College of Science and Mathematics

Department of Mathematics
and Statistics

Second Annual Kennesaw Mountain Undergraduate Mathematics Conference Program and Abstracts [1]

October 19–20, 2012

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Welcome

Welcome to the second annual Kennesaw Mountain Undergraduate Mathematics Conference!

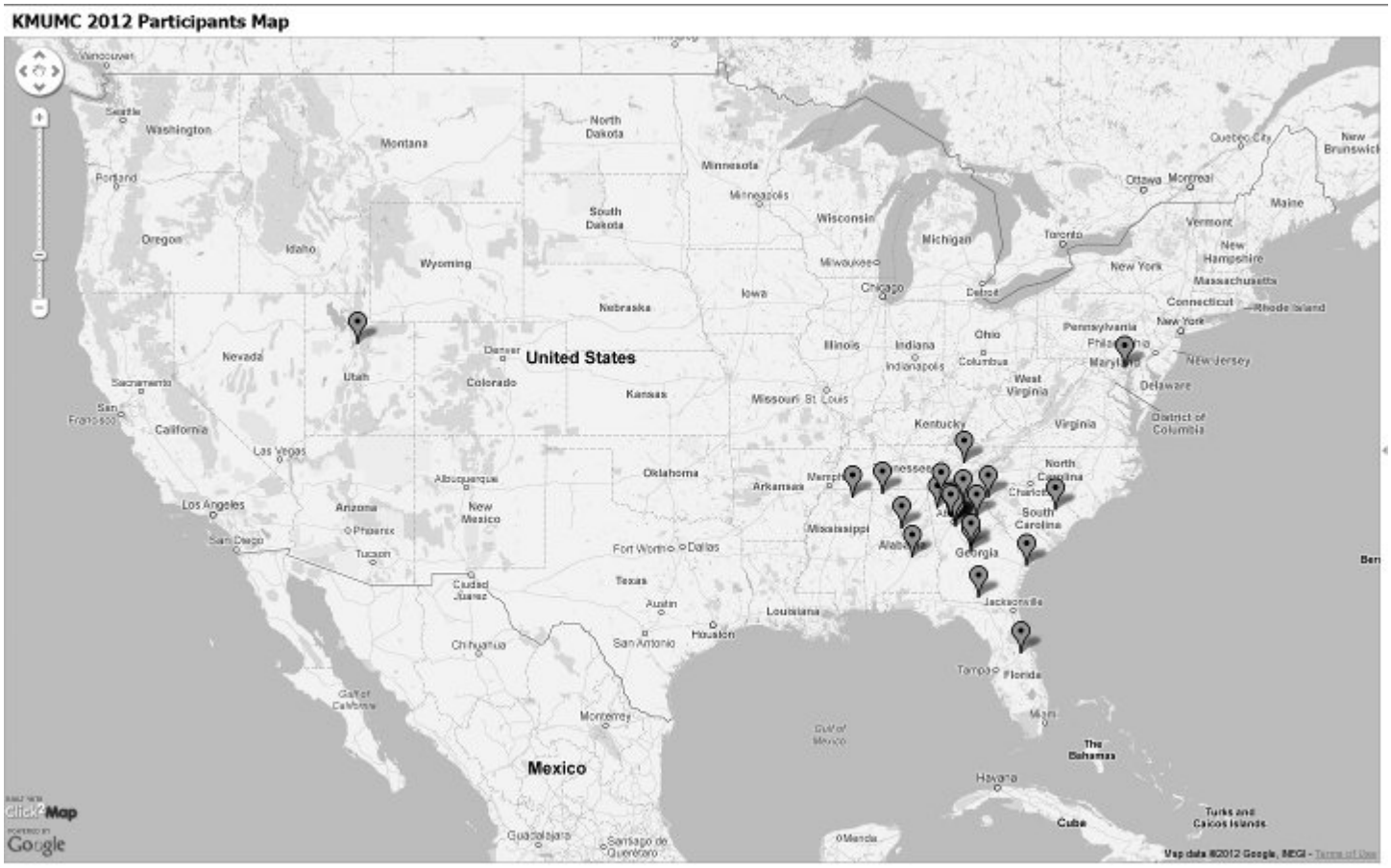
We are thrilled that this year KMUMC attracted over 160 participants from 26 universities in 8 states!

We hope you will enjoy the talks, activities, food, great weather, and the beautiful Kennesaw State University campus and come back next year!

We would also appreciate any feedback and any suggestions you have. Please fill out the feedback form included in your registration materials or send comments to Dr. Yuliya Babenko (ybabenko@kennesaw.edu).

Sincerely,
KMUMC Organizers

KMUMC 2012 Participants Map



Location of Talks

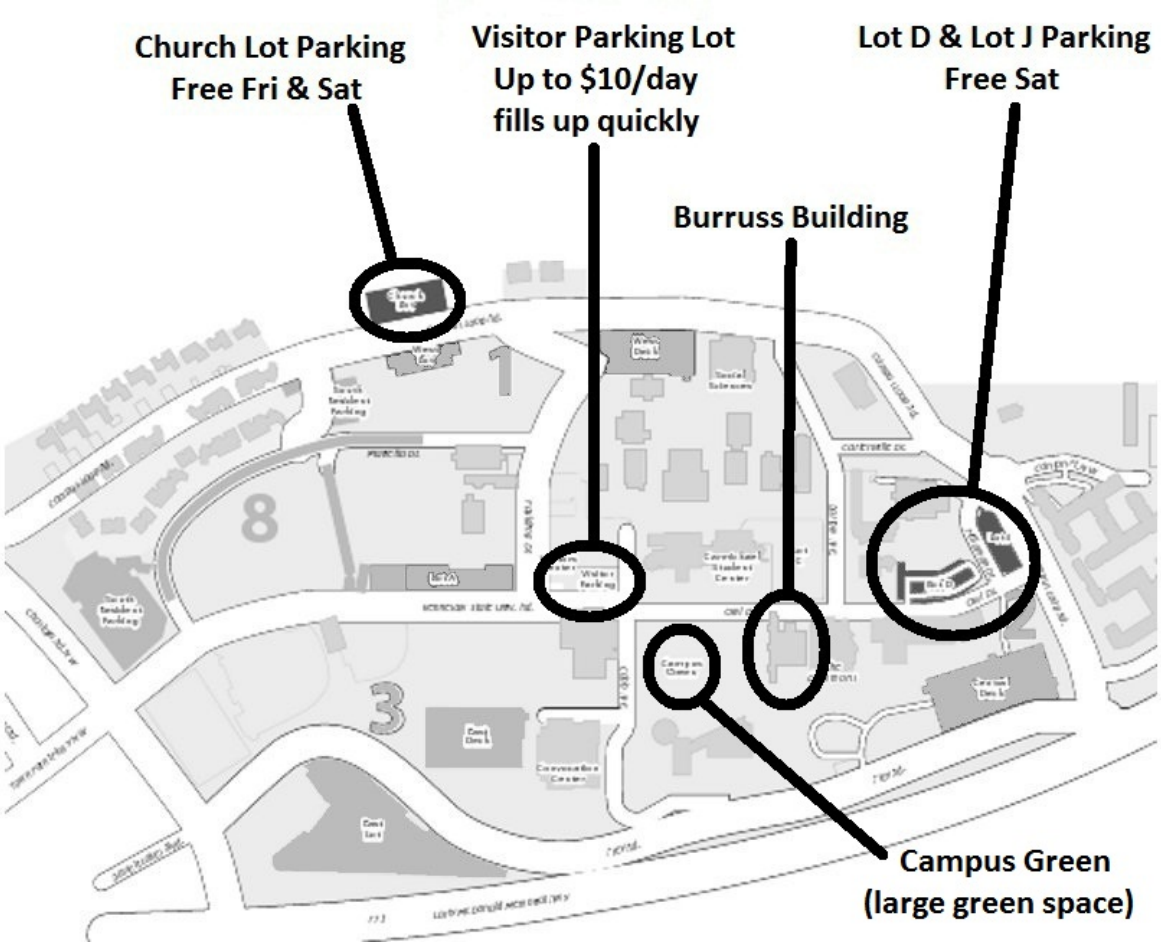
The conference will take place in the Burruss Building, abbreviated BB. See the campus map in your registration packet for directions. Registration and all breaks will be in the Burruss Building Atrium (BB 122). All plenary talks and the career panel will be in BB 151 (Auditorium).

