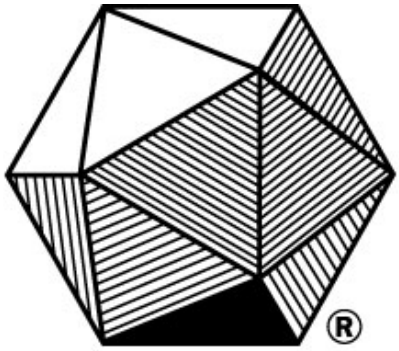

MAA

MATHEMATICAL ASSOCIATION OF AMERICA

78th Annual Meeting of the Oklahoma-Arkansas Section

The University of Central Arkansas
31 March–2 April 2016

MAA Mission:
to advance the mathematical sciences, especially at the collegiate level

OK-AR Section website
http://sections.maa.org/okar/

Executive Committee
2015–2016

Ron Smith, Past Chair	Anita Walker '17, Secretary
Amy Schachle, Chair	Kristi Karber '16, Treasurer
Ramesh Garimella, 1st Vice-Chair	Michael Lloyd '18, Communications Director
Andy Miller, 2nd Vice-Chair	Lisa Mantini, July '14–June '17, Governor

Building Abbreviations

LSC	Lewis Science Building
MCST	Math, Computer Science, Technology Building

Abbreviations for OK-AR Institutions Represented in the Program Book

ASMSA	Arkansas School for Mathematics, Sciences, and the Arts
ASU	Arkansas State University
ATU	Arkansas Tech University
CU	Cameron University
EME	Emeritus
HSU	Henderson State University
HU	Harding University
JBU	John Brown University
NACC	North Arkansas Community College
NSU	Northeastern State University
OBU	Oklahoma Baptist University
OSU	Oklahoma State University
OU	University of Oklahoma
SNU	Southern Nazarene University
TU	University of Tulsa
UA	University of Arkansas
UAFS	University of Arkansas, Fort Smith
UALR	University of Arkansas, Little Rock
UAPB	University of Arkansas, Pine Bluff
UCA	University of Central Arkansas
UCO	University of Central Oklahoma

Thursday, 31 March 2016

16:00-19:00 **SECTION NExT**, **MCST Room 220**

18:00-20:00 **REGISTRATION**, **MCST Lobby**

19:00-24:00 **TEAM JEOPARDY COMPETITION**, **LSC Room 101 and LSC Room 102**

Friday, 1 April 2016

7:30-11:30 **SECTION NExT**, **MCST Room 111**

8:00-12:00 **REGISTRATION**, **MCST Lobby**

8:00-12:00 **BOOK SALES, EXHIBITORS, REFRESHMENTS**, **MCST Room 100**

8:30-11:00 **STUDENT WORKSHOP**, **MCST Room 219**

Rational Tangles – A Math Circle Approach

Abstract John Conway introduced the notion of rational tangles in a foundational paper on knot theory. He also devised a wickedly cool dance to explain them. This "rational tangle" dance has become a staple of math circles across the country. The presenters will lead the group through this classic math circle activity. Well also discuss math circles in general and how to start a math circle.

Presenters Kimberly Adams (TU)
Donna Farrior (TU)

8:30-11:00 **FACULTY WORKSHOP**, **MCST Room 220**

Math Pathways Projects in Arkansas and Oklahoma

Abstract Public higher education entities and faculty organizations in both Arkansas and Oklahoma have partnered to reform general education and gateway mathematics options in each state. These state task forces are currently developing recommendations for multiple pathways that increase the number of students who complete math coursework aligned with their chosen program of study and who successfully achieve their postsecondary goals. Both states are receiving consultation and technical support from the Math Pathways to Completion project of the Charles Dana Center at the University of Texas at Austin. Participants in this workshop will engage in conversation that will explore the problems math pathways are intended to address, student needs for mathematics courses, and ways for aligning mathematics skills from departments across campus with mathematics courses.

Presenters Charles Watson (UCA)
Michael Oehrtman (OSU)
Valerie Martin (NACC)
Amy Getz, Charles Dana Center at University of Texas at Austin

11:30-12:45 **SECTION NExT LUNCH**, **Old Main Second Floor**

11:30-12:45 **DEPARTMENT CHAIRS LUNCH**, **Old Main Second Floor**

11:30-12:45 **FACULTY SPONSORS LUNCH**, **Old Main Second Floor**

UNDERGRADUATE TALKS Session 1, MCST Room 104 Presiding: David Boliver (EME)

13:00-13:15 **Patterns Within Ulam's Spiral**, Josiah Ireland (HU)

Mentor Jason Holland

Abstract Usually, primes are studied in Ulam's spiral. In this talk however, we explore other interesting sequence problems by utilizing a unique coordinate system.

