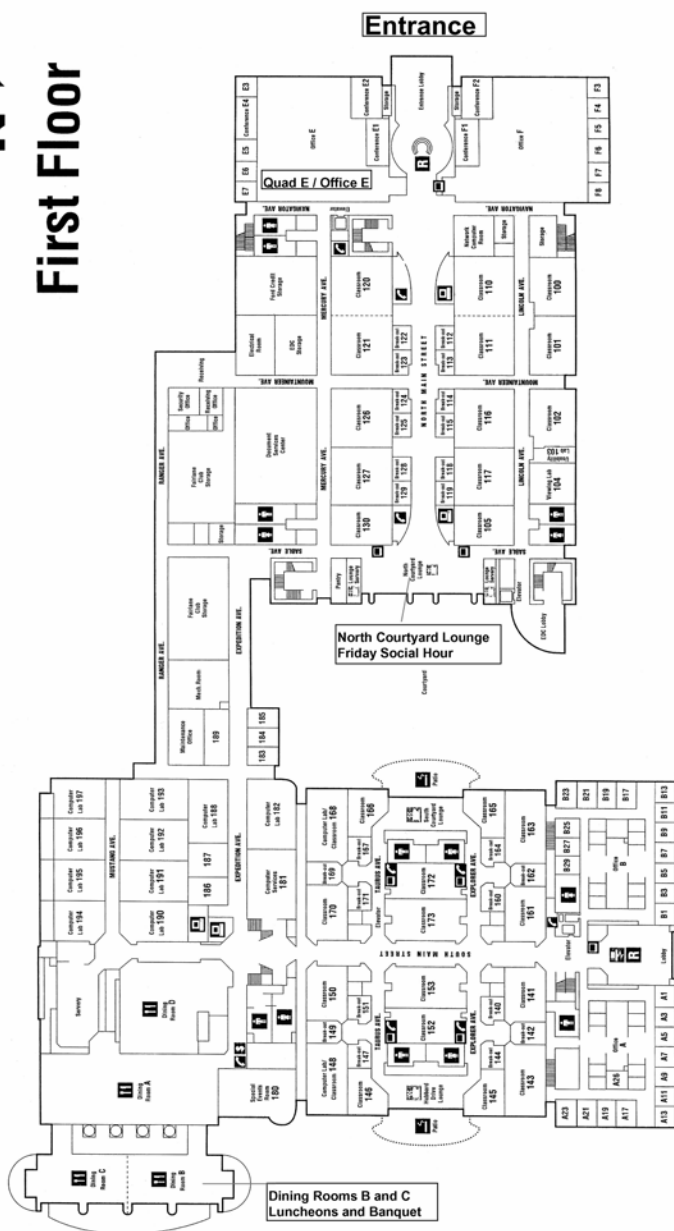


N
First Floor



2007 Joint Annual Meeting Michigan Section–MAA & MichMATYC

The 2007 Joint Annual Meeting of the Michigan Section of the Mathematical Association of America and MichMATYC, the Michigan Mathematical Association of Two-Year Colleges, will be held on Friday and Saturday, May 4 and 5 at the University of Michigan-Dearborn in Dearborn, Michigan.

Registration, exhibits, talks, lunches, and also the Friday evening Awards Banquet will be held in the North Building of the Fairlane Center of the University of Michigan-Dearborn. The Fairlane Center, at 19000 Hubbard Drive, is located approximately a mile east of the main campus of the university.

Advanced registration by April 26 is required for all scheduled meals. Registration can be done online or by mailing the form on Page 19. If mailing your registration, please mail the form in time to arrive by April 26. On site registration will be in the Lobby of the North Building of the Fairlane Center beginning at 8:00 am on Friday and at 8:30 am on Saturday.

Additional local arrangements information, including hotel information and maps and driving directions can be found on pages 17-20 and on the back cover. Hotel reservations should be made directly with the hotels. Please note the hotel deadlines on page 18 for getting the conference rate.

A website with up-to-date information is available at

<http://www.michmaa.org/section2007>

or by following a link from the Michigan Section MAA page.

Program Notes and Contents

An indexed list of all speakers can be found on page 16. The schedule on pages 2-4 will be completed with the student sessions (deadline March 31), and these will appear in the final version of the program that is distributed at the meeting.