Accessing KSU WiFi Network

1. Select "`KSUGuest`" from the list of available wireless networks.
2. Open a web browser.
3. Enter "`kennesaw`" as security key.
4. Login with your email address.
5. You are now connected to the WiFi network.

Note: Guests have limited bandwidth, will only be able to access the Network between 6am and midnight, and are restricted to Internet connectivity through a web browser.

Campus Map



Friday, October 19, 2012

2:30–5:30 pm	Registration (BB 122 Atrium)	
	Faculty Seminars (BB 114)	Gathering For Gardner (BB 151)
3:00–4:00 pm	**Michael Dorff** *Undergraduate Research*	*Puzzle Session*
4:00–5:00 pm	**Michele DiPietro** *Teaching: assessment, documenting, and scholarly analysis*	*Mathematical Scavenger Hunt*
5:00–5:20 pm	Break	
5:20–5:30 pm	Dean's Welcome (BB 151)	
5:30–6:30 pm	Plenary Lecture 1: **Neil Calkin** (BB 151) *Recounting the Rationals*	

Saturday, October 20, 2012 Morning Session

8:00–10:30 am	Registration (Breakfast served at 8:00 am) (BB 122 Atrium)		
	Contributed Talks		
Moderator:	ALGEBRA (BB 108) Erik Westlund	COMBINATORICS/GRAPH THEORY (BB 109) Joe DeMaio	ANALYSIS/NUMERICAL ANALYSIS (BB 114) Yuliya Babenko
8:30–8:45 am	**E. Abernethy** *The Milnor Invariant on Almost Trivial Links*	**A. Couch** *Couch's Triangle*	**R. Anderson** *Simultaneous Approximation of a Function and Its Derivative by Linear Splines*
8:50–9:05 am	**K. Berry** *Factor Posets and Dual Frames*	**J. Jacobson** *Fibonacci and Lucas Identities by Means of Graphs*	**J. Garrish** *Introductory Talk on Fractal Geometry*
9:10–9:25 am	**N. Smoot** *The Distribution of Consecutive 2^k Power Residues and Implications*	**M. Thomas** *The Card Collector Problem*	**D. Cosper** *Identity Return Triangles for Cubic Laminations*
9:30–9:45 am	**H. Brewer** *Total Efficient Dominating Sets in Cayley Graphs of Finite Abelian Groups*	**D. DeMars** *Order Properties in the Subpath Poset of Cyclic and Acyclic Graphs*	**J. Olson** *Counting Central Strips in Laminations of the Unit Disk*
9:50–10:05 am	**J. Lanterman** *Irreducible Integers Under the Congruence Modulo n Relation*	**J. DiNatale** *A Combinatorial Game Played on Wheels*	**N. Powers, Y.Babenko** *An Algorithm for Near Optimal Adaptive Linear Spline Interpolation*
10:05–10:20 am	Coffee Break		
10:20–10:30 am	Department Chair's Welcome (BB 151)		
10:30–11:20 am	Plenary Lecture 2: **Janice Wethington** (BB 151) *Public-Key Cryptography*		
11:30–12:30 pm	Panel Session (Careers with Mathematics): **Jeffrey Berman** (Lockheed Martin), **Melissa Danielson** (CDC), **Matthew Graham** (Home Depot), **James Piekut** (Amerigroup), **Janice Wethington** (NSA), (BB 151)		

Saturday, October 20, 2012 Afternoon Session

12:30–1:30 pm	Lunch (BB 122 Atrium)		
1:30–2:00 pm	Poster Session (BB 122 Atrium)		
2:30–3:20 pm	Plenary Lecture 3: **Michael Dorff** (BB 151) *Shortest Paths, Soap Films, and Mathematics*		
3:30–4:00 pm	Coffee Break		
	Contributed Talks		
Moderator:	GENERAL INTEREST (BB 108) Marla Bell	COMBINATORICS/GRAPH THEORY (BB 109) Mari Castle	APPLIED MATHEMATICS (BB 114) Tatiana Rudchenko
4:00–4:15 pm	**Haddock, Lindsay, Moore** *Using a Simulation of a Rocket Launch as a Teaching Tool in a Calculus Classroom*	**J. DeMaio** *Domination and Independence on the Triangular Honeycomb Chessboard*	**N. Dowling** *Modern Application of Complex Numbers*
4:20–4:35 pm	**Couch, Paine, Wright** *Using Rocket Flight as a Pedagogical Tool for Teaching Projectile Motion*	**T. Kindred** *Total Domination on the Triangular Honeycomb Chessboard*	**A. Reyes** *Applications of Complex Numbers in Economics*
4:40–4:55 pm	**J. Mayer** *Can Success in Calculus* 1 *be Improved?*	**J. Reinoehl** *Interval* 3*-graph Impropriety*	**T. Rudchenko** *Application of Fuzzy-Set Theory in Operations Research*
5:00–5:15 pm	**S. Thistlethwaite** *Broad Outline of the Uses of Mathematics in Physics from the Early Seventeenth Century to the Present Day*	**M. Olsen** *Locating the Mode of Some Unimodal Families of Graphs*	**A. Edwards** *Finding and Correcting the Error in York's Equation for Analytically Calculating the Slope and Intercept using Generalized Linear Least Squares Analysis*
5:20–5:35 pm	**K. Rose** *Automated Enforcement Yielding a New Wave of Reinforcement*	**E. Paulk** *The Evolution of Surveying*	**J. Lee** *Changes in Atmospheric Gases in The United States*
5:40–5:55 pm	**J. Leighton** *Current Trends in Degree Utilization Among Women*	**M. Smith** *Mathematics and Structure in Music*	**K. Bradford** *Understanding the Trends of Gynecological Cancers Among Selected Minority Groups: A DECADE IN REVIEW* (1999–2010)
6:00 pm	Concluding Remarks		

Biographies of Invited Speakers/Panelists

Jeffery Berman: Jeffery Berman attended undergraduate school at Millersville University where he received a B.A. in Mathematics, and graduate school at the University of Delaware where he received an M.A. in Mathematics. His first job was with General Electric in Valley Forge, PA. His current position is Senior Staff Software Engineer at Lockheed-Martin. Jeff's hobbies include teaching Calc 1 and Calc 2 in the evening at KSU, lifting weights, and golf.

Neil Calkin: Dr. Neil Calkin is currently Professor in the Department of Mathematical Sciences at Clemson University. Dr. Calkin was born in Connecticut, and raised in England. He studied mathematics at Trinity College, Cambridge, and earned a Doctorate in Mathematics in Combinatorics and Optimization in 1988 from the University of Waterloo. His interests lie in the interplay of combinatorics with other areas of mathematics, especially number theory and linear algebra. In his copious free time he enjoys doing origami, mathematically based magic tricks, and cooking.