13:20-13:35 **A Boundary-Value Problem of Sturm-Liouville Type**, Daniel Brumley (UCO)

Mentors Michael Fulkerson, Britney Hopkins, Kristi Karber

Abstract We discuss the existence of multiple positive solutions to a fourth-order boundary-value problem of Sturm-Liouville type.

13:40-13:55 **Survival Analysis of Cutaneous Melanoma Between Whites and African Americans/Blacks in the USA**, Sujana Rupakheti (CU)

Mentor Jean-Jacques Kengwoung-Keumo

Abstract In this talk we analyze disparities in melanoma survival rates between Whites and African Americans/Blacks in the USA from 1973 through 2012. We use the hypertabastic proportional hazards model for the analysis.

14:00-14:15 **Modeling of Epidemic: Disease Free Equilibrium**, Diana Morales (UCA)

Mentor Long Le

Abstract A system of four partial differential equations which models a disease epidemic within a population. Particular emphasis will be placed on the disease free equilibrium, the reproduction number, and the next generation method.

UNDERGRADUATE TALKS Session 2, MCST Room 105 Presiding: Britney Hopkins (UCO)

13:00-13:15 **Comparison of Robust Linear Regression Methods**, Abhaya Poudel (CU)

Mentors Hong Li, Jean-Jacques Kengwoung-Keumo

Abstract A regression method that is insensitive to outliers and/or influential points is called a Robust Linear Regression Method. In 2012 Tabatabai, Li, et.al. introduced a new model TELBS robust regression method as an alternative to methods such as LTS-estimate, S-estimate, M-estimate and MM-estimate that are used in the presence of outliers.

13:20-13:35 **Modeling of Epidemic: Endemic Stability**, Alma Malibekova (UCA)

Mentor Long Le

Abstract Our research focuses on mathematical modeling of an epidemic within a population. It consists of a system of four non-linear ordinary differential equations that represent the groups of potential, exposed, infected, and removed populations. The goal is to find and study the endemic stability state.

13:40-13:55 **Generalized Holm's Procedure for Multiple Comparisons**, Christian Helms (ASU)

Mentor Hong Zhou

Abstract The multiple comparison is a common statistical procedure when there are more than two hypotheses to be tested at same time. We developed a new procedure which can reject a pre-specified number of hypotheses at each step. It has been proven that this procedure can control the FDA-mandated family-wise error rate.

14:00-14:15 **Dancing Around Equations**, Denise Starnes (SNU)

Mentor Nicholas Zoller

Abstract This presentation will mesh together mathematics and the dance world by implementing fractals to generate choreographic variations based on the quadrants of the complex plane. Live and video demonstrations of the choreographic result will be presented along with a classroom lesson plan.

UNDERGRADUATE TALKS Session 3, MCST Room 110 Presiding: Shanda Hood (UA)

13:00-13:15 **Cellular Models of Canine Parvovirus**, Brittany Myers (UCO)

Mentors Brittany Bannish, Sean Laverty

Abstract I built two differential equations models to better understand how Canine Parvovirus type 2 (CPV2) infects host cells and to study the different types of antibody response.

13:20-13:35 **Fair Division of a Shareable Good**, Natalie Wimer (CU)

Mentors James Dover, Narayan Thapa

Abstract In a classic fair division problem, a heterogeneous resource must be divided among multiple people to ensure that each person receives his fair share. We consider a problem of how best to divide the resource so that each person receives a fair level of satisfaction.

13:40-13:55 **HypoTest: Interactive Hypothesis Test Package for R**, James Palmer (UCA)

Mentor R.B. Lenin

Abstract We developed an R package known as HypoTest, which contains user-friendly R functions to perform various hypothesis tests as part of inferential statistics.

14:00-14:15 **Mathematics and Music**, Holly Hickman (UAFS)

Mentor Jack Jackson

Abstract This research visualizes the space of equivalence classes of all two note musical chords via a Geometer's Sketchpad sketch and uses this sketch to provide a visual analysis of two well-known pieces. This is based upon Dimitri Tymoczko's Möbius strip representation of two chord space.

