

**Tentative Program for the INMAA Fall Meeting**  
 DePauw University  
 November 5, 2005

**All activities will occur in the Julian Science and Mathematics Center.**

**Abstracts can be found at [insert weblink]**

Time	Event	Room Number
7:45 - 8:30	Registration	Atrium
8:00 - 3:00	MAA Book Sale	156
8:30- 8:45	<b>Welcome</b> to DePauw University	147
8:45 – 9:25	<p style="text-align: center;"><b>Medieval Arabic Algebra in Practice</b>            Jeff Oaks (University of Indianapolis)</p> <p>Algebra (<math>\text{\it al-jabr wa'l-muq\=abala}</math>) was one of several methods available to practitioners in the medieval Muslim world for finding the value of an unknown number or magnitude. We begin this talk by explaining just what was meant by an <math>\text{\it algebraic}</math> solution to a problem. We then address the origins of the method, and we place it in its scientific and cultural context. In addition, we dispell some myths about Islamic math which continue to appear in textbooks and expository articles.</p>	147
9:00—11:00?	<b>Graduate Student Workshop</b> Andrew Ellett (DePauw University)	159

## Parallel Session 1: Undergraduate Students

Time	Event	Room Number
9:30 – 9:50	<p style="text-align: center;"><b>Origami Folding and Ruled Straightedge Construction</b> Rosanna Nafziger (Goshen College)</p> <p>With the ability to solve cubic equations, origami construction is more powerful than straight-edge and compass construction. This talk will examine the axioms of both methods, and compare origami construction to ruled straight-edge &amp; compass construction.</p>	157
9:55—10:15	<p style="text-align: center;"><b>A Model of Social Security</b> Laurel Fordice (Saint Mary of the Woods College)</p> <p>I will look at a model for Social Security. This model was developed for use in the economics classroom, but is here adapted for a unit in college algebra. While the algebra involved is fairly simple, it does provide a useful interpretation of a complex entity and a way to introduce accessible real-world data.</p>	157
10:20—10:40	<p style="text-align: center;"><b>Do Dogs Really Know Calculus?</b> Eric Reyes (Rose Hulman Institute of Technology)</p> <p>In this talk, we address the importance of the fifth assumption in least squares regression analysis: error in measurements is negligible. We will look at the affect measurement error has on ordinary least squares regression as well as discuss a method for handling measurement error under the special case where we have a hypothesized value for the slope and a zero intercept is assumed. Finally, we discuss the findings of Timothy Pennings regarding his question: "do dogs know calculus?"</p>	157
10:45—11:05	<p style="text-align: center;"><b>The Geometry of the Arms Race</b> Sarah Cohen (Saint Mary of the Woods College)</p> <p>In 1978, Brams and others published a model of the arms race between the United States and the Soviet Union during the Cold War era. The model involves analytic geometry, game theory, and algebra. This presentation will explain the Cold War model and examine a current application.</p>	157
11:10—11:30	<p style="text-align: center;"><b>Solving the Cubic Equation</b> Darci Rector (Saint Mary of the Woods College)</p> <p>One of the most impressive mathematical achievements of the 16th century was the development of the algebraic solution of cubic equations. The history and discovery of the cubic solution is full of scandal and drama between mathematicians. The quadratic formula, cube roots of unity, and <math>i</math> are all going to be discussed in the process of solving the cubic equation and then working through examples using the method.</p>	157
11:35—11:55	<p style="text-align: center;"><b>How to Spread Rumors Fast</b> Cassandra Freeman (Saint Mary of the Woods College)</p> <p>Imagine a group of friends, each with an important bit of information to share. How can they get the word out most efficiently, and how long will it take? I will present the answer given by C. Kenneth Fan and others, and will point out its application to parallel computing.</p>	157