Melissa Danielson: Melissa Danielson received a B.A. from the University of Virginia and attended graduate school at Emory University where she received a Master of Science in Public Health (MSPH) and Biostatistics. Her first job was a Statistician with SAIC, working on a contract with the Disability and Health Team at CDC. Currently, Melissa is a Health Scientist with the Child Development Studies Team at CDC.

Michael Dorff: Dr. Michael Dorff is currently an Associate Professor and Associate Chair in the Department of Mathematics as Brigham Young University. He is also the director of the NSF-funded BYU summer mathematics REU and the director of the NSF-funded Center for Undergraduate Research in Mathematics (CURM). He is also recipient of Franklin Tepper Haimo Award for Distinguished College or University Teaching of Mathematics (2010). In addition, Professor Dorff has 7 teaching and 3 service awards, PI on 13 grants ($2.4 million), Director/founder NSF-funded CURM Center for Undergraduate Research in Mathematics (2006–present), Director/founder REU (2005–present), Invited speaker on mathematics for general audience and on research topics for specialists (at over 65 conferences, universities, and colleges), External reviewer for mathematics departments, 3-day workshop for professors on working with undergraduates on research (2007–present), Main organizer for 5 national conferences, Fulbright scholar (2005–06), High school teacher (1986–90). His research areas include Complex Analysis, Minimal Surfaces, and Geometry.

Michele DiPietro: Dr. Michele DiPietro is the President of the Professional and Organizational Development (POD) Network in Higher Education, the premiere professional society of CETLs in North America. He is the director of the Georgia Conference on College & University Teaching and of the POD/KSU Institute for New Faculty Developers. His book, "How learning works: Seven research-based principles for smart teaching," co-authored with former Eberly Center colleagues, distills the research on learning into 7 principles and provides pedagogical strategies for educators, has been translated into Chinese (forthcoming) and Korean. Dr. DiPietro was the recipient of the POD Innovation award in 2008. His scholarly work includes learning sciences, academic integrity, diversity and inclusivity in the classroom, statistics education, student evaluations of teaching, Millennial students, the consultation process in faculty development, and teaching in times of tragedies. He received his Ph.D. in Statistics from Carnegie Mellon University in 2001. His statistical research has been in the areas of cladistic analysis in genetics and interest rate models in finance. His course "The statistics of sexual orientation" has been featured on The Chronicle of Higher Education and in other publications.

Matthew Graham: Matthew Graham received his B.S. and M.S. in Aerospace Engineering from Georgia Institute of Technology. His first job was as an Intern at the NASA Glenn Research Center. His current position is as Director, Inventory Planning and Replenishment, at The Home Depot. Matthew's hobbies included hiking, climbing, and kendo.

James Piekut: James Piekut is a graduate of Virginia Tech. His first job was with Towers Perrin and he is currently the Associate Vice President, Corporate Actuarial for Amerigroup.

Janice Wethington: Dr. Janice Wethington received a Ph.D. in Algebraic Geometry from the University of Georgia. She worked at the National Security Agency as a summer intern in 1996 and 1997 and has worked there as a full time employee since 2005. She has two cats, one of which also has his Ph.D. in Algebraic Geometry. The other has yet to find himself.

Plenary Talks

1. TITLE: *Recounting the Rationals*
SPEAKER: **Neil Calkin**
INSTITUTION: Clemson University
EMAIL: calkin@math.clemson.edu
ABSTRACT: It is well known that the rationals are countable, that is, that there is a bijection from the non-negative integers to the rational numbers: as simple as the standard proof of this fact is, computationally it is remarkably mysterious. Indeed, at the moment, it is difficult to list, say, the 10^{100}th rational, and with current technology and algorithms, impossible to give the 10^{300}th rational. In joint work with the late Herbert S. Wilf, we give an alternate enumeration of the positive rationals: after a detour via generating functions, restricted partitions andcontinuous nowhere differentiable functions, we will discuss computational advantages of our enumeration. In particular, we will give the last few digits of the numerator and denominator of the 10^{1000}th rational.

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2. TITLE: *Public Key Cryptography*
SPEAKER: **Janice Wethington**
INSTITUTION: National Security Agency
EMAIL: janice1729@yahoo.com
ABSTRACT: Public Key Cryptography refers to a cryptographic system that uses two keys, one public and one private, to exchange communications privately. We will discuss two methods of producing keys, RSA and Diffie-Hellman, and the relative security of each.

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3. TITLE: *Shortest Paths, Soap Films, and Mathematics*
SPEAKER: **Michael Dorff**
INSTITUTION: Brigham Young University
EMAIL: mdorff@math.byu.edu
ABSTRACT: In high school geometry we learn that the shortest path between two points is a line. In this talk we explore this idea in several different settings. First, we apply this idea to finding the shortest path connecting four points. Then we move this idea up a dimension and look at a few equivalent ideas in terms of surfaces in 3-dimensional space. Surprisingly, these first two settings are connected through soap films that result when a wire frame is dipped into soap solution. We use a hands-on approach to look at the geometry of some specific soap films or "minimal surfaces".

Contributed Talks & Posters

1. TITLE: *The Milnor Invariant on Almost Trivial Links*
SPEAKER: **Eleanor Abernethy**
INSTITUTION: University of Tennessee–Knoxville
EMAIL: eabernethy720@hotmail.com
ABSTRACT: This talk will give an introduction into Milnor's Link Group and the invariant on Almost Trivial Links. I will show with examples how one may use generators of the link group of an almost trivial link to create a parallel of one of the link's components.

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2. TITLE: *Simultaneous Approximation of a Function and Its Derivative by Linear Splines*
SPEAKER: **Ryan Anderson**
INSTITUTION: Kennesaw State University
EMAIL: rander43@students.kennesaw.edu
ABSTRACT: Linear splines, in particular interpolating splines, are used to approximate a function given on a discrete set of values of the function. Linear splines are widely used in many applications targeting geometric modeling of curves and surfaces as piecewise linear functions are generally easy to work with. The concept of linear splines have been extended to bilinear (linear in each variable) and further to polylinear splines with many results having been proved. In this talk, I will introduce the concept of spline interpolation and discuss new results on simultaneous approximation of a multivariate function (of certain smoothness) and its derivatives by linear splines as well as present some results on the error of approximation. The work was done under the supervision of Dr. Yuliya Babenko.

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3. TITLE: *Factor Posets and Dual Frames*
SPEAKER: **Kylie Berry**
INSTITUTION: Berry College
EMAIL: kylie.berry@vikings.berry.edu
ABSTRACT: A *frame* in $\mathbb{R}^n$ is a redundant spanning set. Equivalently, a frame is a sequence of vectors $\{f_i\}_{i=1}^k$ for which there exist constants $0 < A \leq B < \infty$ such that, for every $x \in \mathbb{R}^n$, $A\|x\|^2 \leq \sum_{i=1}^k |\langle x, f_i\rangle|^2 \leq B\|x\|^2$. A frame is *tight* if $A = B$. I will present results about the combinatorial structure of tight frames using factor posets. A factor poset of a frame is defined to be a collection of subsets of I, the index set of our vectors, ordered by inclusion so that nonempty $J \subseteq I$ is in the factor poset if and only if $\{f_i\}_{i\in J}$ is a tight frame in $\mathbb{R}^n$. We will then discuss some results on dual frames. A set of vectors $\{g_i\}_{i=1}^k$ is said to be a *dual frame* if for a frame $\{f_i\}_{i=1}^k$ we have that $x = \sum_{i=1}^k \langle x, g_i\rangle f_i$, $\forall\ x \in \mathbb{R}^n$. I will relate the two topics by discussing the connections between the factor posets of frames and their duals. Finally, I extend the notion of diagram vectors for frames in infinite dimensions. The diagram vectors of a frame are used to determine if any given subframe of the frame is tight.