UNDERGRADUATE TALKS Session 4, MCST Room 213 Presiding: John Watson (ATU)

13:00-13:15 **Experimental Exploration of Solutions to Third-Order, Chaotic Differential Equations**, Douglas Roisen (UCA)

Mentor Stephen Addison

Abstract Families of solutions to chaotic differential equations have been investigated experimentally by constructing equivalent electric circuits. This process will be reviewed through exploring the solutions of some third-order, chaotic differential equations.

13:20-13:35 **Multivariate Analysis of Health Insurance Data**, Macoe Austin Davis (UCA)

Mentor Seo-eun Choi

Abstract This presentation will focus on analyzing the weight of effect that four different independent variables have on a binary dependent variable (whether or not an individual possesses a health insurance plan).

13:40-13:55 **Exploring The Properties Of Parallel Curves**, Tanya Plascencia (UCO)

Mentor Ashley Taylor

Abstract Two smooth curves C_u and C_g are parallel if the normal at each point $\mathrm{P} \in C_u$ meets C_g at a point $\overline{\mathrm{P}}$ such that $|\mathrm{P}\overline{\mathrm{P}}|$ is constant and the tangent lines to the curves at $\mathrm{P} \in C_u$ and $\overline{\mathrm{P}} \in C_g$ are parallel. This definition will be extended and some of its fascinating properties explored.

14:00-14:15 **Traveling Wave Solutions of Infectious Diseases Model**, Jeein Yoon (CU)

Mentor Narayan Thapa

Abstract Mathematical models of the spread of infectious diseases can be used to better understand the spatial spread and the minimum speed at which these diseases can spread from region to region. We seek a traveling wave solution of an infectious diseases model which leads to the minimal speed.

UNDERGRADUATE TALKS Session 5, MCST Room 220 Presiding: Carolyn Eoff (HSU)

13:00-13:15 **Mathematical and Numerical Approaches: Fourth Order Hyperbolic Partial Differential Equations**, Madison Rowe (ASU)

Mentor Jeongho Ahn

Abstract We improve numerical schemes to solve linear fourth order hyperbolic PDEs which describe the transverse motion of buckling beams. An approximated equation of the PDE can be established to obtain its exact solution. Further research uses Discontinuous Galerkin methods to investigate their accuracy and to obtain numerical results.

13:20-13:35 **Mathematics, Ethics, and Christianity**, Matthew Welborn (OBU)

Mentors Matthew Arbo, Cherith Tucker

Abstract Beginning with a survey of ethical codes for mathematicians and concluding with a proposal of ethical guidelines, I will explore the intersection of mathematics, ethics, and Christianity.

13:40-13:55 **Maximizing Guaranteed Value in a Fair Division of a Cake under Piecewise-Linear Valuation**, Brandon Payne (CU)

Mentor James Dover

Abstract A 3-flavored cake is to be cut into three pieces and divided among three people having different preferences. We determine, based on a given set of piecewise-linear preferences, the highest level of value that can be guaranteed to these three people.

14:00-14:15 **A Statistical Analysis of Challenges Faced by First-Time Presidents in Public Comprehensive Institutions**, Lance Ford (UCO)

Mentor Tracy Morris

Abstract One of the challenges facing first-time presidents is the replacement of senior staff. Logistic regression models and a multiple regression model were created to explore this challenge.

UNDERGRADUATE TALKS Session 6, MCST Room 219 Presiding: Ivan Raykov (UAPB)

13:00-13:15 **Numerical Solutions to the Black-Scholes Option Pricing Model**, Ayush Lal Joshi (CU)

Mentors Gokul Kadel, Narayan Thapa

Abstract The Black-Scholes Option Pricing Model has been influential in estimating the price of financial options. The numerical solutions to this equation can be calculated using the Finite Difference method.

13:20-13:35 **Conforming Finite Element Methods for Approximation Elliptic Problems Using MATLAB**, Danielle Raules (UAPB), Camille Gardner (UAPB)

Mentor Anna Harris

Abstract Finite element method is a flexible numerical method that can be used to approximate the real solution even for complex irregular regions. We wrote MATLAB code to solve model second-order elliptic problems numerically for different boundary conditions, Dirichlet and Neumann.

