ancient group of organisms, is among the most sophisticated DNA processing in living organisms. Particularly interesting from the computational point of view is the process of gene assembly from its micronuclear to its macronuclear form. The intramolecular model for gene assembly in ciliates considers three operations *ld, hi,* and *dlad* that can assemble any gene pattern through folding and recombination. Our representation is in terms of signed permutations and we will show that simple assemblies possess very involved properties.

Mike Nancarrow – Jacksonville University

An Introductory Mathematical Biology Class for Calculus II Students

The development and implementation of a Calculus II course emphasizing mathematical models in biology that is accessible to Biology students will be discussed. Course topics include a study of differential equation models with examples drawn largely from medicine and ecology. Student use analytic techniques in concert with a computer algebra system to help them understand the modeling process, characterize long-term behaviors, and make predictions about an assortment of biological processes.

Anna Little – Jacksonville University

A Multiscale Spectral Method for Estimating the Number of Clusters

This talk introduce a new multiscale, spectral algorithm for estimating the number of clusters of a data set. By viewing the data as a weighted graph, spectral clustering methods use the eigenvalues and eigenvectors of the graph Laplacian to cluster the data; the user must specify both the number of clusters and a scale parameter, and clustering results are very sensitive to these parameter choices. Our algorithm computes the eigenvalues of the Laplacian iteratively for a large range of scales, and analyzes how the eigenvalues change as a function of the scale. Thus variation of the scale parameter, which usually confuses the clustering problem, is used to infer the number of clusters in a robust and automated way. The algorithm is applied to test data sets (both simulated and real-world) for method validation.

Murphy Conn Griffin – University of North Florida

Topological Properties of Thickened Graphs

This presentation introduces the topology of *thickened graphs. A thickened graph F(G)* is a compact, orientable, open surface embedded with an underlying graph *G* as a deformation retract. Research into the properties of thickened graphs has emerged out of graph theoretic applications in DNA computation, however, this talk will be a strictly topological discussion of how graph structure affects *thickening*, how *vertex-neighborhood substitutions* yield different homeomorphism types, and how *edge additions* affect the number of boundary components of thickened graphs.

Contributed Papers Session II

Scott Hochwald – University of North Florida

γ A. K. A. C

Euler used C to denote what we now call γ. We will discuss the origins and applications of what is known today as Euler's constant.

John Coney – Coney Mathematics, Political Economy and Logic

Solving Biquadratics

Following the algorithm used by J. Uspensky given in "Theory of Equations", I will solve a particular biquadratic. Then I will show that a sufficient condition for the resolvent to have an integer solution is that a quartic be a product of quadratics: If $f(x) = (x^2 + ax + b)(x^2 + cx + d)$, then the resolvent has solution b+d.

Altay Özgener and Robert Shollar – State College of Florida

Fun Facts About Positive Integers

In this lighthearted talk, we will talk about integers, and tell some expected and unexpected facts about some of them.

Katie Bakewell – University of North Florida

Applications of Self Assembly Graphs (Part I)

By using iterative three-degree perturbations, any graph can be represented as a self-assembled DNA graph structure of three armed junction molecules. In representing these graph structures as deformation retracts of closed compact DNA manifolds, a single strand can be identified which traverses each edge of the graph structure at least once. We show various applications of the property to traditional graph theory problems, and consider weighting algorithms and their applications to DNA computing.

Daria Karpenko – University of South Florida

Dynamic Simulation of 1D Cellular Automata with DNA-based Tiles

We show how 1D cellular automata can be dynamically simulated by DNA-based tiles within the Active Abstract Tile Assembly Model (Active aTAM). The Active aTAM is a tile model for self assembly where tiles are able to transfer signals and change identities according to the signals received. We give a brief description of the model with the dynamics of tile attachment, detachment, and signal passing, and then show that the model allows a simulation of cellular automata with assemblies that do not record the entire computational history but only the current updates of the states, demonstrating the idea of reusable space in self-assembly. The simulation is such that at a given location the sequence of tiles that

attach and detach corresponds precisely to the sequence of states the synchronous cellular automaton generates at that location.