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4. TITLE: *Understanding the Trends of Gynecological Cancers Among Selected Minority Groups: A DECADE IN REVIEW* (1999–2010)
SPEAKER: **Kayla R. Bradford**
INSTITUTION: Troy University–Montgomery
EMAIL: kbradford21613@troy.edu
ABSTRACT: The purposes of this paper is to discover the trends if any, among the gynecological cancer statistics as pertaining to African American and Hispanic women in the U.S versus that of White women. This study compares the data collected by the Center for Disease Control (CDC) and the National Cancer Institute of the National Health Institutes (NIH) as well as a few others to draw awareness to the changes in the incidence and mortality rates by the races. It will cover the five main gynecological cancers: uterine, cervical, vaginal, ovarian, and vulvar with a quick reference to breast cancer. The different cancers are reviewed according to new cases, survival, and death rates. This paper however does not offer a solution to fix the rise of fall in the data but only intends to bring awareness and knowledge of the situation of Gynecological Cancers in selected minority groups over the past decade.

5. TITLE: *Total Efficient Dominating Sets in Cayley Graphs of Finite Abelian Groups*
SPEAKER: **Hollis Brewer**
INSTITUTION: Kennesaw State University
EMAIL: hbrewer1@students.kennesaw.edu
ABSTRACT: A set $S \subseteq V$ is a *total efficient dominating set* (TEDS) of a graph $G = (V, E)$ if each vertex in V is adjacent to exactly one vertex in S. From the work of Gavlas and Schultz we have that a TEDS S exists on the path graph P_n if and only if $n \not\equiv 1 \mod 4$, and in the cycle graph, C_n, if and only if $n \equiv 0 \mod 4$. Let H be a finite group with identity e. Let C be a subset of H satisfying $e \notin C$ and $C = C^{-1}$, that is, $a \in C$ if and only if $a^{-1} \in C$. The *Cayley graph* on H with *connection set* C, denoted $G(H, C)$, satisfies: the vertices of $G(H, C)$ are the elements of H; there is an edge joining $a, b \in G(H, C)$ if and only if $a^{-1}b \in C$. For the dihedral group D_n of size $2n$, DeMaio and Castle have shown that a TEDS S exists in $G(D_n, C)$ if and only if $k \mid n$ where $|C| = k$. In this talk we will extend this result to Cayley graphs of finite abelian groups.

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6. TITLE: *Adaptive Interpolation of Hyperbolic Functions by Linear Splines in L2-error: Local Estimate* (poster)
SPEAKER: **Shannon Bryce**
INSTITUTION: Kennesaw State University
EMAIL: sbryce1@students.kennesaw.edu
ABSTRACT: Splines are piecewise polynomial functions. Due to their simplicity, approximation by various types of splines is one of the standard procedures in many applications (computer-aided geometric design, image processing, numerical solutions for partial differential equations etc.). In all these applications, there is a standard distinction between uniform (mesh elements dont vary much) and adaptive (mesh adjusts to the given function) methods of constructing a mesh to build splines. In the uniform case, the domain of interest is decomposed into a partition where elements do not vary much. However, clearly more accurate adaptive methods are highly nonlinear and no polynomial time algorithm exists to provide an optimal approximant for each given function.

Therefore, the next natural question would be to construct asymptotically optimal sequences of partitions (that are triangulations when we use linear splines) and interpolating splines on them. To that end we first need to find a triangle that is locally (for some small region) optimal. In this talk we shall discuss how to find the optimal shape of the mesh element triangle in the case of approximating the bivariate functions with negative curvature by interpolating linear splines, and the approximation error on it.

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7. TITLE: *Adaptive Interpolation of Hyperbolic Functions by Linear Splines in L2-error: Global Estimate* (poster)
SPEAKER: **Teagan Bryce**
INSTITUTION: Kennesaw State University
EMAIL: tbryce@students.kennesaw.edu
ABSTRACT: Once we found the local L2- error of approximating the bi-variate functions with negative curvature by interpolating linear splines, we will put it together to obtain the global estimate for the optimal error. We shall discuss a sketch of an algorithm to construct asymptotically optimal sequences of triangulations and will present the asymptotics of the optimal error.

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8. TITLE: *Identity Return Triangles for Cubic Laminations*
SPEAKER: **David J. Cosper**
INSTITUTION: University of Alabama–Birmingham
EMAIL: dcosper@uab.edu
ABSTRACT: A *lamination* is a combinatorial/topological way of studying the connected Julia set of a complex polynomial. A lamination is a closed collection of chords of the circle which do not intersect except at vertices. Particularly, we are interested in invariant laminations under the the map $\sigma_d(t) = dt \pmod 1$ where $t \in [0, 1)$. A *polygon* is then a finite collection of chords meeting at their end points forming a polygon in the closed unit disk in $\mathbb{C}_\infty$. An *identity return polygon* is a polygon which maps away from itself, while also preserving order, and eventually maps back to itself by the identity, and whose images are pairwise dis- joint. Kiwi proved that the number of sides of an identity return polygon cannot exceed the degree d of the map $\sigma_d(t)$. This also implies

in the case when $d = 2$ that no identity return polygon may exist. Therefore, we will specialize to the first interesting case $d = 3$, but we also consider the general case when $d > 2$. Some open questions about σ_d are

1. What is the minimum period of an identity return polygon?
2. Do all periods above the minimum occur?
3. Given 3 points of a given period p, what are the criteria for forming an identity return triangle?
4. Given a period p, how many identity return polygons may be formed?

We show that for any d, no identity return d-gon of period $p = 2$ may exist under σ_d, though period $p = 2$ triangles may exist for all $d > 3$.

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9. TITLE: *Couch's Triangle*
SPEAKER: **Andrew Couch**
INSTITUTION: Kennesaw State University
EMAIL: couch1015@yahoo.com
ABSTRACT: Pascal's Triangle has been used for math for ages now and through its time it has revolutionized the way we do math and it is truly an essential tool for the expansion and furthering of mathematics as a whole. However, what happens you change the pattern in computing the rows in Pascal's Triangle? Well that is where Couch's Triangle comes in. Instead of merely adding to obtain the rows of the triangle, for Couch's Triangle, one begins by subtraction to get the second row, then adds to achieve the third, and then subtracts to achieve the forth, and then continues the pattern to achieve the nth row. Being that one introduces subtraction and addition into the sequence, the amount of the patterns is essentially doubled. Where Pascal's Triangle is used for binomial expansion, Couch's Triangle is not. In fact, Couch's Triangle in fact can be used for trinomial expansion and in one of the diagonals of the Triangle, there is an interesting pattern when it comes to prime numbers. The amount of patterns in the theory is essentially endless and the discovery is just only beginning. This theory was discovered during my senior year of high school under the supervision of Don Slater and Debbie Poss.

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10. TITLE: *Using Rocket Flight as a Pedagogical Tool for Teaching Projectile Motion*
SPEAKER: **Elly Couch, Ryan Paine,** and **Atticus Wright**
INSTITUTION: The University of North Alabama
EMAIL: paine95@gmail.com, awright@una.edu
ABSTRACT: Teaching styles and methods in mathematics vary widely throughout academia: which begs the question, is there a superior way to instruct students on complicated concepts such as projectile motion? Will incorporating a physical model into an Algebra II lesson on projectile motion result in better student test scores as compared to students who are taught a traditional lesson? Or is the tried and true textbook-based teaching method most effective? Through our research, we hope to answer these questions and discern which teaching style will provide students with a richer learning experience.