13:40-13:55 **Love Letter: A Look at End Game Strategies**, Chris Stratton (NSU)

Mentor Demitri Plessas

Abstract Love Letter is a competitive card game. The 16 cards create a vast number of game states with subtle differences in their associated probabilities. An analysis of endgame states will provide insights that help secure your chance of love with the princess of your dreams.

14:15-14:30 BREAK – Visit and relax for a few minutes!

TEACHING NOTES Session 7, MCST Room 104 Presiding: Fred Worth (HSU)

14:30-14:45 Helping Students Distinguish the Arbitrary and the Necessary in Mathematics, David Boliver (EME)

Abstract Conversations with college graduates indicate that most see all of math as necessary and not rooted in culture. We share experiences in dealing with this.

14:50-15:05 Individual Sessions with Students in a Proof Course, Myron Rigsby (UAFS)

Abstract In my discrete and abstract algebra classes, I meet with each student individually on a biweekly basis. I will discuss the logistical issues involved and present feedback from students on the impact for learning.

15:10-15:25 Baseball (and Other Sports) as a Medium for Teaching Liberal Arts Mathematics, Fred Worth (HSU)

Abstract Many liberal arts mathematics students are weak in mathematics or fearful of the topic. Framing the subject in a (seemingly) unrelated setting that is comfortable to the student can make the mathematics class less painful, indeed, possibly pleasant.

15:30-15:45 Geometry Games, Cherith Tucker (OBU)

Abstract This presentation will introduce games such as SET and Spot It!, which can be used in an upper level college geometry classroom to challenge student intuition, illustrate the power and limitations of models in axiomatic systems, and add a little fun.

TEACHING NOTES and INSTRUCTIONAL TECHNOLOGY Session 8, MCST Room 105 Presiding: James Fetterly (UCA)

14:30-14:45 Using ALEKS in the Intermediate Algebra Classroom (and Beyond), Tanner Auch (OBU), Cherith Tucker (OBU)

Abstract OBU has used ALEKS as a tool in Intermediate Algebra for several years. The success of its implementation will be demonstrated by analyzing longitudinal data for students as they progress through College Algebra. Successes and failures of using ALEKS will be addressed.

14:50-15:05 Exploring Taxicab Geometry via Geometer's Sketchpad, Jack Jackson II (UAFS)

Abstract We will introduce Taxicab Geometry, illustrate several interesting features via Geometer's Sketchpad, and discuss its importance in the study of secondary and college geometry.

15:10-15:25 Virtual Manipulative Supporting Sequence Convergence in Taylor Series Convergence, Jason Martin (UCA)

Abstract 225 students responded to Taylor series tasks. We observed significant differences between students who used virtual manipulatives and those who did not. We claim that the use of these virtual manipulatives promoted an understanding consistent with pointwise convergence.

15:30-15:45 Experiences with Knowing and Learning in Mathematics – a UTeach course, James Fetterly (UCA)

Abstract The instructor will share his experiences and impressions along with his adaptations and innovations related to the UTeach course Knowing and Learning in Mathematics and Science. A method to assist students with a framework to guide them in the process of developing a thorough protocol for the essential clinical interview will be described.

GENERAL Session 9, MCST Room 110 Presiding: Demitri Plessas (NSU)

14:30-14:45 **The Relationship Between Teacher and Student Attitude Toward Mathematics and Reform Oriented Teaching**, Haley Laffoon (UCA)

Mentor Linda Griffith

Abstract Does teaching style matter? This session will present findings of a quantitative research study that analyzes relationships between teacher and student attitudes toward mathematics, teaching style, and student success in a mathematics course.

14:50-15:05 **Reforming Math Education in the US: Ideas from the Japanese System**, John Watson (ATU)

Abstract That US students perform significantly below students from many other countries on international assessments of mathematics literacy is a well-known fact. Last fall, I observed high school math classes in Japan and met with teachers and government officials. This is a report on the conclusions I reached following my experiences there.

15:10-15:25 **Implementing a Successful Supplemental Instruction Program**, Shanda Hood (UCA)

Abstract In this talk we will discuss the operation of the Mathematics Department SI program, the training of our SI leaders, how we have dealt with the problem of attendance, and how the SI philosophy has been put in to practice to create a comfortable and productive learning environment for our students.