Program Schedule	2 – 4
Abstracts	5 - 15
Plenary Session Abstracts	5 – 6
Local Invited Session Abstracts	7 – 8
Contributed / Panel Discussion Session Abstracts	9 – 15
Speaker Index	16
Local Arrangement Information	17 – 20+
Travel / Parking / Hotel / Meal Information	17 - 18
Registration Form / Maps	19 – 20+

9:00 - 9:10 Welcome		Quad E
Daniel Little , Chancellor of UM -Dearborn		
9:15 - 9:45 Local Invited		Quad E
<i>Circle Packings from Penrose Tilings</i>		
David Austin , Grand Valley State University		
9:55 - 10:15 116	9:55 - 10:15 120/121	9:55 - 10:15 110/111
<i>On the Vitali Covering Lemma</i>	<i>The Use of Metaphor in Geometry: an Example Involving Curvature</i>	<i>The Use of Metaphor in Geometry: an Example Involving Curvature</i>
Jan Hlavacek , SVSU	Steve Blair, Will Dickinson, and Paul Yu , GVSU	
10:15 - 10:45 Break		
10:45 - 11:15 Local 120/121	10:45 - 11:15 Local 110/111	
<i>The Zero Divisor Graph of a Semigroup</i>	<i>Computations with Quaternions, Octonions, and Beyond</i>	
Lisa DeMeyer , CMU	Dan Isaksen , WSU	
11:20 - 11:40 116	11:20 - 11:40 120/121	11:20 - 11:40 110/111
<i>A Generalized Approach to Polygons and Morphing</i>	<i>Retaining All/More of Your Students: Math Success, Part I</i>	<i>Technology and Cooperative Learning: What Works</i>
Daniel Drucker , WSU	Jack Rotman , LCC	Homa Ghaussi-Mujtaba , LCC
11:45 - 12:05 116	11:45 - 12:05 120/121	11:45 - 12:05 110/111
<i>The Swapping Number of a Graph</i>	<i>Retaining All/More of Your Students: Math Success, Part II</i>	<i>The Effects of Spiraling Homework on Mathematical Concept Development and Skill Retention.</i>
Amy Hlavacek , SVSU	Jack Rotman , LCC	Kim Rescorla , EMU
12:15 - 2:00 Luncheon		Dining Rooms B and C
<i>The Experiences of a Mathematician Getting Involved in Mathematics Education Issues</i>		
Richard Hill , Michigan State University		

Registration Form

Name _____

Affiliation _____

Phone _____ Email _____

Meal Reservations must be received by April 26, 2007.

Friday Luncheon (\$14.00).....Number _____ Cost _____

Friday Banquet (\$30.00)

Champagne Chicken.....Number _____ Cost _____

Grilled Salmon.....Number _____ Cost _____

Vegetarian.....Number _____ Cost _____

Saturday Luncheon (\$14.00).....Number _____ Cost _____

*Section Dues/Registration Fee (\$15.00).....Cost _____

**Participants who have already paid their 2006-2007 annual Section dues do not need to pay any additional registration fees. No dues or fees are charged for student participants or for family members who do not attend sessions.*

Total enclosed

Name(s) of Guest(s) _____

Please circle the categories that best describe your situation:

- MAA Member: Yes No MichMATYC Member: Yes No
- Student: undergraduate graduate
- Educator: K-12 2-yr College 4-yr College University
Government Business/Industry Retired

Make your check for registration and meals payable to **Michigan Section-MAA** and mail it with this form (or a copy of this form) to:

Belinda Soliz, Department of Mathematics & Statistics
 University of Michigan-Dearborn
 4901 Evergreen Road
 Dearborn, MI 48128-1491

Hotel Accommodations

Blocks of rooms have been reserved at two local hotels. Please mention the University of Michigan MAA conference when making your reservation to get the discounted rate of \$83. There are other hotels in the area and an Internet search may get you a good rate also.