Robert Shollar – State College of Florida

Some Different Ways to Sum a Series

In 1644, Pietro Mengoli posed the famous Basel problem. Named after the hometown of the great Leonard Euler, the Basel problem withstood attacks by many outstanding mathematicians of the time. It took the great mind of Euler to tame this problem in 1735. Ever since then, mathematicians have found new and exciting ways of solving this age old problem. We will investigate some of these famous solutions that range from the classic Eulerian style to more modern techniques. Join us in discovering a bit of history behind solving $\zeta(2)$.

Sudam Surasinghe – University of North Florida

Applications of Self Assembly Graphs (Part II)

By using iterative three-degree perturbations, any graph can be represented as a self-assembled DNA graph structure of three armed junction molecules. In representing these graph structures as deformation retracts of closed compact DNA manifolds, a single strand can be identified which traverses each edge of the graph structure at least once. We show various applications of the property to traditional graph theory problems, and consider weighting algorithms and their applications to DNA computing.

Contributed Papers Session III

Colin Defant – University of Florida

A Note About Iterated Arithmetic Functions

Let $f: N \to N_0$ be a multiplicative arithmetic function such that for all primes p and positive integers a, $f(p^a) < p^a$ and $f(p) \mid f(p^a)$. Suppose also that any prime that divides $f(p^a)$ also divides $pf(p)$. Define $f(0)=0$ and let $H(n) = \lim_{m\to\infty} f^m(n)$, where f^m denotes the m^{th} iterate of f. After a discussion of some important results from the past century concerning iterated arithmetic functions, we prove that the function H is completely multiplicative.

Pulara Mapatuna – University of North Florida

Regularity Preserving Lemma

This talk discusses the application of iterative 1- splicing recursively on a regular language under a finite set of rules. The proof conveys that the recursive language generated by this splicing process preserves the regularity of the starting language. The proof of the Regularity Preserving Lemma will be discussed through examples where appropriate.

Charles Lindsey – Florida Gulf Coast University

Doing Arithmetic in Medieval Europe

The period between roughly 500 CE and 1000 CE is still a fairly obscure time in the development of mathematics in Western Europe. We will survey what is known about European mathematics during this interval, especially in terms of the development and dissemination of techniques for arithmetical calculation. Finally, we will look at the contributions of Gerbert d'Aurillac in the context of other contemporary developments in the art of calculation on the abacus and the influence of Gerbert's methods in the 11th and 12th centuries.

Latrica Williams – St. Petersburg College

Blending vs. Flipping: Should You Blend or Flip Your Math Class?

Effectively implementing the blended learning or flipped class model requires addressing the questions, "Which model is best suited for the content that is being taught?" "What resources are available for students to learn out of class?" "How can the incorporation of social media be used as a form of research methodology and analysis as well as educational and social interaction?" "How can technology assist with teaching and learning of course content?" The presentation will answer those questions based on my experiences as well as examine the success rates, level of interest, engagement of students in comparison to traditional classes, and the advantages and disadvantages of involving technology, mobile learning and social media in education. As a conclusion to the presentation, participants will hear techniques used to integrate and employ these aspects as well as best practices and pitfalls.

Todd Pierce – University of West Florida

Mathematics of Casino Games

There are many types of casino games, but these games can essentially be broken down into 2 categories: Games involving skill, and games of pure chance. Games of pure chance rely solely on the player's instinct of knowing when to bet and when to simply walk away. Games such as Keno, Roulette, and Craps are all games of pure chance. In this presentation we will discuss important gambling concepts as they relate to the casino's perspective as well as analyze a few of these pure chance games including the ones listed above. The problem of Gambler's Ruin will also be discussed.

