**MD-DC-VA Section MAA Spring 2006 Meeting, Loyola College, Baltimore, MD**
**Contributed Paper Abstracts** (**) indicates papers recommended for all students

**Harel Barzilai and Homer Austin, Salisbury University**
**On their home turf: K-12 Math Teachers inform University Professional Development Programs.**

The co-directors of Math ADEPT, a math content course based professional development program for K-12 teachers, share their recent experiences while gathering "on the ground" information through visits to schools in the region served by ADEPT. Through an informal but structured interview process that is part of a multi-pronged assessment program, K-12 teachers were able to strengthen two-way communication with ADEPT's hosting university, and to provide candid and informative feedback on the real-world effects of the program. Highlights from the school visits will be shared as part of a broader discussion of why other universities and program directors may wish to adopt a similar strategy for gaining a more detailed "snapshot" of their program's effects.

**Hongwei Chen, Christopher Newport University**
**(**)Evaluation of some variant Euler sums**

Based on experimentation with computer algebraic systems, a large class of Euler sums has been explicitly evaluated in terms of the Riemann zeta function. In this talk, we will report some similar results on variant Euler sums.

**Marshall M. Cohen, Department of Mathematics, Morgan State University**
**(**) Elements of Finite Order in the Group of Formal Power Series Under Composition**

We consider formal power series $f(z) = az + bz^2 + \mathrm{K}\ (a \neq 0)$, with coefficients in a field of characteristic 0. These form a group under the operation of composition (= substitution: $fg(z) = ag(z) + bg(z)^2 + \mathrm{K}\ (a \neq 0)$ We prove (Theorem 1) that every element *f(z)* of finite order is conjugate to its linear term $L_a(z) = az.$ Then we investigate the construction of elements of order n and prove (Theorem 2) that, given a primitive *n*'th root of unity *a*, the coefficients of the terms $z^k$ may be chosen arbitrarily(!) as long as $k \neq nj + 1.$ The coefficients of the terms $z^{nj+1}, j = 1, 2, \mathrm{K}$ , are then uniquely determined.

**Gregory Dresden, Washington and Lee University**
**(**) Three Transcendental Numbers from *n!*, $n^n$, and $F_n$..**

Consider the decimal formed from the last digit of the Fibonacci sequence, $F_n$. It's easy to show that this number is rational. But what if we consider the last non-zero digit of the Fibonacci sequence? We will show that we now get a transcendental number, and we will indicate how we can arrive at similar conclusions for $n!, n^n$ and other sequences.

**Dr. Raymond Fletcher, Virginia State University**
(**) **Automorphisms of the Cevian Algebra**

We will define radial and reflective automorphisms on a Cevian Algebra and show that every radial automorphism can be expressed as the composition of four reflective automorphisms. We also describe a pure geometric result that is easily proved using the automorphism theory of the Cevian Algebra.

**Peter M. Joyce, CCBC at Catonsville**
**(**) Even and Odd Permutations (Simple Proof)**

We present a simple correct proof that a permutation cannot be both even and odd. The proof given only requires knowledge of mathematical induction and basic knowledge of transpositions.

**Dan Kalman, American University**
**(**) Archimedes in the Fifth Dimension**

A simple variation on Archimedes' derivation of the volume of a sphere involves comparing a hemisphere, a cylinder, and a cone with compatible dimensions. Cavalieri's principle shows that the volume of the cylinder is the sum of the volumes of the cone and hemisphere, and so expresses the volume of the sphere in terms of the previously known volumes of the cylinder and cone. This paper shows that if Archimedes had lived in a five (rather than three) dimensional space, he might have used similar methods to derive the volume of a sphere in 5D.

**Samuel S. Kutler, St John's College**
**(**) Is One A Number?**

How ancients considered number; how we do so.

**Jody Lockhart, United States Naval Academy**
**(**) Determinants of Matrices Over the Integers Modulo m**

We discuss determinants of matrices over the ring of integers mod m. We derive a recursive formula for the number of matrices with a given determinant and give several examples.

**Asamoah Nkwanta, Morgan State University**
**(**) Counting non-contiguous simple sequence repeats in DNA sequences**

In this talk, we count the number of non-contiguous arrangements of certain simple sequence repeats (SSRs) that occur in DNA sequences or patterns. We then find the probability of having a certain number of non-contiguous SSRs in DNA sequences of specified lengths.

**G. Edgar Parker, James Madison University**
**Math for People Who Don't Want to Take Math: The Nature of Applied Mathematics**

At James Madison, we have a "made for GenEd, satisfy the math requirement" course called The Nature of Mathematics. I have taught what is, by some measures, a successful pure math version of this course for many, Many, MANY years and made two unsuccessful attempts at an applied math version in the mid-90's. In this talk I will talk about a successful applied math version that has evolved, and make comparisons with a problem-solving course in the mathematics for elementary/middle school curriculum that I have taught for the first two times this academic year.