15:30-15:45 **Investigating Calculus Students' Struggles with Algebra**, Sepideh Stewart (OU)

Abstract Common algebraic errors made by students in college/university math courses will be identified. This will lead to a model for intervention that will help students succeed in higher level mathematics.

APPLIED MATH Session 10, MCST Room 111 Presiding: Anna Harris (UAPB)

14:30-14:45 **Age-Based human Population Growth Model**, Robert Habimana (UCA)

Mentor Clarence Burg

Abstract In this work we build a human population growth model by subdividing a population into age groups. We used data for births and deaths from the United nation to predict the population in ten to fifty years.

14:50-15:05 **Superconvergence of Nonconforming Finite Element Approximation for the Second Order Elliptic Problems by L^2-Projection**, Anna Harris (UAPB)

Abstract The Finite Element Method (FEM) is used to turn a complex problem into simple and manageable problems. Using the L^2-projection method we enhanced the existing numerical approximation and computational time. I wrote Matlab computer programs to verify the theory.

15:10-15:25 **Optimizations with Fitzpatrick Functions**, Ivan Raykov (UAPB)

Abstract This talk presents some applications and properties of Fitzpatrick functions that are useful for solving optimization problems. These include convexity, maximal monotonicity, and lower semi-continuity.

15:30-15:45 **A Survey of Mathematical Representations of Allelopathic Interactions in Aquatic Habitats**, Jean-Jacques Kengwoung-Keumo (CU)

Abstract Mathematical models of allelopathic interactions in aquatic environments are surveyed with the goal of collecting such models in one place. Whether and how these models could apply to terrestrial habitats will also be discussed.

14:30-15:50 EXECUTIVE COMMITTEE MEETING

16:00-17:00 R.B. DEAL LECTURE, College of Business Auditorium, Room 107

Playing in Mathematics, Dr. Thomas Milligan (UCO)

Abstract The Tower of Hanoi puzzle, a game of cops and robbers, and the board game Settlers of Catan are examples of puzzles and games that lend themselves to interesting mathematical observations. We will take a look at the mathematics that arises from investigating these means of play. Some of the topics that we will cover include difference equations, topics in graph theory including minors and tree width, the inverse eigenvalue problem, and operations research. In each of these areas, I will highlight research performed by undergraduate students.

Bio Thomas Milligan earned his BS and MS in mathematics from Brigham Young University in 1997 and 1999 respectively. In 2004, he finished his PhD in applied mathematics at the College of William and Mary, where he studied matrix theory. He joined the faculty at the University of Central Oklahoma in 2007. His work with his colleagues and with undergraduate students has led to research in many different areas of mathematics, with his favorite area being combinatorial matrix theory. His love for looking at games and puzzles mathematically comes from having four children while he was a student. They still occasionally have to wait patiently as he explains how the game they are playing as a family intersects some area of mathematics.

17:00-17:30 R.B. DEAL FAMILY RECEPTION, College of Business Auditorium Lobby

Hosts R.B. Deal Committee: Fred Worth (HSU), Charles Cooper (UCO), William Durand (HSU), Jill Guerra (UAFS), Lee Turner (SNU)

18:00-19:30 BANQUET – BUFFET STYLE, Brewer Hegeman Conference Center, Room 111

Seasonal Garden Salad	Seasonal Fresh Fruit Salad
Grilled Chicken Breast with Cider Marinade	Dinner Rolls
Brussels Sprouts with Almond Butter	Assorted Desserts
Marinated Roasted Red Potatoes	Iced Water, Tea, Coffee

19:45-20:45 N.A. COURT LECTURE, College of Business Auditorium, Room 107

Knotty Games, Dr. Allison Henrich, Seattle University

Abstract/Bio A brochure will be available at the Lecture.

See you tomorrow morning.

There is an Open Session at 9:30 in the morning. There is no presider and the participants will decide the order of their talks.

The next Section Meeting is at the University of Oklahoma currently set for 7–8 April 2017.