Monika Kiss, Brian Camp and Shawn Weatherford - Saint Leo University

Assessing the Effectiveness of Online Homework in Graphing Abilities and Efficacy in College Algebra: A Preliminary Report

Do students develop effective and necessary graphing skills in College Algebra when using online homework? In this presentation we discuss our methods for tracking the impact that online homework has in student learning. We also show some very preliminary results and our next steps in this study.

Matthew Simmons – University of North Florida

Involutively Bordered Words

Antimorphic and morphic involutions are used to define θ-bordered words. Properties of these θ-bordered words will be discussed along with specific applications to strands of DNA molecules. Results of θ-bordered words with respect to both antimorphisms and morphisms will be explored. Proofs will be discussed for some results.

Wesley Henderson – University of West Florida

Conic Sections and Communications

Communication, the transfer of information from one entity to another across time and space, comes in many forms using different media. There are two bodies primarily involved: The sender and the receiver. Considering this sender and receiver to be foci, we will show how conics (circles, ellipses, parabolas, and hyperbolas) play a vital role in communications. We will show this role among GPS systems, satellite dishes, in navigations systems such as LORAN, whispering rooms, and so on.

Benjamin Hutz – Florida Institute of Technology

Using Computer Algebra Systems for Undergraduate Research

Student research projects provide an opportunity for students to work on more open-ended, less well-defined problems and can be a valuable aid to their education. However, choosing problems that are of an appropriate scope and difficulty can be challenging. In this talk I will discuss the success I have had with projects involving the computer algebra system Sage and discuss on-going work implementing dynamical systems functionality in Sage.

Benjamin Webster – University of North Florida

Identifying and Computing Maximal Bond Free Languages

We investigate a structural characterization of maximal bond free languages. For a given set of words of fixed length, we describe how to generate a language such that all subwords of the Kleene closure of the language that are of the given length are in our original set. Applications to DNA computing are discussed.

Contributed Papers Session IV

Carrie Grant – Flagler College

Online Course Redesign: Using the Best Practices

Do the students in your online courses wonder where the course material is located? Do they jump into the homework before completing any of the lessons/activities? Are they unable to understand how to take effective notes for success? Do you have high withdrawal rates? In this session, learn how to redesign your class so that students can easily navigate through the material in the correct order for success in your course. This online platform restructures the course to include activities that involve guided notes, a video lesson, an applet, and then an online assignment. These activities keep the students

accountable and engages them in the learning process to develop deep conceptual understanding of the material beyond just memorizing how to complete the homework exercises.

Lubomir Markov – Barry University

In Marden's Footsteps: Searching for MVTs in the Complex Domain

Morris Marden (1905-1991) was a leading expert on geometry of zeros, who spent significant part of his professional life searching for suitable extensions of Rolle's Theorem and other Mean-Value Theorems to functions of a complex variable. In this talk, which we dedicate to his memory, we'll present several new results of that nature.

Mike Keller – St. Johns River State College

Discover Patterns by Stacking Cups

We will make pyramids by stacking cups, then you will discover patterns and make predictions. Material can be used in a class that covers curve fitting or sequences. Cups will be provided, but please bring your own graphing calculator.

Kelsey Garrett – University of West Florida

Analysis of Health Data using Entropy: HIV and Tuberculosis

HIV/AIDS has become a worldwide epidemic. Approximate 35 million people are living with this disease and many do not have access to the proper treatment or care. This problem is most apparent in sub-Saharan Africa. The number one killer associated with HIV is Tuberculosis and it is vital that we analyze who is at high risk for this disease, as it could save millions of lives. Data mining, specifically Decision Tress, can be useful when looking for patterns in large data sets. Decision Trees can show the complex paths that lead to identifying the people at the highest risk of contracting TB. Finding these paths can be difficult. We will discuss how Entropy and Information Gain is applied to an HIV data set to determine the factors that may contribute to an HIV patient contracting TB.