Hampton Inn Detroit/Dearborn

20061 Michigan Avenue
Dearborn, Michigan
Tel: (313) 436-9600
Discount rate is \$83 + tax
(if reservation is made by **April 24**)
<http://www.hamptoninn.com>

Doubletree Hotel Dearborn

5801 Southfield Expressway
Detroit, Michigan
Tel: (313) 336-3340
Discount rate is \$83 + tax
(reservation by **April 12**)
<http://doubletree.hilton.com>

Meals

The Friday and Saturday luncheons as well as the Friday evening Awards Banquet will be served in **Dining Rooms B and C** of the Fairlane Center. The reception before Friday's dinner will be held in the **North Courtyard Lounge** of the Fairlane Center.

Friday's buffet lunch includes salads, lunchmeat trays, fresh fruit trays, relish trays, assorted breads, dessert and beverages. **Saturday's lunch** includes salads, wrapped sandwiches and sandwiches on Kaiser rolls, fresh fruit trays, dessert and beverages.

The menu for the **Awards Dinner** includes a choice of Champagne Chicken served with fresh mushrooms and grapes in a champagne sauce on a bed of garden blend rice, Grilled Salmon complimented with a sun dried tomato sauce and herb roasted red skin potatoes, and a vegetarian dinner. All dinners include a chef selected vegetable, salad, dessert, and dinner rolls.

University policy does not allow the use of a cash bar at the pre-banquet reception in the North Courtyard Lounge. Refreshments and beverages will be available at the reception.

Please note that this year AWM and WAM have taken a break from organizing the traditional early Saturday morning breakfast. Hopefully, this event can be revived and reappear on the program in 2008.

Meal reservations can be made by using the registration form on the next page or by using the online form on the conference web site:

<http://www.michmaa.org/section2007/>

Meal reservation must be received by April 26, 2007

2:10 – 2:30	116	2:10 – 2:30	120/121	2:10 – 2:30	110/111
<i>Superconvergence of the numerical traces of discontinuous Galerkin methods for convection-diffusion problems</i>		<i>Friday the 13th</i>		<i>Students' Mental Models and Calculus Optimization Problems</i>	
Fatih Celiker , WSU		Joseph Matti , SVSU		Dale Winter UM-Ann Arbor	
2:35 – 2:55	116	2:35 – 2:55	120/121	2:35 – 3:20	110/111
<i>On a class of integral operators related to the Fock spaces</i>		<i>Do Dogs Know Bifurcations?</i>		<i>Panel Discussion: College Algebra or Precalculus – Directing Our Students down the Right Path</i>	
Ovidiu Furdui , WMU		Tim Pennings Hope College		Louise Paquette, Nan Jackson, Homa Ghaussi-Mujtaba, Dan Harned, Kay Barks, Jing Wang	
3:00 – 3:20	116	3:00 – 3:20	120/121	Lansing CC	
		<i>The Right Right Triangle on the Sphere</i>			
		William Dickinson GVSU			
3:20 – 3:50	Break				
3:50 – 4:50	Plenary Address				Quad E
<i>What have we learned from the Classification of the Finite Simple Groups?</i>					
Ronald Solomon , The Ohio State University					
5:00 – 5:30	Business Meeting				120/121
5:30 - 6:00	Chairs and Liaisons Meeting				120/121
6:15 – 7:15	Social Hour				North Courtyard Lounge
7:15 – 9:45	Awards Banquet				Dining Rooms B and C
<i>The Mathematics of Identification Numbers</i>					
Joe Gallian , University of Minnesota Duluth					

9:00 – 10:00 Plenary Address		Quad E	
<i>Escher's Combinatorial Patterns and Their Aftermath</i>			
Doris Schattschneider , Moravian College			
10:05 – 10:25	116	10:05 – 10:25 120/121	10:05 – 10:25 110/111
		<i>A Tale of Two Ellipsoids</i>	<i>The Relationship between Reading Ability and Performance in Developmental Mathematics</i>
		Brian McCartin Kettering University	Barbara Jur , MCC
10:25 – 10:50 Break			
10:50 – 11:20	Local Invited 120/121	10:50 – 11:20	Local Invited 110/111
<i>Paint by number: a visualization of complex functions</i>		<i>Locally nilpotent derivations and their applications</i>	
Mike Bolt , Calvin College		Anthony Crachiola , SVSU	
11:25 -11:45	116	11:25 - 11:45 120/121	11:25 – 12:10 110/111
		<i>Numbers Simultaneously Polygonal and Centered Polygonal</i>	Panel Discussion: <i>Being a STEM Faculty Member in Supporting Secondary Teachers of Mathematics</i>
		Steven Schlicker , GVSU	
11:50 – 12:10	116	11:50 – 12:10 120/121	
		<i>Confidence Intervals of the Attributable Risk with Intermediate Base-level under Cross-sectional Sampling Scheme</i>	Roger Verhey UM – Dearborn Joanne Caniglia EMU Jerrold Grossman Oakland U. et. al.
		Tanweer Shapla , EMU	
12:15 -2:00 Luncheon		Dining Rooms B and C	
<i>A Model for Vibrio Cholerae Colonization of the Human Intestine</i>			
Anna Spagnuolo , Oakland University			

