

Ohio Section MAA

Fall Meeting
October 27-28, 2006
Muskingum College

Abstracts of Contributed Papers

4:25 – 4:40 Friday

Session A – Room 202, BSC

John Tynan, Marietta College

Excel Saves the Day

Abstract: While solving a standard max/min problem in Calculus the nonstandard answer did not have a nice closed form. Fortunately we were able to use Excel to model some of the answers to come up with an acceptable solution.

4:25 – 4:40 Friday

Session B – Room 204, BSC

Iyad A. Ajwa, Ashland University

Applications of The Characteristic Sets Method

Abstract: The Characteristic Sets (CS) Method is an advanced mathematical computation that was discovered by the Chinese mathematician Wentsun Wu in 1978. Wu rediscovered the CS method in the context of his work on the algebraization of geometry and mechanical geometry theorem proving. The CS method is the core of Wu's Method for Automated Geometry Theorem Proving where hundreds of non-trivial theorems have been proven and many new geometric relations have been derived. Other applications of the CS method include solving systems of equations, robotics, and computer vision.

4:45 – 5:00 Friday

Session A – Room 202, BSC

Allen Cox, Kent State University, Kent

Basic Differentiation Applied to a Multivariable Inequality

Abstract: As stated in a recent mathematics journal, a problem is proposed as: For positive real numbers a , b , and c , prove that

$$abc \leq \frac{(a+b+c)^3 - (a^3 + b^3 + c^3)}{24} \leq \frac{(a+b+c)^3}{27}.$$

Using basic properties of derivatives in single valued and multivariable calculus, I will show how this inequality can be proven in a simple and effective way. This talk is accessible to freshmen students and above.

4:45 – 5:00 Friday

Session B – Room 204, BSC

Lee T. Kennard, Kenyon College

Asymptotics on the Class Number

Abstract: If x and y are integers, what numbers can be represented by the form $x^2 + y^2$? What about $5x^2 + 6xy + 2y^2$? Interestingly, the answers to both questions are the same. Furthermore, this has something to do with the fact that both have the same discriminant. Carl Gauss and other mathematicians have studied questions like this in a general context by looking at polynomials of the form $f(x, y) = ax^2 + bxy + cy^2$. The examples above turn out to be in the same equivalence class. In my talk, I will define what it means for two forms to be equivalent, show how to count the number, called class number, of equivalence classes, and discuss the results my REU group obtained this summer on the asymptotics of the class number.

5:05 – 5:20 Friday

Session A – Room 202, BSC

Prem Singh, Ohio University

Mathematics Education Using Classroom Assessment Techniques

Abstract: This presentation will focus on how to facilitate the teaching/learning of mathematics using classroom assessment techniques. These techniques will help students take charge of their learning in and outside of classroom

5:05 – 5:20 Friday

Session B – Room 204, BSC

Matthew C. Zaremsky, Kenyon College

Irreducible Representations of Metacyclic Groups: The Waffle Method

Abstract: The waffle method is a highly visual, very useful tool for finding every irreducible representation of any metacyclic group. Irreducible representations allow these abstract groups to be inspected with the tools of linear algebra, something that can reveal many previously unseen facts about the group structure. The waffle method can also be applied to certain wreath products of cyclic groups, exposing these groups to the possibilities of linear algebra, just like the metacyclics. This method is particularly desirable for its visual simplicity: all the information

about the irreducible representations is contained in a diagram that just looks like a basic breakfast waffle.

5:25 – 5:40 Friday

Session A – Room 202, BSC

Thomas Hern, Bowling Green State University

A Calculus Seminar

Abstract: We describe a seminar at BGSU geared toward providing a vehicle for sharing of experience and ideas between experienced instructors and those who are new or have modest experience—a substitute for not having Cliff Long and Fred Rickey around anymore. This can involve larger issues as well as concrete day-to-day problems. The weekly seminar has been ongoing for several years and tenure-track faculty, instructors, visitors and advanced graduate students have participated.