## Parallel Session 2

Time	Event	Location
9:30 – 9:50	<p style="text-align: center;"><b>On the Shape of a Cookie</b> David Finn (Rose Hulman Institute of Technology)</p> <p>We examine a heuristic model for the shape of a plain sugar cookie (a vanilla wafer) as a nonsymmetric sessile drop. We test this heuristic model by comparing the shape of a vanilla wafer to solutions of the capillary surface equation <math>\operatorname{div}(\nabla u \sqrt{1+ \nabla u ^2}) = \kappa u - \lambda</math> in a planar domain <math>\Omega</math> with the boundary condition <math>u = 0</math> on <math>\partial\Omega</math>.</p>	151
9:55—10:15	<p style="text-align: center;"><b>Mathematical Cookies</b> Hari Ravindran (Rose Hulman Institute of Technology)</p> <p>In this talk, we present some results on the shape of nonsymmetric sessile drops as a model for a plain sugar cookie. The results concern the behavior of the mathematical model for an elliptical shaped cookie.</p>	151
10:20—10:40	<p style="text-align: center;"><b>Does the Wave Equation Really Work?</b> Michael Karls (Ball State University)</p> <p>Joint work with Donald C. Armstead, an undergraduate at Ball State.</p> <p>In an introductory calculus or physics sequence, one often encounters the "Simple Harmonic Oscillator". This phenomenon can be modeled with an ordinary differential equation and verified in the classroom experimentally with a mass attached to a spring. A related, but more complicated partial differential equation model for a vibrating string arises as an example in most courses on Boundary Value Problems or Mathematical Physics. A natural question arises - is there a way to inexpensively check this model in a classroom setting? We illustrate one possible experiment - modeling a vibrating string.</p> <p>Level of talk: This talk is aimed at a broad audience. Students who have completed the first calculus sequence or physics sequence and are familiar with differential equations should have the appropriate background.</p>	151
10:45—11:05	<p style="text-align: center;"><b>Maximizing Social Interactions</b> Rick Gillman (Valparaiso University)</p> <p>At faculty receptions, participants frequently gather their food and drink and settle in at a table with a group of colleagues. They don't really mix with any other faculty. In our Quantitative Problem Solving course, students are asked to re-arrange their working groups according to two rules: no two people sit together more than once and no one sits at the same table with two different groups. This talk shares some results on how frequent new seating arrangements can be obtained.</p>	151
11:10—11:30	<p style="text-align: center;"><b>Can I Expect to Win the Three Strikes Game?</b> Paula Stickles (Indiana University)</p> <p>The program The Price is Right has existed on television since 1956. Its current format with Bob Barker as host has aired on CBS (Columbia Broadcasting System) since 1972. There is currently a selection of over seventy pricing games to choose from for contestants to play when they are invited on stage. One game that has been in existence since the seventies is the Three Strikes game.</p> <p>The Three Strikes game is played for a car. The five numbers in the price of the car are placed in a bag in the form of tokens with the numbers on them. One token with a strike (X) on it is also placed in the bag. The contestant pulls out one token at a time. If a number is drawn, the contestant guesses which position the number is in</p>	151

	<p>the price of the car. If the contestant is incorrect, the number is returned to the bag, and if the contestant is correct, the token is removed. If the contestant pulls out the strike token, it is returned to the bag. In order to win the car, the contestant must successfully draw out the five numbers and correctly place them in the price of the car before pulling out the strike three times. A previous version of the Three Strikes game included three strikes placed in the bag, but if a strike was drawn it was not replaced.</p> <p>For this presentation, we consider the previous version and the current version of the game, and investigate the probability of winning each version of the game using Markov chains. We compare the probabilities of the current version of the game with empirical probabilities generated via a computer simulation. The results of the Markov chains, computer simulation, and the comparison of the results will be discussed.</p>	
11:35—11:55	<p style="text-align: center;"><b>Minimizing a Convex Function on a Convex Set</b> Morteza Seddighin (Indiana University East)</p> <p>In our study of the Antieigenvalues of an operator or a matrix, we faced the problem of minimizing a convex function on a convex set. Thus, we devised some interesting techniques for this type of optimization, using geometry. We believe the minimization of a convex function on a convex set has applications far beyond the computation of Antieigenvalues. In this presentation we will discuss this optimization technique with little to Operator Theory. It should be appropriate for a general audience.</p>	151