Local Arrangements Information

The **Fairlane Center** of the University of Michigan-Dearborn is located at **19000 Hubbard Drive** in Dearborn, about a mile east of the main campus, which is located on Evergreen Road. All events will take place in the Fairlane Center.

Travel

From the west

Take I-94 east to Southfield (M-39) and exit north. Follow Southfield (North) to the Michigan Ave. (U.S. 12) exit. Stay on the Southfield Service Drive to Hubbard Drive and turn left. Follow Hubbard Drive and turn right into the Southern entrance of the UM-Dearborn/Fairlane Center (The marquis will reflect the following; *The University of Michigan-Dearborn/Fairlane Center*). Follow the entrance road to the back and turn left at the stop sign; the North Building will be located on your left hand side. Parking is directly across from the North Building.

From the east

Take I-94 west to Southfield (M-39) and exit north. Follow Southfield (North) to the Michigan Ave. (U.S. 12) exit. Stay on the Southfield Service Drive to Hubbard Drive and turn left. Follow Hubbard Drive and turn right into the Southern entrance of the UM-Dearborn/Fairlane Center (The marquis will reflect the following; *The University of Michigan-Dearborn/Fairlane Center*). Follow the entrance road to the back and turn left at the stop sign; the North Building will be located on your left hand side. Parking is directly across from the North Building.

From the south

Take Southfield (M-39) north to the Michigan Avenue exit. Stay on the Southfield Service Drive to Hubbard Drive and turn left. Follow Hubbard Drive and turn right into the Southern entrance of the UM-Dearborn/Fairlane Center (The marquis will reflect the following; *The University of Michigan-Dearborn/Fairlane Center*). Follow the entrance road to the back and turn left at the stop sign; the North Building will be located on your left hand side. Parking is directly across from the North Building.

From the north

Take Southfield (M-39) south to the Ford Road exit. Stay on the Ford Road Service Drive to Hubbard Drive and turn right. Follow Hubbard Drive and turn right into the Southern entrance of the UM-Dearborn/Fairlane Center (The marquis will reflect the following; *The University of Michigan-Dearborn/Fairlane Center*). Follow the entrance road to the back and turn left at the stop sign; the North Building will be located on your left hand side. Parking is directly across from the North Building.

2007 Speaker Index

Austin, David	2, 7
Barks, Kay	3, 14
Blair, Steve	2, 9
Bolt, Mike	4, 7
Caniglia, Joanne	4, 15
Celiker, Fatih	3, 9
Crachiola, Anthony	4, 7
DeMeyer, Lisa	2, 8
Dickinson, William	2, 3, 9
Drucker, Daniel	2, 10
Furdui, Ovidiu	3, 10
Gallian, Joe	3, 5
Ghaussi-Mujtaba, Homa	2, 3, 10, 14
Grossman, Jerrold	4, 15
Harned, Dan	3, 14
Hill, Richard	2, 5
Hlavacek, Amy	2, 11
Hlavacek, Jan	2, 11
Isaksen, Dan	2, 8
Jackson, Nan	3, 14
Jur, Barbara	4, 11
Little, Daniel	2
Matti, Joseph	3, 12
McCartin, Brian	4, 12
Paquette, Louise	3, 14
Pennings, Tim	3, 12
Rescorla, Kim	2, 13
Rotman, Jack	2, 13
Schattschneider, Doris	4, 6
Schlicker, Steven	4, 13
Shapla, Tanweer	4, 14
Solomon, Ronald	3, 6
Spagnuolo, Anna	4, 6
Verhey, Roger	4, 15
Wang, Jing	3, 14
Winter, Dale	3, 14
Yu, Paul	2, 9