After pre-testing, we will teach one group of students a hybridized Algebra II lesson on projectile motion and one group of students a traditional lesson.

Our hybridized lesson, incorporating a physical model, will be based off data gathered from a rocket launch. To encourage active student participation in the launch, we will guide a discussion group and ask students to complete a worksheet. Our rocket will be launched at a pre-determined angle, achieve its maximum height (apogee), and, after a brief pause, deploy a parachute to return safely to the ground. Additionally, it will be outfitted with an altimeter that will provide us with data regarding its speed, flight duration, and descent rate. Taking into account these factors, we will be able to determine and map the rocket's trajectory.

Our traditional lesson will be largely theoretical and textbook-based. It will cover the basic formula(s) of a parabola, will detail methods that can be used to evaluate various aspects of a fired object's trajectory, and will include practice problems for students to work.

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11. TITLE: *Domination and Independence on the Triangular Honeycomb Chessboard*
SPEAKER: **Joseph DeMaio*** and **Hong Lien Tran**
INSTITUTION: Kennesaw State University
EMAIL: jdemaio@kennesaw.edu
ABSTRACT: Chessboard puzzles are frequently translated into graph theoretic forms for careful analysis. Let Q_n be the graph derived by legal moves of the queen on the square board of side n. Vertices of the graph represent the squares of the board. Two vertices are adjacent if and only if the queen can legally move between the corresponding squares. In similar fashion, define K_n, R_n, B_n, and N_n for the king, rook, bishop and knight. Two classic problems in both graph theory and the study chessboard puzzles are those of dominating sets of minimum cardinality and independent sets of maximum cardinality.

A set $S \subseteq V$ is a dominating set of a graph $G = (V, E)$ if each vertex in V is either in S or is adjacent to a vertex in S. A vertex is said to dominate itself and all its neighbors. The domination number of a graph G, $\gamma(G)$, is the minimum cardinality of a dominating set of G. In short, the domination problem is to threaten or occupy every square on the board with the fewest pieces. A set $S \subseteq V$ is an independent set of vertices if no two vertices in S are adjacent. The independence number of a graph G, $\beta_0(G)$, is the maximum cardinality of an independent set of G. Here the problem is to place the maximum number of pieces such that no piece is immediately threatened.

In the 1996 MAA publication, *Which Way Did the Bicycle Go?*, Konhauser, Velleman, and Wagon defined the triangular honeycomb chessboard of side n. This talk explores domination and independence on the variant triangular honeycomb chessboard for the knight, bishop, rook, queen and king.

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12. TITLE: *Order Properties in the Subpath Poset of Cyclic and Acyclic Graphs*
SPEAKER: **Derrick DeMars**
INSTITUTION: Blue Mountain College
EMAIL: demars1992@yahoo.com
ABSTRACT: We examine the subpath poset of cyclic and acyclic graphs. We determine whether their subpath posets are lattices.

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13. TITLE: *A Combinatorial Game Played on Wheels*
SPEAKER: **Joseph DiNatale**
INSTITUTION: Armstrong Atlantic State University
EMAIL: jd4732@stu.armstrong.edu
ABSTRACT: Nim is a well-known combinatorial game in which two plays alternate removing objects from piles. In 2003, Masahiko Fukuyama proposed a version of Nim played on graphs where two players alternate traversing the weighted edges of an undirected graph. Players move by drecreasing the weight value of an edge by a strictly nonnegative integer; when an edge's weight value is less than or equal to zero, the edge terminates. We examine this variation of Nim and consider its winning strategies.

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14. TITLE: *Modern Application of Complex Numbers*
SPEAKER: **Nicole Dowling**
INSTITUTION: Kennesaw State University
EMAIL: mscookiez19@gmail.com
ABSTRACT: Discovery of complex numbers has provided scientists with new, more general methods of research. Since complex numbers had been introduced, many algebraic problems, which had to be divided into several particular cases, could now receive some general features. New methods were developed to solving familiar problems; these methods also enriched the very contents of the problems and resulted in an energetic development of one of the most important branches in mathematical analysis, i.e. the theory of complex variable function. The complex numbers apparatus is a great analytical means for solving various geometrical problems. The method of complex numbers allows solving problems of plane geometry using the already existing formulas by means of direct calculation and elementary computations. The use of complex numbers helps in solving plenty of famous problems more elegantly and graciously. It also allows us to find new facts and make generalizations. Complex

numbers are a great way of determining connections between different parts of mathematics and physics. We will specifically talk about the application of complex numbers in elementary algebra and geometry.

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15. TITLE: *Bridging The Financial Divide* (poster)
SPEAKER: **Charles Ebert** and **Raghabendra KC**
INSTITUTION: Rollins College
EMAIL: rkc@rollins.edu, cebert@rollins.edu
ABSTRACT: Addressing the socio-economic gap between investment strategies in Nepal, this project is concerned with investigating the fundamental concepts of portfolio optimization and applying them to the Nepalese Equity Market. By using Markowitz's Mean Variance Theorem and the Capital Asset Pricing Method, the project aims to create a free web-applet that will provide financial advice and opportunities that is usually not available to people of lesser means in countries like Nepal. Hence, helping bridge the financial divide.

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16. TITLE: *Finding and Correcting the Error in York's Equation for Analytically Calculating the Slope and Intercept using Generalized Linear Least Squares Analysis*
SPEAKER: **Alexander Edwards**
INSTITUTION: University of North Alabama
EMAIL: aedwards1@una.edu
ABSTRACT: When calculating a line of best fit of data to a straight line, most often an ordinary least squares (OLS) analysis is used. This assumes all observational errors are in the y data values. There are some instances, however, when there are also signicant errors in the x values and this approach will not compute the best estimate of the slope, m, and intercept, b, of a best fit line. Generalized least squares analysis (GLS) should be employed whenever any of the following are true for all i:

1. $\Delta y_i^2 \ll m^2 \Delta x_i^2$
2. $\Delta y_i^2 + m^2 \Delta x_1 \neq c_1$, where c_1 is a constant
3. $\frac{\Delta y_i}{\Delta x_i} \neq c_2$, where c_2 is a constant

An example when generalized straight line least squares analysis would be appropriate is found in the Clausius-Claperyon Experiment. In this experiment, both the y values, which represent the natural logarithm of pressures and the x values, which represent the reciprocals of the kelvin temperatures, have signicant uncertainties. Such cases require using generalized linear least squares (GLS) analysis to determine the best estimate for the slope and intercept of the line best fit. The purpose of this research is to determine and correct an error found in York's paper, *Least-Squares Fitting of a Straight Line*, which analytically computes the slope and intercept of a best fit line using GLS analysis. In order to determine the error in York's calculation, an analytical technique for solving for the roots of a cubic equation must rst be found. Once the error in York's paper is found and corrected, a program can be created to solve for m and b using the GLS Analysis.

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17. TITLE: *Introductory Talk on Fractal Geometry*
SPEAKER: **Justin Garrish**
INSTITUTION: Towson University
EMAIL: jgarri5@students.towson.edu
ABSTRACT: Fractal sets have properties that may be counter-intuitive compared to classical geometric objects, most notably perhaps is the possibility of non-integer dimension. The talk will start by characterizing fractals with the definition of a self-similar set, as the union of images of itself under a finite system of similitudes. Using Banach's fixed point theorem, I will show that such sets exist and are unique. The talk highlights these properties in examples of well-known fractals, such as the classical Cantor set. From there I will discuss similarity dimension, and open to the more general Hausdorff dimension. The open set condition will be stated and illustrated, along with it's impact on Hausdorff dimension and fractals. The talk concludes with techniques to compute the Hausdorff dimension of a set.