Grayson Jorgenson – Florida Institute of Technology

Computing the Elementary Symmetric Polynomials of the Multiplier Spectra of z^2+c

The moduli space of rational functions of degree 2 is isomorphic to affine space of dimension 2. The elementary symmetric polynomials of the n-multiplier spectra of a degree 2 rational function are polynomials in the invariants of this isomorphism. What do these polynomials look like? It turns out that little is known about their exact form and their computation is difficult in the general case. However, computing enough of them may give hints to patterns in their coefficients and degrees. We focus on the case of the map z^2 + c for which the computations are the most feasible. I introduce needed definitions from arithmetic dynamics and discuss an algorithm that can be used to compute the polynomials. I also summarize the results and difficulties of implementing the algorithm using the Sage computer algebra system.

Michael Reynolds – Indian River State College

Assignments in Functional Iteration and a Bridge to Higher Mathematics

In this talk, participants will receive an overview of a series of assignments that in which students examine the fates of various orbits under the iteration rule $x \to x^2 - x$. These assignments are appropriate as supplementary assignments in a variety of different mathematics courses, certainly including any course identified as a "bridge to higher mathematics". The level of prerequisite mathematical knowledge for these assignments is not advanced; in fact, the assignments have been used successfully in different college courses, many considered "precalculus" to ignite students interest and understanding. The focus of this talk will be pedagogical, with a basic overview of the underlying mathematics presented for those unfamiliar with the language of functional iteration. Specialists in iteration and dynamical systems should not expect to see any new mathematical results here.

Timothy Dombrowski – Saint Leo University

The Black-Litterman Model: Analyzing the Effects of Contradictory Portfolios

The Black-Litterman model incorporates investors' subjective views with market equilibrium data to produce the optimal portfolio for investing. This model uses a Bayesian framework to mix investor views with equilibrium returns from the capital asset pricing model to provide an updated expected return vector and covariance matrix. It then utilizes mean-variance optimization to, in turn, output the optimal portfolio. This project focuses on the types of views that can be implemented into this model and the effects of contradictory views. Through intuition, sample analysis, and algebra, we will determine the effects of such contradictions on the expected return, covariance, and portfolio weights for the assets.

Joao Alberto de Faria – Florida Institute of Technology

Wheeler K3 Surfaces and SAGE

The study of dynamical systems involves the study of orbits of points under iteration by a function. In the case of reversible (i.e. has a time-reversing symmetry) maps on the plane, Roberts and Vivaldi conjectured a distribution for the cycle lengths over finite fields Using the computational algebra software SAGE, we wrote code to analyze the cycle lengths of randomly generated surfaces. This talk will focus on how we can take the mathematics from a paper and translate it into SAGE code that can be used by anyone.

Charles Hedges and Felipe Quiroga – Rollins College

A New Graph Recoloring Game

Graph coloring has applications ranging from data storage allocation to event scheduling. The recoloring game introduced in this paper models the addition of a new event to an existing schedule, which corresponds to the addition of a new vertex and incident edges to a previously colored graph. The game pits an attacker, who tries to undo the schedule by successively adding new vertices and incident edges, against a defender, whose role is to assign a color to each new vertex, and recolor, its neighbors so as to obtain a proper coloring of the whole graph. In this paper, we study the game length of graphs, that is,

the number of new vertices that must be added to a graph to create a situation for which there is no response.

Contributed Papers Session V

Michael Mears – State College of Florida

FTYCMA at Age 50: Looking Back at Things We May Have Forgotten

A sometimes humorous look at our state two year college association, as it turns 50 years old in 2015. The presenter will guide the old and the young about selected highlights and lowlights that have occurred over the past half of a century. There will be terrific prizes for participation, and good memories will be especially awarded.