Abstracts of Plenary Sessions

Joe Gallian, University of Minnesota Duluth
Friday 7:15 – 9:45 Awards Banquet Dining Rooms B and C

The Mathematics of Identification Numbers

Because of the existence of inexpensive, fast, and reliable technology, consumer products are identified with bar codes and identification numbers that have a built-in "check" to partially ensure that the numbers have been correctly entered into a computer or have been correctly scanned by an optical device. In this talk we examine some of the common bar coding and check digits schemes that you encounter everyday. Among them are the UPC bar code, the ZIP bar code, and the check methods used on credit cards, airline tickets, money orders, travelers checks, personal checks, pop cans, books and magazines.

Richard Hill, Michigan State University
Friday 12:15 – 2:00 Luncheon Dining Rooms B and C

The Experiences of a Mathematician Getting Involved in Mathematics Education Issues.

I have been involved with three different kinds of mathematics education programs/studies:

1. The Emerging Scholars Program, a calculus-level support program for students at risk (including inner-city and rural students),
2. A study of the transition in math from high school to college (including a spin-off of some Core-Plus students),
3. Developing a capstone course for future high school math teachers, team-taught by a mathematician and an mathematics educator.

I will present a survey of various interesting things I have learned (and found surprising) from my experiences in each of these programs and how they are interrelated.

Doris Schattschneider, Moravian College
Saturday 9:00 – 10:00 Plenary Address

Quad E

Escher's Combinatorial Patterns and Their Aftermath

From 1938-1942, the Dutch graphic artist M.C. Escher carried out experiments in printing repeating patterns with small carved wooden squares that contained a simple motif of crossing bands, using a purely algorithmic scheme. He asked and answered combinatorial questions about these patterns, and opened the door to many tantalizing questions that have recently been addressed by mathematicians and computer scientists.

Ronald Solomon, The Ohio State University
Friday 3:50 – 4:50 Plenary Address

Quad E

What have we learned from the Classification of the Finite Simple Groups?

The Classification Project was a "hundred years war" with interludes of relative peace. What have it taught us? The names of all the finite simple groups. But, in fact, much more. Our entire way of thinking about finite groups has been transformed by the insights achieved during this project: factorizations, quadratic action, the generalized Fitting subgroup, signalizers, balance, etc. I will survey some of the highlights of this journey of discovery.

Anna Spagnuolo, Oakland University
Saturday 12:15 -2:00 Luncheon

Dining Rooms B and C

*A Model for **Vibrio Cholerae** Colonization of the Human Intestine*

Vibrio cholerae is a pathogen that causes pandemic cholera. In this talk, I will elaborate on the dynamics of *V. cholerae* infection by describing a mathematical model that governs the colonization process for the bacterial dynamics. The results indicate that both host and bacterial factors contribute to colonization. This model can be used to test therapeutic strategies against *V. cholerae*

Louise Paquette, Nan Jackson, Homa Ghaussi-Mujtaba, Dan Harned, Kay Barks, and Jing Wang, Lansing Community College
Friday, 2:35 – 3:20

110/111

Panel Discussion: College Algebra or Precalculus – Directing Our Students down the Right Path

This round table discussion will focus on College Algebra and associated courses to help guide students to the right path. If you teach College Algebra, or your department offers different curricula in College Algebra or Precalculus, please join us to share your experience, ask questions, or give suggestions and comments.

Roger Verhey, University of Michigan – Dearborn
Joanne Caniglia, EMU
Jerrold Grossman, Oakland U.
Saturday, 11:25 – 12:10

110/111

Panel Discussion: Being a STEM Faculty Member in Supporting Secondary Teachers of Mathematics