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18. TITLE: *Using a Simulation of a Rocket Launch as a Teaching Tool in a Calculus Classroom*
SPEAKER: **Baillie Haddock, Patrick Lindsay,** and **Benjamin Moore**
INSTITUTION: University of North Alabama
EMAIL: bchaddock@una.edu, tlindsay@una.edu
ABSTRACT: The purpose of this undergraduate research is to determine if a calculus lesson centered on a simulation of a rocket's flight will improve student's understanding of the concept of derivative. To test this, we will create a simulation of a rocket's flight; this simulation will be used as an integral part of students' instruction on derivative. We hypothesize that using the simulation will increase students' conceptual knowledge because it provides an opportunity to see how one change in the function can change the function's graph. It will also provide them with the practice necessary for mastering methods of manipulating functions to achieve a desired result. Two high school Calculus classes with the same instruction in derivatives will be tested with two different approaches. The control group will receive a traditional, lecture-based lesson in functions, derivatives, and their graphs, while the other will receive a lesson highly reliant on the rocket simulation to aid in the student's comprehension of the said concepts. Both classes will receive a pre-test, to evaluate their knowledge of the material before they are presented with the lesson, and a post-test following the lesson, to evaluate how much their understanding has developed. We expect to find that students' scores on the post-test will be significantly higher than on the pre-test. We also hope to show that this instructional treatment will result in a statistically significant increase in mean test scores over the control group. Faculty Mentors: James Jerkins, Cynthia Stenger, and Jessica Stovall

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19. TITLE: *Fibonacci and Lucas Identities by Means of Graphs*
SPEAKER: **John Jacobson**
INSTITUTION: Kennesaw State University
EMAIL: john.jacobson@linkanalytics.com
ABSTRACT: In 1982, Prodinger and Tichy defined the Fibonacci number of a graph G, $i(G)$, to be the number of independent sets (including the empty set) of the graph. They do so because the Fibonacci number of the path graph, P_n, is the Fibonacci number $F_n + 2$. Nelson's Proof without Words series provides numerous visual arguments for several mathematical identities, some of which feature the Fibonacci sequence. In Proofs that Really Count, Benjamin and Quinn provide purely combinatorial proofs of several mathematical identities, some of which feature the Fibonacci sequence. This talk marries these visual and combinatorial features to prove Fibonacci and Lucas identities by means of graphs.

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20. TITLE: *Total Domination on the Triangular Honeycomb Chessboard*
SPEAKER: **Taylor Kindred**
INSTITUTION: Kennesaw State University
EMAIL: tkindred@students.kennesaw.edu
ABSTRACT: A set $S \subseteq V$ is a dominating set of a graph $G = (V, E)$ if each vertex in V is either in S or is adjacent to a vertex in S. A vertex is said to dominate itself and all its neighbors. The domination number, $\gamma(G)$, is the minimum cardinality of a dominating set of G. When translated to a chessboard puzzle, the domination question is how to threaten or occupy every square on the board with the fewest number of pieces. In the 1996 MAA publication, *Which Way Did the Bicycle Go?*, Konhauser, Velleman, and Wagon defined the triangular honeycomb chessboard of side n. In 2012, DeMaio and Tran computed domination numbers on the triangular honeycomb board.

A set $S \subseteq V$ is a total dominating set of a graph $G = (V, E)$ if each vertex in V is adjacent to a vertex in S. The total domination number, $\gamma_t(G)$, is the minimum cardinality of a total dominating set of G. Translated to the chess board, occupying a space is no longer sufficient. Every space must be threatened. This talk begins the analysis of total domination numbers for the triangular honeycomb chessboard.

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21. TITLE: *Irreducible Integers Under the Congruence Modulo n Relation*
SPEAKER: **James Lanterman**
INSTITUTION: Mercer University

EMAIL: james.m.lanterman@live.mercer.edu
ABSTRACT: For an element a of an integral domain D under an equivalence relation τ, the factorization of a is defined as $\lambda a_1 a_2 a_3 \cdots a_k$, where λ is a unit in D and $a_i \tau a_j$ for all i, j. An irreducible element has no *proper* factorization; that is, a factorization in which there is more than one distinct non-unit factor. In this paper, the irreducible integers under the congruence modulo n relation for some values of n are found, and these findings are generalized in the first step toward a general characterization of the irreducible integers under this relation for any prime n.

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22. TITLE: *Changes in Atmospheric Gases in The United States*
SPEAKER: **James Z. Lee**
INSTITUTION: Troy University–Montgomery
EMAIL: jameszlee92@yahoo.com
ABSTRACT: As the Earth remains to age the climates will also remain to change with interference from outside sources. One of the major contributors to the affects of the climate is humans. As Americans tend to their daily lives the use fossil fuels releases the Carbon Dioxide that had been captured for many millennia, and held out of the atmosphere. As there are more and more of these gases released there are affects on the plant life within the area of the higher concentrations. This may lead to either: accelerated plant growth, decelerated plant growth, or plant life ceasing to exist.

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23. TITLE: *Current Trends In Degree Utilization Among Women*
SPEAKER: **Jeanne Leighton**
INSTITUTION: Troy University–Montgomery
EMAIL: Leighton334@gmail.com
ABSTRACT: This presentation examines married women with children and whether or not they choose to utilize their college degree(s). As with many human rights issues, men and women have sacrificed greatly, some dedicating their lives to fighting for a woman's right to vote, attend college, and earn equal pay for equal work. This presentation will highlight the long-term and short-term effects of married mothers who choose not to utilize their college degrees and forgo paid work. It will bring attention to current statistics to determine if trends have emerged.

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24. TITLE: *Determining Factors That Influence Driving Times For Locations That Are 25.0000 Miles Directly From Kennesaw State University* (poster)
SPEAKER: **Michael Leitson**
INSTITUTION: Kennesaw State University
EMAIL: michaelleitson@gmail.com
ABSTRACT: Our main goal was to determine which factors influence locations that are at a 25-mile straight-shot distance from Kennesaw State University (KSU). KSU has an extremely large proportion of commuter students and we wanted to find out where the most desirable commutes occurred. The Distance Measurement tool, provided by Google Maps, was used to determine exact distances, along with mapping software such as Google Maps, Bing and MapQuest. A variety of statistical methods were used, such as descriptive statistics, t-tests, stratified confidence intervals, risk ratios, and ANOVA. We concluded that while a greater mileage is correlated with a longer driving time, other factors may have an effect, such as the number of roads, median household income and categorized city. These results further indicated that the starting destination for the most desirable commutes to KSU occurred near interstates or in rural counties.

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25. TITLE: *A Predictive Model for Movie Success in Opening Weekend Ticket Sales* (poster)
SPEAKER: **Beth Leslie**
INSTITUTION: Kennesaw State University
EMAIL: bethjleslie@gmail.com
ABSTRACT: Background: Research shows that opening weekend movie success can be predicted by public sentiment and yet the specific qualities that generate public sentiment are suspected, but have not been identified.

This study of the 2009 movie releases from the largest production studios was designed to track the quantifiable factors that could potentially influence the probability of the success of a movie on its U.S. release opening weekend and build a predictive model to identify the likelihood of a films opening weekend success.

Methods: Various attributes of 67 movies released in 2009 were measured and analyzed. Initial exploratory analysis consisted of descriptive statistics, frequency tables, and odds ratios. Principal component analysis and cluster analysis were used for variable reduction and multivariate logistic regression was used to build a predictive model.