Warren McGovern – Florida Atlantic University

Group Rings: an undergraduate project

Group rings are a nice construction of rings in the theory of algebra and is a fabulous way of combining both topics from the undergraduate experience in algebra. For a ring R and a group G (with multiplicative structure), the group ring is denoted by R[G]. An element of R[G] is a finite sum of elements of the form rg where r ϵ R and g ϵ G. The additive structure is given by treating the elements of G as a basis for R[G] and so we like terms: $r_1g + r_2g = (r_1 + r_2)g$. The multiplicative structure of R[G] is given by the rule (rg)(sh)=(rs)(gh) for all r,s ϵ R and for all g,h ϵ G.

We will discuss the identification of nice elements in the group ring as well as consider some interesting classes of rings and classify when a group ring is in such a class. In particular, we will look at some open questions concerning some small rings and small groups.

Carol Warner – Barry University

Using the Principles of Stand-Up Comedy to Engage Your Students

Teaching is a branch of entertainment and it's much the same as stand-up comedy -the more outlandish the lecture is, the more memorable it is. Being an effective teacher takes an enormous amount of self-confidence, flexibility and a thick skin. Like comedians, teachers experience brief periods of humiliation, we create stuff on the fly, and our students value interaction more than they do information.

Daniel Moseley – Jacksonville University

Incorporating iPads in the Classroom

Recently, the mathematics department at Jacksonville University received a technology gift that we have used to incorporate iPads in conjunction with Apple TVs in each classroom. We will document the classroom configurations and the uses we have discovered for this system. We will also discuss the challenges we have encountered as well as some technical detail of the configuration.

Thomas Ricard – Saint Leo University

A Musical Interpretation of Pi

Mathematics has long been recognized as being integral to the art of music, particularly in timing, acoustics and tonal structure. In this presentation we take the music to the mathematics, by interpreting a sequence of contiguous digits of pi as musical tones. By adding a tonally appropriate chord structure and interpretive timing to this sequence of tones, we have the beginning of a song that literally has no end.

Amy Stein – Florida Atlantic University

Knitting with Matrices

This project looks at transforming simple knitting patterns into matrices. The matrices can then be manipulated using matrix multiplications and the transpose to create matrices that represent a rotation or flipped image of the original shape when translated back into being a knitting pattern. The matrix multiplications will then be used to create a computer program that can easily create the knitting patterns of a flipped or rotated shape from a pattern that the user inputs.

Yuanchung Sun – Florida Institute of Technology

Mathematical Modeling and Methods of Signal Separations

Recent advances in sensor design and imaging techniques allow for classification of pure substances by their spectral fingerprints, the realistic data however often contain mixtures of multiple substances, typically corrupted by noise. A fundamental scientific problem is to unmix the measured spectral data into a combination of basic components (pure or source spectra), or a so called source separation problem.

In this talk, the speaker shall consider three classes of unmixing problems depending on the available knowledge of the source signals (minimal, partial or full knowledge of a template of source signals). The problems are blind, partially blind and template assisted source separation. Deterministic and statistic models and their numerical methods will be formulated. Numerical results on examples including NMR, DOAS, and Raman spectra will be presented.

Ted Andresen - Honeywell Aerospace & SPC (Retired)

Finding Answers to Real World Problems with Newton-Raphson

Some real world problems don't have an explicit algebraic solution. Instead they require large computer algorithms. Sometimes a single input variable can be adjusted to give a desired output value. A unique form of the Newton-Raphson method can be used to search for an input value that will guide the algorithm to the desired result. Applications from ballistics and biomechanics will be presented.

Plenary Sessions

Ruth Charney – George Pólya Lecturer, MAA

Bio: Ruth Charney is Professor of Mathematics at Brandeis University. She received her PhD from Princeton University in 1977 and held a postdoctoral position at UC Berkeley and an assistant professor position at Yale. She spent 18 years as a member of the Ohio State University Mathematics Department before returning to Brandeis University, her undergraduate alma mater, in 2003.

Charney is interested in the interplay between topology and algebra. Her research spans several areas of mathematics, including K-theory, algebraic topology, and her current area of interest, geometric group theory. In 2012, she was named a Fellow of the American Mathematical Society (AMS). She is a member of the Board of Trustees of AMS and of the Mathematical Sciences Research Institute (MSRI). She is currently serving as President of the Association for Women in Mathematics.

