Abstracts for the April 1-2, 2005 Indiana Section Meeting of the Mathematical Association of America

Indiana University - Purdue University Fort Wayne
Fort Wayne, Indiana
Friday and Saturday, April 1-2, 2005

Friday, April 1, 2005

Science Building 168

4:00-4:25 **Visualizing real surfaces in the complex projective plane**
Adam Coffman, IPFW

Abstract: *The complex projective plane uses two complex numbers in its local coordinate system, so it's four-dimensional. I will show some pictures that illustrate how two-dimensional surfaces intersect complex lines in the complex projective plane.*

4:30-4:55 **On solutions of families of Diophantine equations**
Alain Togbe, Purdue University North Central

Abstract: *In this talk, we discuss Baker's method for solving families of Diophantine equations, particularly families of Thue equations. We give a survey of the results obtained since 1990.*

5:00-5:25 **Fredholm integral equation and its applications**
Sheon Young Kang, Purdue University North Central

Abstract: *A new Gauss type Quadrature based on Clenshaw-Curtis Quadrature for FredholmIntegral Equations of the Second kind* $x(t) + \int_a^b k(t,s)x(s)ds = y(t)$ *whose kernel is either discontinuous or not smooth along the main diagonal. This new numerical approximation scheme is of spectral accuracy when* $k(t,s)$ *is infinitely differentiable away from the diagonal. Application to integro-differential Schroedinger Equation is given.*

5:30-5:55 **The graph theory of Blackwork embroidery**
Joshua Holden, Rose-Hulman Institute of Technology

Abstract: *Blackwork embroidery, also known as "Spanish stitch" or "Holbein stitch", is a needlework technique often associated with Elizabethan England. The patterns used in Blackwork generally are strongly geometric, and are traversed in a way that can be easily described by graph theory. We will characterize these graph traversals and present some algorithms that may be of practical use to needleworkers as well as theoretical interest.*

Science Building G30

4:00-4:25 **Teaching the different interpretations of probability**
Mark Inlow, Rose-Hulman Institute of Technology

Abstract: *In this talk we present different interpretations of probability and advocate teaching these interpretations more thoroughly in undergraduate probability and statistics courses. In particular, we argue that these interpretations be emphasized in statistics courses which (typically) teach methods based on the frequentist interpretation.*

4:30-4:55 **WeBWork - A web based homework delivery system**
Bogdan Vajiac, Indiana University Northwest

Abstract: *WebWork is a cost effective homework delivery system that improved traditional homework by allowing immediate feedback to students and by encouraging cooperation (it gives individualized problems). This talk will present the benefits of the WebWork system and the results we got by implementing it at Indiana University Northwest.*

5:00-5:25 **Generalized linear models in actuarial science**
Curtis Gary Dean, Ball State University

Abstract: *Generalized Linear Models (GLMs) have greatly expanded the range of real world problems that can be analyzed compared to classical linear models. GLMs are particularly useful to actuaries who are applying these models to handle a variety of business problems. This talk will provide a basic description of GLMs and give several examples of their uses.*

5:30-5:55 **Asymptotics for the zeros of the generalized Bessel polynomials**
Amos Carpenter, Butler University

Abstract: *We will investigate the location of the zeros of the normalized generalized Bessel polynomials and the normalized reversed generalized Bessel polynomials. Also, the rate at which these zeros approach certain well-defined curves is investigated. On the basis of numerical computations and graphs, new conjectures are proposed.*

Walb Union Ballroom

7:45-8:45 **Episodes in the early history of the Lucasian Chair**
Jim Tattersall, Providence College

Abstract: *In 1663, Henry Lucas, the long-time secretary to the Chancellor of the University of Cambridge, made a bequest, subsequently granted by Charles II, to endow a chair in mathematics. A number of conditions were attached to the Chair. Among the more prominent Lucasian professors were Newton, Babbage, Stokes, Dirac, and Hawking. We focus attention on the early Lucasians. Many of whom were very diligent in carrying out their Lucasian responsibilities but as history has shown such was not always the case. In the process, we uncover several untold stories and some interesting mathematics.*

Saturday, April 2, 2005

Science Building 168

9:05-9:55 **Periodic trajectories for evolutionary type equations in general Banach spaces**
Mitch Voisei, Tri-State University

Abstract: *The existence of periodic solutions for the evolution equation* $y'(t) + Ay(t) \ni F(t, y(t)) + f(t), t \geq 0, y(0) = y(T)$ *is investigated under considerably simple assumptions on* A *and* F*. Here* X *is a Banach space,* $A : D(A) \subset X \to 2^X$ *is* $m-$*accretive,* $-A$ *generates a compact semigroup,* F *is a Caratheodory mapping which is periodic in its first argument and has a sublinear growth toward infinity. Two examples concerning nonlinear parabolic equations are presented.*