Most federal grants such as Math Science Partnership grants emphasize the involvement of higher education STEM faculty as collaborators. Many of the grant proposals include engaging secondary teachers and their STEM faculty collaborators in the professional development model known as (Japanese) Lesson Study. This model has been the primary method for teacher professional development in Japan for over 25 years. Teachers work in groups of 4 to 6 to design and develop a lesson that addresses a particular weakness of students. This becomes their "research" lesson as they seek to develop a deeper understanding of the mathematics in that lesson and effective ways to engage students in learning that mathematics. This lesson is then taught by one of the teachers in their classroom while the other teachers play the role of observers of students as they engage in the lesson. The data collected is then shared and the lesson revised. The revised lesson is then taught by a different teacher in his or her classroom. An important ingredient to this process is the participation of a STEM faculty member to serve as the "Knowledgeable Other". This session will briefly describe the process and its impact on teachers and the role of the Knowledgeable other in this context. The session will also present other aspects of how STEM faculty might collaborate with classroom teachers of mathematics. For example, a current statewide MSP project requires STEM faculty for its development of teacher-leaders in school districts. The presentation includes a panel that includes STEM faculty and school personnel who have been engaged in Lesson Study.

Tanweer Shapla, Eastern Michigan University
Saturday, 11:50 – 12:10

120/121

Confidence Intervals of the Attributable Risk with Intermediate Base-level under Cross-sectional Sampling Scheme

The attributable risk (AR) is one of the most important indices to measure the association between a risk factor and a disease. This paper investigates AR for intermediate exposure levels for a risk factor with multiple exposure levels under a cross-sectional study design. This technique could be useful in detecting the significance of a particular level of a risk factor and amalgamating insignificant levels, which causes the reduction of number of levels. A real life example of the association of hypertension and body mass index (BMI) has also been presented to illustrate the method.

Dale Winter, University of Michigan -Ann Arbor
Friday, 2:10 – 2:30

110/111

Students' Mental Models and Calculus Optimization Problems

In this report we give the results of a large-scale survey of undergraduate ($n = 317$) and graduate ($n = 16$) students' intuitive solutions of a "real-world" calculus optimization problem. While undergraduate students were unlikely to give optimal solutions based on intuition alone, graduate students were able to intuitively judge optimal solutions reasonably accurately. To explain this discrepancy, we examine features of the mental models that the undergraduate students used to understand the "real-world" situation described in the optimization problem, and how these models may have led to inaccurate solutions.

Abstracts for Local Invited Sessions

David Austin, Grand Valley State University
Friday, 9:15 – 9:45

Quad E

Circle Packings from Penrose Tilings

Circle packings begin with a combinatorial object---a triangulation---and impose a geometric structure on it. In this talk, I'll describe some joint work with an undergraduate, Matthew Stamps, in which we studied circle packings that arise from triangulations created by Penrose tilings and compared the geometry of the tilings to the geometry of the circle packings. I will introduce the audience to both circle packings and Penrose tilings.

Mike Bolt, Calvin College
Saturday, 10:50 – 11:20

120/121

Paint by number: a visualization of complex functions

One challenge to understanding complex analysis is the difficulty one can have in forming an intuition for analytic functions. Frank Farris suggested a new way to visualize complex functions. The method is called domain coloring. In this talk we present two implementations of domain coloring and we contrast it with the usual transformational approach. We also use domain coloring to illustrate some of the deeper theorems in complex variables.

Anthony Crachiola, Saginaw Valley State University
Saturday, 10:50 – 11:20

110/111

Locally nilpotent derivations and their applications

Locally nilpotent derivations (LNDs) generalize algebraically everything we love about partial derivatives of polynomials. LNDs have gained popularity over the last few decades as algebraic geometers find them useful in tackling deep problems such as Hilbert 14 and the Jacobian Conjecture. I will explain the basic algebra behind LNDs and their connection to such problems. I hope that the talk will peak interest in the subject but also inspire those teaching abstract algebra to incorporate LNDs as a special topic for students learning the definition of a ring.

Lisa DeMeyer, Central Michigan University
Friday, 10:45 – 11:15

120/121

The Zero Divisor Graph of a Semigroup

Let S be a commutative semigroup with zero element. We associate a simple graph $G(S)$ to the semigroup S as follows: let the vertices of $G(S)$ be the nonzero zero divisors of S and connect two vertices a and b in case their product is zero. There are many results describing the possible shape of such a graph. The talk will include recent results by undergraduate students as well as several open questions.