### Parallel Session 3

Time	Event	Location
9:30—9:50	<p style="text-align: center;"><b>Blackwork Embroidery and Algorithms for Maze Traversals</b> Joshua Holden (Rose Hulman Institute of Technology)</p> <p>Blackwork embroidery is a needlework technique often associated with Elizabethan England. The patterns used in Blackwork generally are traversed in a way that can be described by classical algorithms in graph theory, such as those used in "The Labyrinth Problem". We will investigate which of these maze-traversing algorithms can also be used to traverse blackwork patterns.</p>	152
9:55—10:15	<p style="text-align: center;"><b>Fast Algorithms for Counting Smooth Integers</b> Scott Parsell (Butler University)</p> <p>A positive integer is said to be <math>y</math>-smooth if it has no prime factors exceeding <math>y</math>. Smooth numbers arise in factoring algorithms such as the number field sieve and therefore have important connections to cryptography. In joint work with J. Sorenson, we develop a refined version of Berstein's algorithm for estimating the number of <math>y</math>-smooth integers less than <math>x</math>. The main improvement is the use of analytic information about the distribution of primes to avoid enumeration of all the primes up to <math>y</math>. With a suitable choice of parameters, this yields an algorithm that is both faster and more accurate than previous versions.</p>	152
10:20—10:40	<p style="text-align: center;"><b>An Integral Technique for Evaluating Series</b> Jim Lesko (Grace College)</p> <p>Anyone who has studied infinite series knows that most of them are hard to evaluate in a closed form expression. When we do try to evaluate them, there are a rare few mainstream techniques to attempt - for example power series techniques. In this presentation I will discuss a technique which has received some attention in recent MAA articles (see [Efthimiou, Math Magazine, February 1999], [Burk, College Math Journal, May 2000], [Lesko, College Math Journal, March 2001], [Lesko and Smith, Math Magazine, December 2003]). In particular, it is sometimes the case that the summand <math>a_n</math> of an infinite series <math>\sum_{n=1}^{\infty} a_n</math> can be recognized as the closed form of a definite integral. If the order of summation and integration can be interchanged, then the series can sometimes be converted into an integral. I will give several nice examples illustrating this technique.</p>	152
10:45—11:05	<p style="text-align: center;"><b>Critical Points and Real Surfaces in Complex 2-Space</b> Adam Coffman (IPFW)</p> <p>Graphs of multivariable functions with critical points can be used in visualizing the local extrinsic geometry of real surfaces embedded in the space of ordered pairs of complex numbers.</p>	152
11:10—11:30	<p style="text-align: center;"><b>Overview of a Technology Course for Pre-Service and In-Service Mathematics Teachers</b> Joe Stickles (University of Evansville)</p> <p>Using technology in the mathematics classroom is not just an option anymore. It is a necessity. We as mathematics educators must arm our students with the proper tools before they leave our classrooms for their own. In this session, a newly developed technology course for pre-service and in-service secondary mathematics teachers will be discussed. The course is designed so in-service teachers earn graduate credit and pre-service teachers earn undergraduate credit. Discussion will include the syllabus and course design, innovative assignments, and student response/work.</p>	152

11:35—11:55	<p style="text-align: center;"><b>A Two-Semester Precalculus/ Calculus I Sequence: A Case Study</b> Mike Axtell (Wabash College)</p> <p>The talk begins by highlighting recent trends and concerns in post-secondary Calculus and Pre-Calculus education. The main purpose of the talk is to discuss the transition to a new Precalculus/Calculus I two semester course at Wabash College, a small liberal arts college for men. Results from the earlier, traditional, sequence are compared to the results from the revised sequence. A list of possible sequence texts is provided.</p>	152
12:00—12:20	<p style="text-align: center;"><b>A NetLogo Simulation of Cheating in a Classroom</b> Andrea McCloskey (Indiana University)</p> <p>This presentation will be of interest to educators unfamiliar with the NetLogo software program, which is described by its authors as “a programmable modeling environment for simulating natural and social phenomena”. I will present a model I recently developed that represents the occurrence of cheating in a single classroom. A user can specify several parameter values for the individual agents (such as number of students, number of teachers, presence of an honor code), and then observe the sometimes surprising outcomes that emerge at the classroom-level over many runs. The value of the resulting microworld is not what it reveals about the pedagogical problem of cheating (the audience should not expect to learn how to curb cheating in their classrooms!). Instead, the mathematical value of the model lies in its demand for abstraction of a “real-world” phenomenon.</p>	152

### Afternoon Session

Time	Event	Location
12:00 - 1:20	Lunch	Atrium
1:30—2:30	<p style="text-align: center;"><b>The MAA American Mathematics Competitions: Easy Problems, Hard Problems, History and Outcomes</b> Steve Dunbar (University of Nebraska)</p> <p>The MAA has continuously sponsored nationwide high-school level math contests since 1952. The sequence of contests now spans 5 different contests at increasing levels of mathematical sophistication. Students who succeed at the top level on these contests become the team representing the U.S. at the annual International Mathematical Olympiad. I'll survey the history and organization of the contests, along with the outcomes and some notable mathematicians whose early indications of talent came on these contests. I'll comment about the intersection of these contests with the school mathematics curriculum. Along the way, I'll showcase some interesting, easy, and hard mathematical problems from these contests.</p>	147