5:25 – 5:40 Friday

Session B – Room 204, BSC

Anna A. Davis, Ohio Dominican University

A Relative Version of Finiteness Obstruction of C.T.C. Wall

Abstract: C. T. C. Wall demonstrated that if a CW complex Y is finitely dominated, then the reduced projective class group of Y contains an obstruction which vanishes if and only if Y is homotopy equivalent to a finite CW complex. Wall demonstrated that such an obstruction is invariant under homotopy equivalences. Subsequently Sum and Product Theorems for this obstruction were proved by L. C. Siebenmann. Wall's paper also gives an algebraic definition of relative finiteness obstruction. In this paper we will use a geometric construction to reduce the relative finiteness obstruction to the non-relative version. We will demonstrate that the relative finiteness obstruction is invariant under certain types of homotopy equivalences. We will also prove the relative versions of the Sum and Product Theorems.

5:45 – 6:00 Friday

Session A – Room 202, BSC

Daniel Otero, Xavier University

Redesigning a Mathematics Education Curriculum

Abstract: Beginning in 2004, members of the Mathematics & Computer Science department at Xavier University have been working to redesign their curriculum to support undergraduate students in programs of mathematics education. In particular, a number of new courses were

instituted to meet the needs of future middle school mathematics teachers. This talk will describe the new curriculum which was launched this fall, the steps that were taken to put it into place, and ongoing issues that have arisen as the curriculum comes on line.

10:35 – 10:50 Saturday

Session A – Room 202, BSC

Andrew J. Homan, Ohio Northern University

An Extension of a Putnam problem

Abstract: We revisit the problem B1 of the 1973 Putnam Competition, on which a number of papers have already been written. In that problem, $2n+1$ integers are given with the property that any $2n$ of them can be divided into two groups of n with equal sums. The problem requires to prove that the $2n+1$ integers are all equal. It turns out that the result holds for $2n+1$ elements of any field of characteristic zero. Our talk will address the possibilities and limitations of extending this result to fields of finite characteristic.

10:35 – 10:50 Saturday

Session B – Room 204, BSC

Thomas P. Dence, Ashland University

Do You Know the Constant $L = 2.622057$?

Abstract: The world's most famous constant, π , hails from a geometry background. Here is another constant, with a similar background, that hasn't had the same press, and rightly so, but it is still interesting in its own right.

10:55 – 11:10 Saturday

Session A – Room 202, BSC

MB Rao, University of Cincinnati

Monty Hall Phenomenon – Stories and Controversies

Abstract: A decade ago, the Automobile-Goats problem has taken the country by storm. In a game show, there are three closed doors on the stage, behind one of which there is an automobile and behind the other two doors a goat each. The host of the game show knows exactly what is behind each door. An invited participant of the show chooses a door. The host opens one of the other two doors exhibiting a goat. The participant is given a choice: stick to the initial selection or choose the remaining unopened door. Whatever be the final choice, the participant gets what is behind it. Which one is a better strategy: stick to the initial selection or switch doors? In this talk, a review of controversies, stories, and history surrounding the problem will be presented.

10:55 – 11:10 Saturday

Session B – Room 204, BSC

Michael Wallace

Solution to the Thomas Dence Problem

Abstract: At the Fall, 2005 Section Meeting, President Bill Benz of host Ashland University proposed the following problem: If the sum of A , B , and C is 6, the sum of their squares 8, and the sum of their third powers 5, find the sum of their fourth powers. At the next Meeting, in Spring, 2006 at the University of Akron, Tom Dence showed how to find the solution (0), and offered the Section a new problem: If the sum of A , B , C , and D is 3, the sum of their squares 7, their cubes 9, and their fourth powers 11, find the sum of their fifth powers. In this talk we show how to solve Dr. Dence's problem without breaking the symmetry between the variables. This leads to discovering a general formula for solving all such problems. Will this mean the end of the chain of problem proposing? Maybe not.

11:15 – 11:30 Saturday

Session A – Room 202, BSC

MB Rao, University of Cincinnati

Monty Hall Phenomenon - A Generalization

Abstract: The three-door game-show problem has become part of our mathematical lore. A review of the problem and its solution will be expounded in a simple way. Some generalizations will be presented which will make transparent the solution of the three-door problem.

11:15 – 11:30 Saturday

Session B – Room 204, BSC

William R. Fuller, Ohio Northern University

Pythagorean Tangent Sequences

Abstract: Pythagorean tangent sequences provide a pleasing interface between geometry and number theory. The sequences will be presented and some of their properties will be discussed. The subject is one that students at a variety of levels can find interesting and can help them make a transition from geometric explorations to finding delight in more abstract discovery.