10:00-10:25 **Geometric modelling: An applied geometry course**
David Finn, Rose-Hulman Institute of Technology

Abstract: *Over the past few years, the speaker has been teaching a course on geometric modelling as the principal applied geometry course at Rose-Hulman. The course covers some of the mathematical methods for describing physical and virtual objects used in computer-aided geometric design, CAD/CAM systems and computer graphics. The prerequisite for the course is only multivariable calculus. This course has generated interest among students from various majors to pursue additional studies in projective geometry, differential geometry, and computational geometry. This talk describes the course, some of the materials from the course, and the motivation used to generate interest in additional courses in geometry.*

10:30-10:55 **The Knight's closed tour on a chessboard**
Rozalia Tadjer, Goshen College

Abstract: *In this presentation, I am going to talk about the knight's closed tour on a $m \times n$ board. A closed tour is a Hamilton circuit - each square of the bpard is visited only once and the knight's last move takes it back to the first square. There are some specific properties of the board, which ensure a closed tour, specified in the following theorem: a board supports a closed (knight's) tour if and only if its area mn is an even integer > 24 and neither m, nor n is 1, 2, or 4. I will explain the proof in one direction and show an example of the second direction.*

11:00-11:35 **Tripos and Diskos, two new geometric puzzle-games**
Jeremiah Farrell, Butler University

Abstract: *Both puzzle-games were designed for students at the Indiana School for the Blind but are of interest to sighted persons as well. We explore the geometry behind the two and generalize to similar games. There are many open questions - some of which may be suitable for undergraduate research projects.*

11:35-12:00 **Fair division with money**
David Housman, Goshen College

Abstract: *An inheritance is to be divided evenly among siblings. Different siblings may value different objects differently (e.g., the pianist sister who lives next door would value the baby grand piano more than the brother who lives a thousand miles away and never liked the sound of a piano), and siblings are willing to give or receive money as one way to make the division fair. The literature has proposed several division methods and fairness properties for division methods to have. This talk will review some of that literature and provide some results showing how compatible various proterties are.*

Science Building G30

10:00-10:25 **Equal area functions**
Jared Laughlin, Purdue University

Abstract: *An Equal Area Function is a function where the area of the triangle formed by a tangent line and the positive coordinate axes is independent of the point of tangency. One such function is $f(x) = 1/x$. In this talk we shall try to answer the following two questions: Is it possible to find all such functions? How does all this generalize to higher dimensions?*

10:30-10:55 **Properties of bipartite self-complementary graphs**
Laura Stellfox, Valparaiso University

Abstract: *A bipartite graph is a graph where the vertex set can be decomposed into two subsets U and V such that each edge of G joins a vertex of U to a vertex of V. A bipartite graph is denoted as $G(U, V)$. Given a bipartite graph $G(U, V)$, its bipartite-complement is the bipartite graph $\bar{G}(U, V)$ with the same vertex set as G, but with the edge set $\{uv | u \in U, v \in V, \text{ and } uv \notin E(G)\}$. A bipartite graph G is bipartite self-complementary if G is isomorphic to $\bar{G}$. In my talk, I explore general properties of bipartite self-complementary graphs.*

Science Building G34

11:00-12:00 **In-service training programs for K-12 teachers: A round table discussion**
Zsuzsanna Szaniszlo, Valparaiso University
Colleen M Hoover, St Mary's College
Mary K Porter, St Mary's College

Abstract: *The purpose of this session is to share ideas and experiences of successful training programs involving mathematical context and pedagogy. The format of the session will be roundtable discussion. Everyone with interest in such programs is welcome to participate in this discussion.*

Science Building 168

1:45-2:45 **Three mathematical vignettes; millennial, pontifical, and nyctaginaceous**
Jim Tattersall, Providence College

Abstract: *Two first century (A.D.) manuscripts, the "Introduction to Arithmetic," by Nicomachus of Gerasa and "Mathematics Useful for Understanding Plato" by Theon of Smyrna were the main sources of knowledge of formal Greek arithmetic in the Middle Ages. The books are philosophical in nature, contain few original results and no formal proofs. They abound, however, in intriguing number theoretic observations. We discuss and extend some of the results found in these ancient volumes. Secondly, we discuss the mathematics of Gerbert the Great, a tenth century educator. We end with the achievements and adventures of Louis Antoine de Bougainville, mathematician, explorer, and student of D'Alembert.*