Dan Isaksen, Wayne State University
Friday, 10:45 – 11:15

110/111

Computations with Quaternions, Octonions, and Beyond

The Cayley-Dickson algebras are a sequence of algebras of dimension 2^n . The first three are well-known; they are the real numbers, the complex numbers, and the quaternions. The next algebra, called the octonions, is more obscure but still classical. I will describe the octonions and explain their uses. I will also discuss the Cayley-Dickson algebra of dimension 16.

Kim Rescorla, Eastern Michigan University
Friday, 11:45 – 12:05

110/111

The Effects of Spiraling Homework on Mathematical Concept Development and Skill Retention.

Spiraling homework, which spirals back to previous lessons, may improve retention. Two groups of EMU students in *Linear Models and Probability* were compared. The *spiraling* group $n_1 = 40$ received spiraling homework, while the *nonspiraling* group $n_2 = 47$ worked conventional exercises. Other variables such as student preparation, exercise difficulty, instructor, and grading were kept uniform. The *spiraling* group scored significantly higher p -value = 2×10^{-7} on the cumulative final exam. Other interesting comparisons are discussed.

Jack Rotman, Lansing Community College
Friday, 11:20 - 11:40, 11:45 – 12:05

120/121

Retaining All/More of Your Students: Math Success (Part I and Part II)

What can we do to help more students succeed at a high level? What factors contribute to ‘failures’ in mathematics? This session will present specific techniques that you can use to improve student performance! Whether you teach “developmental”, “applied”, or “intensive” mathematics, you will come away with new ideas.

Steven Schlicker, Grand Valley State University
Saturday, 11:25 -11:45

120/121

Numbers Simultaneously Polygonal and Centered Polygonal

Recently, while teaching a course in number theory for practicing secondary mathematics teachers, I introduced the topic of polygonal numbers and centered polygonal numbers. While doing so, a question came to mind. Which numbers are simultaneously k -polygonal and k -centered polygonal? To my surprise, I could not find any information on this topic in any source, so I investigated this problem and discovered an infinite family of previously unknown integer sequences.

Joseph Matti, Saginaw Valley State University
Friday, 2:10 – 2:30

120/121

Friday the 13th

Paraskevidekatriophobia or Friggtriskaidekaphobia (fear of Friday the 13th) are specialized forms of triskaidekaphobia (fear of the number 13). There are 14 distinct calendars in the current (since 1582) Gregorian system - are there any "lucky" ones amongst them (i.e. one in which there is no occurrence of Friday the 13th)? NO! Find out which calendars are the least unlucky (1 occurrence) and the most unlucky (3 occurrences) and when they will occur during this century.

Brian McCartin, Kettering University
Saturday, 10:05 – 10:25

120/121

A Tale of Two Ellipsoids

In two dimensions, the concentration ellipse of statistics and the inertia ellipse of mechanics coincide. Yet, in three dimensions, the concentration ellipsoid and the inertia ellipsoid are distinct. This talk will review these facts, introduce a new relationship involving the eccentricities of their respective principal cross-sections, and provide an exhaustive treatment of their shared degeneracies.

Tim Pennings, Hope College
Friday, 2:35 – 2:55

120/121

Do Dogs Know Bifurcations?

It has been established that dogs - at least Elvis - knows calculus. That is, Elvis can find the optimal - fastest - route to a ball thrown down the beach and in the water. But what happens when Elvis is positioned in the water and retrieves a ball that is also in the water? When should he swim the entire distance to the ball, and when should he swim in to the shore, run along the shore, and then swim back out to the ball? What is the bifurcation point for the change in optimal strategy? Does Elvis bifurcate? Does his fur bicate?

Abstracts for Contributed Sessions

Steve Blair, Will Dickinson, and Paul Yu, Grand Valley State University
Friday, 9:55 – 10:15

110/111

The Use of Metaphor in Geometry: an Example Involving Curvature

We will discuss an episode from a larger study involving the teaching and learning of non-Euclidean geometry at Grand Valley State University. In particular, we will consider how a teacher and undergraduate students used the metaphor of a bug driving a car along a track to connect intuitive and abstract conceptualizations of planar curvature.