Saturday, 2 April 2016

8:00-9:10 **SECTION BUSINESS MEETING**, **College of Business Auditorium, Room 107**

8:00-12:00 **REGISTRATION**, **MCST Lobby**

8:00-12:00 **BOOK SALES, EXHIBITORS, REFRESHMENTS**, **MCST Room 100**

9:15-11:00 **INDIVIDUAL INTEGRATION BEE**, **MCST First Floor, Math Resource Lab**

ALGEBRA and ANALYSIS Session 11, MCST Room 104 Presiding: Michael Fulkerson (UCO)

9:30-9:45 **Equivalence Classes of K-Orbits in the Flag Variety of $\mathfrak{gl}(p+q,\mathbb{C})$ (A Combinatorial Approach)**, Nina Williams (OSU)

Mentor Leticia Barchini

Abstract We consider relationships between the pair of complex Lie groups $(G,K) = (GL(p+q,\mathbb{C}), GL(p,\mathbb{C}) \times GL(q,\mathbb{C}))$ and the finite set $\{Q : K\text{-orbits on the flag variety } \mathfrak{B}\}$ via the moment map μ and describe the map's pre-image using combinatorial methods.

9:50-10:05 **Boundary Behavior of Holomorphic Functions on the Ball**, Michael Fulkerson (UCO)

Abstract In this talk, we investigate the boundary behavior of holomorphic functions on the ball. In particular, we extend to higher dimensions a theorem of Lusin and Privalov concerning radial limit zero sets of holomorphic functions on the unit disc.

10:10-10:25 **Murder Rates in the United States**, Charlie Wood (UCA)

Mentor R. B. Lenin

Abstract Murder rates (per 100K people) were collected for all 50 states to use as the dependent variable in a regression analysis where corresponding data for 75 different independent variables was collected and tried. Those variables included measures of a wide variety of demographic information. The statistical results showed strong significance with very meaningful social implications.

GENERAL Session 12, MCST Room 105 Presiding: Cherith Tucker (OBU)

9:30-9:45 **From Modular to Co-Req, New Rollout in Math Remediation**, Annie Childers (UALR)

Abstract This presentation will note the changes being made to UALR's math remediation program. We are moving from a modular emporium style of classes to a co-requisite model. Details will be given about the process and its advantages.

9:50-10:05 **Transformative Learning Via an ACT Prep. Program**, Britney Hopkins (UCO), Kristi Karber (UCO)

Abstract We will discuss the details of our ACT Prep. Program, the benefits it provided to our students, as well as the challenges we faced in creating and running such a program.

10:10-10:25 **Smith Numbers from Prime Repunits**, Noel Sagullo (UAFS)

Abstract A Smith number is a composite integer whose sum of digits equals the sum of the digits of its prime factors. For example, $4937775 = 3 \times 5 \times 5 \times 65837$ is a Smith number with a digit sum of 42, the same as the sum of the digits of its prime factors. We present the history of Smith Numbers and describe ways of constructing them.

10:30-10:45 **A Demonstration of C-PR (Chebyshev-Proxy Rootfinder)**, Lawrence Huff (UCA)

Abstract We present an explanation and demonstration of C-PR (Chebyshev-Proxy Root-finder), which is a method to find all solutions of $f(x) = 0$ in an interval $[a,b]$. A promising modification of this method will also be introduced.

GENERAL Session 13, MCST Room 110 Presiding: Michael Lloyd (HSU)

9:30-9:45 **Worst pitchers in baseball history**, Fred Worth (HSU)

Abstract Major League Baseball showcases the best baseball players in the world. Many authors/researchers focus on the best of those players. Previously, I have considered the least accomplished (aka "worst") hitters. This time, I will consider the least accomplished pitchers.

9:50-10:05 **Arkansas Lottery Spending**, Michael Lloyd (HSU)

Abstract The Arkansas Lottery per capita spending by county is surprisingly large. It will be regressed with demographic data.

10:10-10:25 **A Theorem of Wiener**, Joshua Whitman (OSU)

Mentor David Ullrich

Abstract The following is proven: if one has a non-zero function represented as a Fourier series with the property that the sum of the coefficients converges absolutely, then the reciprocal may also be represented as a Fourier series with the same property. We prove that these functions form a Banach Algebra which can be related to the field of complex numbers.

10:30-10:45 **What Does Local Symmetry Tell Us about Graphs?**, Demitri Plessas (NSU)

Abstract Làslò Lovàsz used local symmetry to prove that a graph with n vertices and m edges where $m \geq 1/2\binom{n}{2}$ could be reconstructed uniquely from its edge deleted subgraphs. We extend and formalize this idea of local symmetry to generate an inverse semigroup of a graph.