Results: Significant predictors of high opening weekend ticket sales include running time, estimated production budget, movie genre, and series membership. Budget has different effects for different genres and running times. The final multivariate logistic regression model had a c statistic of .919 and a misclassification rate of 7.9%

Conclusion: The results of this study imply that the movies the American public is most willing to pay to see are high-budget action movies and those types of movies are more likely to have high ticket sales on opening weekend.

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26. TITLE: *Can Success in Calculus* 1 *be Improved?*
SPEAKER: **John Mayer**
INSTITUTION: University of Alabama–Birmingham
EMAIL: jcmayer@uab.edu
ABSTRACT: Over the past few years, as part of the research of the NSF-sponsored Greater Birmingham Mathematics Partnership, we have been studying ways to improve student learning and success in entry-level mathematics courses, starting with the lowest: Basic Algebra (developmental) and Finite Mathematics. In order to determine where we should next put our efforts, we have conducted a statistical study over six years of data on student success in Calculus 1 in relationship to the first mathematics course taken at UAB. This is an attempt to answer the question Are we preparing students for calculus? We have a placement procedure for first-time freshmen which is relevant, and which we will discuss. Of first-time freshman placing into Calculus 1, 81 % make an A, B, or C; their mean grade on a 4-point scale is 2.676. Even if we consider only those who just placed into Calculus 1, eliminating the strongest of the strong, the mean grade is 2.367. On the other hand, those who place as freshmen into lower-level courses* have a varied chance of success as you might expect. We looked for the group where placing resources to improve learning might yield the most bang for the buck. This report will focus on the statistical analysis and the conclusions that we reached. (# William Bond is thanked for performing the statistical analysis. *Lower level courses leading to calculus are Basic Algebra, Intermediate Algebra, Pre-Calculus Algebra, Pre-Calculus Algebra and Trigonometry [4 hrs], and Pre-Calculus Trigonometry.)

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27. TITLE: *Locating the Mode of Some Unimodal Families of Graphs*
SPEAKER: **McCabe Olsen**
INSTITUTION: Mercer University
EMAIL: mccabe.olsen@gmail.com
ABSTRACT: The unimodality of independence polynomials of graphs is an active area of research. Our goal is to investigate particular families of unimodal graphs to provide an efficient means of locating the mode of the independence polynomial. In the process of this work, we determine a closed form for the independence polynomial of certain "path-like" graphs and further analyze the behavior of these polynomials. Our proof bulids upon the work of Bahls, Bahls-Salazar, Benhoumani, and Wang-Zhu.

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28. TITLE: *Counting Central Strips in Laminations of the Unit Disk*
SPEAKER: **Joseph Olson**
INSTITUTION: University of Alabama at Birmingham
EMAIL: jwolson@uab.edu
ABSTRACT: Invariant laminations are a mathematical tool constructed by William Thurston to study complex dynamics. However, a new perspective on invariant laminations, called sibling invariance, is potentially equipped with better tools to classify laminations of degree $d > 2$. Thurston used a notion of central strips to classify invariant laminations of degree $d = 2$. I will define central strips for laminations of degree $d \geq 2$ and prove

the existence of a central strip in almost every lamination. The structure of a central strip depends on a full sibling family of leaves which maps to a non-diametrical leaf. This construction naturally gives rise to a bijective correspondence between full sibling families and the collection of bi-colored trees. This connection provides a count for the number of different central strips possible.

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29. Title: *The Evolution of Surveying*
Speaker: **Evan Paulk**
Institution: Troy University–Montgomery
Email: epaulk@troy.edu
Abstract: This presentation will discuss the evolution of land surveying. It will go through the inception of surveying, to where surveying is now. The presentation will give the listeners a better understanding of what surveying is, why it was conceived, the instrumentation, algorithms, and where surveying is heading.

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30. Title: *An Algorithm for Near Optimal Adaptive Linear Spline Interpolation*
Speaker: **Nicholas Powers** and **Yuliya Babenko**
Institution: Kennesaw State University
Email: nickpowers43@gmail.com, ybabenko@kennesaw.edu
Abstract: For many applications simpler representations of functions are needed. One way to produce such simplified representations is through interpolation or approximation. Piecewise linear functions, or linear splines are one of the simplest yet effective tools for that. It is natural to desire as little error as possible in these approximations, but is it possible to achieve an approximation with minimal error, i.e. to find the best possible approximate (or interpolant) for EACH given function? Unfortunately the answer is no. But we can get close to the optimal error if we construct the interpolant based on a mesh, which adapts to each function.

To construct the mesh, we begin by dividing the domain into a set of subdomains and on each we construct a mesh adaptively to the local behavior of the function on that particular subdomain. In this talk we discuss the details of the algorithm and, particularly, its implementation. The work on this project has been done under supervision of Dr. Yuliya Babenko.

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31. Title: *Interval* 3*-graph Impropriety*
Speaker: **Joshua Reinoehl**
Institution: University of North Alabama
Email: jreinoehl@una.edu
Abstract: An interval graph is proper if and only if it has a representation in which no interval contains another. Beyerl and Jamison introduced the study of p-improper interval graphs where no interval contains more than p other intervals in 2008. Dasgupta, Flesch, and Lundren extended this to interval bigraphs in 2010. This paper extends their ideas to an interval 3-graph, with the introduction of p-improper interval 3-graphs with three partite sets where no intervals contain other intervals from the same partite set. We find different structures of p-improper interval 3-graphs and also find the bounds on said structures.

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32. Title: *Applications of Complex Numbers in Economics*
Speaker: **Anna Reyes**
Institution: Kennesaw State University
Email: areyes14@students.kennesaw.edu
Abstract: The concepts and practices of complex numbers can be applied to a number of modern fields such as fluid dynamics, electromagnetism, quantum mechanics, and more. Our research, more specifically, involves the applications of complex numbers in economics. Furthermore, it focuses on the topics of duration and internal rate of return.

The elements of duration and internal rate of return can be visually interpreted using complex numbers and their representation in the complex plane. Using financial algebra, the roots derived from the Time Value of Money Equation, and Cotes Theorem, one can use a variation of number series to create plots on an Argand

diagram and witness the patterns in positions of the roots. The roots' placements and their distances between each other determine economic values such as discount factors the duration for a bond.

Complex numbers can be wholly applied to the field of economics in a way that is beneficial in addressing contemporary economic issues. Matters such as the modern economic state can be analyzed (and possibly explained through the concept of 4-D Economics) using complex numbers.

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33. TITLE: *Targeting Risky Credit: The Cost of Simplicity* (poster)
SPEAKER: **Amanda Rollason**
INSTITUTION: Kennesaw State University
EMAIL: arollaso@kennesaw.edu
ABSTRACT: When consumers apply for a line of credit, there is a rather lengthy background check into their financial histories. The goal of this analysis project is to use SAS to identify what tell-tale signs in consumers credit history would best model the bad consumers, and, in turn, use this as a way to prevent potential future bad consumers from getting approved for lines of credit. Three models, each successively less complicated, are developed for comparison. The research question then becomes: how do these models affect the bottom line, i.e., what is the cost of simplicity?

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34. TITLE: *Automated Enforcement Yielding a New Wave of Reinforcement*
SPEAKER: **Kaitlin Rose**
INSTITUTION: Troy University–Montgomery
EMAIL: krose53603@troy.edu
ABSTRACT: This presentation demonstrates the effectiveness used in automated enforcement in semi-urban communities. Automated enforcement has been used in many different countries including the United States for catching speeders and red light runners. The measures taken to improve law enforcement can be shown, but deciding if they are effective in semi urban communities are shown here.