Fatih Celiker, Wayne State University
Friday, 2:10 – 2:30

116

Superconvergence of the numerical traces of discontinuous Galerkin methods for convection-diffusion problems

We study a new superconvergence property of a large class of finite element methods for one-dimensional convection-diffusion problems. This class includes discontinuous Galerkin methods defined in terms of numerical traces, discontinuous Petrov-Galerkin methods and hybridized mixed methods. We prove that the so-called numerical traces of both variables superconverge at all the nodes of the mesh, provided that the traces are single-valued. In particular, for a local discontinuous Galerkin method, we show that the superconvergence is order $2p + 1$ when polynomials of degree at most p are used.

William Dickinson, Grand Valley State University
Friday, 3:00 – 3:20

120/121

*The **Right Right** Triangle on the Sphere*

Despite the obvious differences between the Euclidean plane and a unit sphere, spherical geometry has many similarities to Euclidean geometry. For example, lines in spherical and Euclidean geometry both divide their respective geometries into two equal pieces and the isosceles triangle theorem is valid in each. Therefore, we might expect right triangles in spherical geometry to behave like Euclidean right triangles. However, if we follow the natural generalization of a right triangle to spherical geometry, the two cousins behave differently. In this talk we explain a different way of generalizing right triangles to the sphere that is much more harmonious.

Daniel Drucker, Wayne State University
Friday, 11:20 – 11:40 116
A Generalized Approach to Polygons and Morphing

If an n -gon Z is regarded as a vector in \mathbb{C}^n rather than as a set of points in the complex plane \mathbb{C} , then extra generality can be achieved by applying a transformation of \mathbb{C}^n to Z instead of applying a single transformation of \mathbb{C} to all of its vertices. Definitions of morphs and derivations of formulas for their areas can be simplified by the use of matrix identities and the inner product of \mathbb{C}^n .

Ovidiu Furdui, Western Michigan University
Friday, 2:35 – 2:55 116

On a class of integral operators related to the Fock spaces

For real parameters a, b, c and s , where s is a positive real number we determine exactly when the Bergman type integral operators

$$T_{a,b,c}f(z) = \int_{\mathbb{C}^n} e^{a|z|^2 + b\langle z, w \rangle + c|w|^2} f(w) dv_s(w) \quad \text{and}$$

$$S_{a,b,c}f(z) = \int_{\mathbb{C}^n} |e^{a|z|^2 + b\langle z, w \rangle + c|w|^2}| f(w) dv_s(w) \quad \text{are bounded on } L^p(\mathbb{C}^n, dv_s(z)),$$

where $dv_s(z) = \left(\frac{s}{\pi}\right)^n e^{-s|z|^2} dv(z)$ is the Gaussian probability measure on \mathbb{C}^n and $dv(z)$ is the ordinary Lebesgue measure on \mathbb{C}^n . These integral operators induced by the kernel function on Fock space were introduced recently by professor Kehe Zhu.

Homa Ghaussi-Mujtaba, Lansing Community College
Friday, 11:20 – 11:40 110/111

Technology and Cooperative Learning: What Works

This presentation will benefit participants who want to improve retention in their online college algebra course and want to improve success rate in their calculus courses. Participants learn how cooperative learning is incorporated in online college algebra to create a sense of community in an online environment. Examples of what have worked with data will be shared. Participants also learn which cooperative learning techniques have improved the success rate in honors calculus courses at Lansing Community College.

Amy Hlavacek, Saginaw Valley State University
Friday, 11:45 – 12:05 116

The Swapping Number of a Graph

We define the swapping number of an arbitrary simple graph, which involves the weakening of the concept of a graph automorphism. We proceed to classify all 1-swappable trees.

Jan Hlavacek, Saginaw Valley State University
Friday, 9:55 – 10:15 116

On the Vitali Covering Lemma

The classical Vitali covering lemma states that from any Vitali covering of a set $A \subset \mathbb{R}^n$ by balls, we can select a pairwise disjoint subset of balls that still covers almost all of the set A . In this talk, we will present a survey of some generalizations of this lemma.

Barbara Jur, Macomb Community College
Saturday, 10:05 – 10:25 110/111

The Relationship between Reading Ability and Performance in Developmental Mathematics

Is there a relationship between the ability to read and the ability to do mathematics? Students at MCC are given the COMPASS placement test to advise them about math courses and also testing reading level. Literature has suggested a relationship to performance. The correlation for students in Fundamentals of Mathematics and Beginning Algebra will be discussed. Implications for teaching strategies will also be offered.