APPLIED MATH Session 14 , MCST Room 111 Presiding: Jason Martin (UCA)

9:30-9:45 **Uniqueness of Measure for the Navier-Stokes Equations on the Sphere**, Gregory Varner (JBU)

Abstract We will discuss the existence and uniqueness of time-invariant measure for the time-periodic 2D Navier-Stokes equations on the sphere. The problem can be reduced to the study of the associated Markov chain, and we give necessary conditions for the existence and uniqueness of the measure. These ideas can be extended to the full time-dependent equations.

9:50-10:05 **A degree of freedom in Statistics**, Daiho Uhm (UAFS)

Abstract Many students and faculty members ask what is a Degree of Freedom (DF) in Statistics. This presentation gives the meaning of the DF and examples, and also the DF would be explained mathematically.

10:10-10:25 **Asymptotic Tracking and Disturbance Rejection of the Blood Glucose Regulation System**, Brandon Ashley (UCA)

Mentor Weijiu Liu

Abstract The blood glucose system can be represented as a control model with multiple feedback controllers. We wish to use asymptotic tracking and disturbance rejection methods to design controllers so that the blood glucose system is stabilized about some reference while subject to functional disturbances.

10:30-10:45 **Measuring the Effectiveness of Federal Funding using Social Network Analysis**, Rebecca Moody (UCA)

Mentor R.B. Lenin

Abstract We use the publications dataset of a select group of researchers of Arkansas to measure the impact both qualitatively and quantitatively. We hope this analysis will identify key researchers who strengthened the collaborative network in terms of their contributions, importance, and participation.

APPLIED MATH Session 15, MCST Room 219 Presiding: Myron Rigsby (UAFS)

9:30-9:45 **The Construction of Sine and Cosine on the Field of Surreal Numbers**, Jessica Maruri (ASMSA)

Mentor Nikki Zhang

Abstract Surreal functions are an underdeveloped part of the field of surreal numbers. The previously defined surreal functions are explained and sine and cosine are derived. A working definition of sine on the surreals is proposed along with the known reasons the definition is not functional.

9:50-10:05 **Cracked Euler-Bernoulli Beams: Time Discretization and FEM**, Jay Mayfield (ASU)

Mentor Jeongho Ahn

Abstract A damageable Euler-Bernoulli beam which can be described by a fourth order partial differential system is presented. Approximate solutions are obtained by discretizing the space and time domains.

10:10-10:25 **Nonclassical Symmetries of a Nonlinear Diffusion Equation and System Equivalent** Seth Bloomberg (UCA), Thomas Deatherage (UCA)

Mentor Daniel Arrigo

Abstract It is generally known that classical point and potential Lie symmetries of differential equations can be different. We question whether this is true when the symmetries are extended to nonclassical symmetries. We consider a class of nonlinear diffusion equations and show that the nonclassical point symmetries are a subset of the nonclassical potential symmetries.

OPEN SESSION Session 16, MCST Room 220

9:30-10:45 The order of talks will be scheduled by the participants.

11:00-12:00 **MAA SECTION VISITOR LECTURE**, **College of Business Auditorium, Room 107**

Actuarial careers: what, where, who, how, and why, Dr. Jim Daniel, MAA Treasurer

Abstract This student-oriented talk describes the job of an actuary, a career that has long been of interest to good problem solvers interested in applying their math skills in business. It describes what is an actuary, where do actuaries work, who are the people in the field, how do you prepare for and seek an actuarial job, and how rewarding is the career.

Bio In 1962 Jim Daniel received his B.A. in mathematics and economics from Wabash College (from which in 1987 he received an honorary doctorate). After graduation from Stanford University in 1965 with a Ph.D. in mathematics (numerical analysis), Jim spent one year in Amsterdam on a post-doc before joining the Computer Science Department and Mathematics Research Center at the University of Wisconsin-Madison. In 1970, he joined the Mathematics Department at the University of Texas at Austin, where he remained until retiring in 2010 except for a two-year temporary stint as the Navys Chief Scientist in Europe and the Middle East. He chaired the UT-Austin department from 1977 to 1983. In 1989 the actuarial program moved back to mathematics from the Finance Department and Jim, knowing nothing of the subject, agreed to take on the program, remaining as its head for 21 years. The university elected him to its Academy of Distinguished Teachers in 2005. Active for many years in the Mathematical Association of America in various leadership roles, he was elected its Treasurer in 2011, a post he still holds. Jim now lives in Davis, CA, with his wife Ann and three spoiled cats.

Thank you for coming, and travel safely!