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35. TITLE: *Application of Fuzzy-Set Theory in Operations Research*
SPEAKER: **Tatiana Rudchenko**
INSTITUTION: Kennesaw State University
EMAIL: trudche1@kennesaw.edu
ABSTRACT: Mathematical methods based on regression analysis or time-series analysis, are widely used in economics. All these methods require great amount of statistical information with a whole number of requirements around its characteristics. But, practically it is not always possible to satisfy all requirements of mathematical statistics. At the same time, satisfactory estimation in some cases may be given by a field expert when relying on the information accessible to him, of high quality and fuzzy. The objective of modeling expert activity is achieved through the adequate converting of his reasoning into quantitative measures. From this point of view fuzzy-set theory becomes a highly developed formal instrument to be used by investigators. Using fuzzy-set theory we created a model that is able to establish an interrelation of top manager performance indices and bonus payments. The model of bonus calculation for management personnel of JSC NMW was developed through the help of Fuzzy Logic Toolbox in the Matlab programming environment.

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36. TITLE: *Mathematics and Structure in Music*
SPEAKER: **McCade Smith**
INSTITUTION: Kennesaw State University
EMAIL: mccadesmith@gmail.com
ABSTRACT: Through this presentation we will take a close look at the mathematics behind the sonata and fugue structure and how this can be observed from a topological view. We will also look at how Fibonacci influences tonality and the structured sections in the sonata.

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37. TITLE: *The Distribution of Consecutive 2^k Power Residues and Implications*
SPEAKER: **Nicolas A. Smoot**
INSTITUTION: Armstrong Atlantic State University
EMAIL: ns0566@stu.armstrong.edu
ABSTRACT: The distribution of power residues of a finite field $\mathbb{F}_p$, for a fixed prime p, is a deep and beautiful problem in number theory. Formulas that describe the distribution of power residues are useful in counting triangles in power residue graphs, which have implications in Ramsey theory, and even in counting finite field solutions to certain Diophantine equations, such as degree k Fermat curves. A kth power residue mod p is some $n \in \mathbb{F}_p^\times$ such that $n \equiv x^k \mod p$ has a solution. In particular, we wish to discuss the occurrence of pairs of consecutive power residues. We will develop formulas that will count the number of pairs of consecutive power residues in $\mathbb{F}_p^\times$ in the case for quadratic, quartic, and octic residues.

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38. TITLE: *Exploring the Efficiencies of Modified Markov Chain Monte Carlo Methods on the Traveling Salesman Problem* (poster)
SPEAKER: **Keenan M Stone** and **Zachary Wilson**
INSTITUTION: Francis Marion University
EMAIL: kstone3466@g.fmarion.edu
ABSTRACT: We present progress in optimizing the computational efficiency for obtaining solutions to the classic Traveling Salesman problem. Using high performance computing, we compare a complete solution, a pure Markov Chain Monte Carlo method for the Metropolis-Hastings algorithm, and modified methods that utilize initialization algorithms to approximate the shortest path then use the Metropolis-Hastings for "fine-tuning".

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39. TITLE: *Broad Outline of the Uses of Mathematics in Physics from the Early Seventeenth Century to the Present Day*
SPEAKER: **Stella Thistlethwaite**
INSTITUTION: University of Tennessee
EMAIL: stella@math.utk.edu
ABSTRACT: The main results in Physics from the seventeenth to the twenty-first century will be outlined. The work of Kepler, Newton, Maxwell, Einstein, Heisenberg, Born, Dirac, von Neumann and Feynman will be mentioned, together with recent developments in Grand Unification Theory and String Theory. Emphasis will be given to the way in which those developments relate to the advancement of pure mathematics throughout those four centuries.

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40. TITLE: *The Card Collector Problem*
SPEAKER: **Michael Thomas**
INSTITUTION: Kennesaw State University
EMAIL: mthom130@students.kennesaw.edu
ABSTRACT: Suppose that every time you purchase a box of cereal form a certain manufacturer, there is a card inside the box. The complete collection has m different cards, each being found with different probabilities inside the cereal boxes. How many purchases are required, on average, in order to get a complete collection? Our approach to the problem is different than the ones in the existing literature. We will also show that the minimum number of purchases is achieved when the cards are uniformly distributed. We also check the theoretical results through simulations.

Friday, October 19, 2012		
2:30–5:30 pm	Registration (BB 122 Atrium)	
	Faculty Seminars (BB 114)	Gathering For Gardner (BB 151)
3:00–4:00 pm	**Michael Dorff** *Undergraduate Research*	*Puzzle Session*
4:00–5:00 pm	**Michele DiPietro** *Teaching: assessment, documenting, and scholarly analysis*	*Mathematical Scavenger Hunt*
5:00–5:20 pm	Break	
5:20–5:30 pm	Dean's Welcome (BB 151)	
5:30–6:30 pm	Plenary Lecture 1: **Neil Calkin** (BB 151) *Recounting the Rationals*	

Saturday, October 20, 2012 Morning Session			
8:00–10:30 am	Registration (Breakfast served at 8:00am) (BB 122 Atrium)		
	Contributed Talks		
Moderator:	ALGEBRA (BB 108) Erik Westlund	COMBINATORICS/GRAPH THEORY (BB 109) Joe DeMaio	ANALYSIS/NUMERICAL ANALYSIS (BB 114) Yuliya Babenko
8:30–8:45 am	E. Abernethy	A. Couch	R. Anderson
8:50–9:05 am	K. Berry	J. Jacobson	J. Garrish
9:10–9:25 am	N. Smoot	M. Thomas	D. Cosper
9:30–9:45 am	H. Brewer	D. DeMars	J. Olson
9:50–10:05 am	J. Lanterman	J. DiNatale	N. Powers, Y.Babenko
10:05–10:20 am	Coffee Break		
10:20–10:30 am	Department Chair's Welcome (BB 151)		
10:30–11:20 am	Plenary Lecture 2: **Janice Wethington** (BB 151) *Public-Key Cryptography*		
11:30–12:30 pm	Panel Session (Careers with Mathematics): **Jeffrey Berman** (Lockheed Martin), **Melissa Danielson** (CDC), **Matthew Graham** (Home Depot), **James Piekut** (Amerigroup), **Janice Wethington** (NSA), (BB 151)		

Saturday, October 20, 2012 Afternoon Session			
12:30–1:30 pm	Lunch (BB 122 Atrium)		
1:30–2:00 pm	Poster Session (BB 122 Atrium)		
2:30–3:20 pm	Plenary Lecture 3: **Michael Dorff** (BB 151) *Shortest Paths, Soap Films, and Mathematics*		
3:30–4:00 pm	Coffee Break		
	Contributed Talks		
Moderator:	GENERAL INTEREST (BB 108) Marla Bell	COMBINATORICS/GRAPH THEORY (BB 109) Mari Castle	APPLIED MATHEMATICS (BB 114) Tatiana Rudchenko
4:00–4:15 pm	Haddock, Lindsay, Moore	J. DeMaio	N. Dowling
4:20–4:35 pm	Couch, Paine, Wright	T. Kindred	A. Reyes
4:40–4:55 pm	J. Mayer	J. Reinoehl	T. Rudchenko
5:00–5:15 pm	S. Thistlethwaite	M. Olsen	A. Edwards
5:20–5:35 pm	K. Rose	E. Paulk	J. Lee
5:40–5:55 pm	J. Leighton	M. Smith	K. Bradford
6:00 pm	Concluding Remarks		