An Excursion into the Strange World of Singular Geometry

In high school we learn about the geometry of the plane. Later, we encounter the geometry of smooth manifolds. In this talk, we take a peek at the mind-bending geometry of singular spaces and their applications.

Jenna Carpenter – First Vice President of MAA

Bio: Jenna P. Carpenter is Associate Dean for Undergraduate Studies, and Wayne and Juanita Spinks Professor, in the College of Engineering and Science at Louisiana Tech University. Carpenter grew up in Hope, Arkansas, and received her B.S. in Mathematics from Louisiana Tech University. She was an Alumni Federation Fellow at Louisiana State University, where she received her Ph.D. in Mathematics, under the direction of Robert Perlis. Her work focused on quadratic forms over number fields. She has been on the faculty at Louisiana Tech since 1989, where she spent ten years as an engineering department head and is now in her sixth year as associate dean.

Carpenter's professional interests include innovative STEM curricula and improving the success of women in STEM fields, for which she has received over $3 million in federal funding. She is currently the principle investigator of an NSF ADVANCE grant, where she leads programs such as faculty mentoring and professional development. She most recently co-authored the MAA Notes Volume "Undergraduate Mathematics for the Life Sciences," with Glenn Ledder and Timothy Comar.

Carpenter has served on a number of MAA committees, including the 2014 CUPM Curriculum Guide Steering Committee, CRAFTY, the Committee on Consultants, and the Committee on Professional Development. She was the Louisiana-Mississippi Section Governor from 2010 – 2013 and the recipient of the Section Teaching Award in 2004. She is a Fellow of the American Society for Engineering Education and was invited in 2011 to participate in a meeting at the White House focused on women and girls in STEM fields.

Outside of work, Carpenter enjoys traveling and is a huge fan of her two children, Trey and Emma, both of whom inherited her fondness for STEM fields. Her husband is a consulting engineer and mayor of the small community where they live.

Top Secret: Women's Contributions to the History of Computing

Did you know that the first computers were humans, not machines? Did you know that these computers were women, not men? Did you know that these women were in their late teens and early 20s, not PhDs? In this talk we will learn about the central role that a group of talented young female mathematics students, called the Top Secret Rosies, played during the transition to the computer era in World War II.

William Dunham, George Pólya Lecturer, MAA

Bio: William Dunham is a historian of mathematics who has written four books on the subject: *Journey Through Genius, The Mathematical Universe, Euler: The Master of Us All,* and *The Calculus Gallery.* He is also featured in the Teaching Company's DVD course, "Great Thinkers, Great Theorems."

In the fall of 2008 and again the spring of 2013, Dunham was a visiting professor at Harvard University, where he taught a course on the mathematics of Leonhard Euler, and he has recently held visiting appointments at Princeton University and at the University of Pennsylvania. He is presently the MAA's George Pólya Lecturer, a title he shares with Ruth Charney.

Two (More) Morsels from Euler

Leonhard Euler (1707 – 1783) is responsible for a stunning array of famous theorems, formulas, and concepts. In this talk we examine a pair of lesser-known results where his genius was on full display.

The first is a curious problem from number theory. Euler sought four different whole numbers, the sum of any pair of which is a perfect square. With characteristic ingenuity, he came up with the fearsome foursome of 18530, 38114, 45986, and 65570. We'll look over his shoulder to see how he did it.

Moving from number theory to analysis, we consider the series of reciprocals of squares – i.e., 1 + 1/4 + 1/9 + 1/16 + … Through his career, Euler gave three different proofs that this sums to $\pi^2/6$. Here we present the argument from his 1755 text on differential calculus. The amazing thing about this derivation is that Euler did it by using l'Hospital's rule … not once nor twice, but *thrice*!

These two results, which require only undergraduate mathematics, are reminders of why Euler is justly considered "the master of us all."