**Matt Pascal, Towson University**
**(**) A Multi-Stage Assessment of *No Child Left Behind* in the Middle School Mathematics Classroom.**

The *No Child Left Behind* Act of 2001 (NCLB) represents the largest item of federal legislation affecting American schools since 1965. Focused on accountability for students' scores on state-approved or state-written standardized content examinations, the law has governed and impacted elementary and middle schools nationwide for several years. This study has examined the direct or indirect effects that NCLB has had on middle school mathematics classrooms in the Washington, D.C. area from the perspectives of the teachers, mathematics education experts,

and other constituencies involved with public education and the legislation that governs it.

**Howard Penn, U.S. Naval Academy**
**(**) Which Ballparks Are Homer Friendly, Part 2**

In part 1, we discussed in which major league ballparks it statistically easy to hit home runs and in which ones it is statistically difficult. In response to a question asked at last summer's Mathfest, we will now consider which ballparks are easy and difficult for left handed batters and separately for right handed batters.

**Phillip Poplin, Longwood University**
**(**) Naive Calculus: Product and Quotient Rules**

Calculus teachers are familiar with students who mistakenly believe that, for a given pair of functions, the derivative of their product is equal to the product of their derivatives; or even that the integral of their product is the product of their integrals. We will investigate whether such pairs of functions exist, and if so, give an outline for how they can be found.

**David Shoenthal, Longwood University**
**(**) Naive Calculus: Chain Rule**
Calculus teachers are familiar with students who mistakenly believe that, for a given pair of functions, the derivative of their composition is equal to the composition of their derivatives. We will investigate whether such pairs of functions exist, and if so, give an outline for how some of them can be found.

**Katherine Socha, St. Mary's College of Maryland**
**(**) Sturm and Bond, or How I Learned to Stop Worrying and Love Linear Algebra**

Once again, the evil Dr. No has captured our hero, James Bond. Dr. No has hired a brilliant scientist to devise a lingering death for Bond: Bond will be frozen to death by a nefarious contraption while in a balmy 75-degree room. This expository talk explains the nefarious idea, using the standard model for temperature flow in a metal rod and reducing the task of solving the problem to an ODE problem (called a Sturm-Liouville problem), which then requires ideas from linear algebra for its solution.

**Katherine Socha, St. Mary's College of Maryland**
**(**) Women and Mathematics Poster Series**

A student came home from school last fall. She told her parents that her teacher refused a request to choose a woman as the subject of a class assignment to write a biography of a mathematician---the reason given by the teacher: "There are no women mathematicians." This incident sparked the development of a new series of posters featuring women and mathematics.

**Ahlam Tannouri, Morgan State University**
**(**) Fractal geometry of the mammalian Bronchial trees**

This is a study of the complexity of branching using Image J software to compute the fractal dimension of original images of bronchial trees of different mammals.

**Michael J. Tierney, Virginia Military Institute**
**Discrete Mathematics with a Writing Intensive Component**

VMI has a writing intensive requirement for all of its graduates. Prior to graduation, all cadets must successfully complete two courses having the designation of "W" for writing intensive. One of the two courses must be in the cadet's major. CS 222W, Discrete Mathematics II, has been used as a vehicle to help satisfy part of the requirement for both our mathematics majors and our

computer science majors. This paper will discuss topics covered in the course and suggestions for writing projects will also be presented.

**Bruce Torrence , Randolph-Macon College**
**(**) Extending the Locker Problem**

The famous locker problem is well known for its ability to stimulate middle school and high school students. For many students, it is perhaps a first exposure to the idea that mathematics can penetrate beyond the realm of the intuitively accessible, and can reveal beautiful and completely unexpected patterns. We'll take a fresh look at this problem and find that it has natural extensions that hold a great deal of potential for exploration by more advanced students.

**Eve Torrence, Randolph-Macon College**
**(**) Origami in the Undergraduate Mathematics Curriculum**

This fall I taught a general education mathematics course for our honors program using origami to introduce topics in several areas of mathematics, including geometry, graph theory, and combinatorics. I'll discuss a few of the results we studied and show off some of the origami objects we created.

**Daniel Vasiliu, Christopher Newport University**
**(**)An Extended Mean Value Theorem For Integrals**

In this article we present an extension of the mean value theorem for integrals along with an interesting application. We show that the integral of a product of two nonnegative, continuous functions e.g. $\int_a^x f(t)g(t)dt$ can be expressed as a convex combination of $f(c)\int_a^x f(t)dt$ and $g(c)\int_a^x g(t)dt$ for some $c,\ a<c<x$. Also we prove that under certain conditions (not very restrictive) the ratio $\frac{c-a}{x-a}$ tends to $\frac{1}{2}$ when *x* approaches *a*. The application consists in using this extension of the mean value theorem to prove $\sum_{k=1}^{\infty}\frac{1}{k^2}=\frac{\pi^2}{6}$.

**Bill Wardlaw, U. S. Naval Academy**
**(**) Row Rank Equals Column Rank (Dedicated to George Mackiw, a good friend and an excellent mathematical expositor.)**

The talk will give a short (perhaps shortest?) proof that the row rank of a matrix is equal to its column rank. The proof is elementary and accessible to students in a beginning linear algebra course. It requires only the definition of matrix multiplication and the fact that a minimal spanning set is a basis.