Abstracts of Faculty Talks

Mathematical Association of America
Allegheny Mountain Section Meeting
University of Pittsburgh at Johnstown
Saturday April 10th, 2010

Krebs Hall, Room 200

10:15-10:30

James Sellers, Penn State University, sellersj@math.psu.edu

Infinite Families of Divisibility Properties Modulo 4 for Non-Squashing Partitions into Distinct Parts

In 2005, Sloane and Sellers defined a function b(n) which denotes the number of non-squashing partitions of n into distinct parts. In their 2005 paper, Sloane and Sellers also proved various congruence properties modulo 2 satisfied by b(n). In this note, we extend their results by proving two infinite families of congruence properties modulo 4 for b(n). In particular, we prove that for all k>2 and all nonnegative n, b(2^{2k+1}n+2^{2k-2}) and b(2^{2k+1}n+3*2^{2k-2}+1) are always divisible by 4. This is joint work with Michael Hirschhorn (UNSW, Australia) and Oystein Rodseth (University of Bergen, Norway).

10:35-10:50

Henry E. Escuadro, Juniata College, escuadro@juniata.edu

Triangular Line Graphs and Word Sense Disambiguation

The triangular line graph of a graph G denoted by T(G) is the graph obtained by replacing each edge of G by a vertex and joining two of these vertices if their corresponding edges in G belong to a common triangle in G. In this talk we present some results about triangular line graphs and how such graphs can be used in the process of word sense disambiguation.

10:55-11:10

Joshua Sasmor, Seton Hill University, sasmor@setonhill.edu

How does the choice of branch cut affect the structure of a Julia set?

The Julia set J for f(z) = z^(5/2)-1/2+i/10 is computed using a share-ware program (Fractint). The algorithm for this computation uses the ATAN2 inverse tangent function to switch between rectangular and polar coordinates for z, where the argument of z is in the interval (-Pi,Pi]. If the branch cut (the source of the discontinuity of the function z^(5/2) is considered to be part of the boundary of the Fatou components, i.e., part of the Julia set itself, then the orbits of points on the branch cut should cover J. The orbits of the branch cut are examined under an alternate choice of interval (namely [-Pi,Pi)). We examine the forward orbits of the branch cut and the backward orbits of the fixed points of f(z) to attempt to illuminate J.

11:15-11:30

Rachelle R. Bouchat, Slippery Rock University, rachelle.bouchat@sru.edu
Path Ideals of Rooted Trees

Associated to each finite simple graph is an edge ideal contained in a polynomial ring. Since an edge ideal can be viewed as path of length 1, the notion of an edge ideal can be generalized to that of a path ideal. Given a positive integer t and a rooted tree, we consider the ideal whose generating set is precisely the set of directed paths of length t. In this talk, we will develop an explicit formula for the linear strand of the path ideal associated to a rooted tree.

Krebs Hall, Room 201

10:15-10:30

Kim Roth, Juniata College, roth@juniata.edu
Statistical Consulting: Successes and Challenges

Statistical consulting at Juniata is a course requiring only Introduction to Probability and Statistics. It involves having the students analyze and report on real data that come from other departments across campus. I will discuss the successes of the presentations to clients and the challenges including getting students to write at a professional level.

10:35-10:50

Michael Caulfield, Gannon University, caulfiel001@gannon.edu
How Apportionment Methods Can (and Sometimes Do) Choose our President

Congress can choose among various methods to reapportion the House of Representatives, and thus the Electoral College, every ten years. We will review three of those methods and see how the method of apportionment chose the President in 1876 and in 2000.

10:55-11:10

KB Boomer, Bucknell University, kb.boomer@bucknell.edu
Using empirical distributions to determine inherent earthquake location accuracy of seismic networks: Are confidence intervals portable to similar networks?

A practical application of resampling methodology has been to estimate the true error in seismic event location. The resulting seismic waves moving through the earth after a seismic event are recorded on networks of seismometers. The arrival times of these waves are used to locate the event.
Previous work (Boomer & Brazier, 2010) has obtained an empirically based 95% confidence interval for the true epicentral location for events occurring within the Kaapvaal Craton of Southern Africa and recoded on the Southern African Seismic Experiment network. The center of this work involved relocating known seismic events (mine blasts) via a jackknife approach.

The next question is whether this empirically based confidence interval can be used to assess seismic event location in another geologic region, such as the Tanzania Craton, which currently has no known reference event.

11:15-11:30

Dan Radelet, Indiana University of PA, dradelet@iup.edu
Reconstruction in Banach spaces

Mathematicians regularly use orthonormal bases to reconstruct general vectors in Hilbert or Banach spaces, relying on the familiar Parseval equality. In this talk, we will generalize the idea of a reconstructive basis by relaxing Paseval's equality and using frames and Riesz bases instead. We will also discuss the resulting improvement on stability, and applications to signal processing.

Krebs Hall, Room 220

10:15-10:30

Alfred Dahma, Indiana University Of Pennsylvania, alfy@iup.edu
Generalized Roundness in Metric Spaces

Generalized roundness is a geometric, non-linear concept in metric spaces. It was defined in the late 1960s, and used to solve open questions regarding Lebesgue function spaces. As the theory developed, it was also shown that the notion of generalized roundedness is equivalent to the concept of negative type. In this talk I will introduce this concept, indicating several properties.

10:35-10:50

John Tolle, Penn State DuBois, jut14@psu.edu
Solving ay''+by'+cy=0 with a Simple Product Rule Approach

When elementary ODEs of first and second order are included in the calculus curriculum, second order linear constant coefficient ODEs are typically solved by a method more appropriate to differential equations courses. This method involves the characteristic equation and its roots, complex-valued solutions, and some method (often mysterious, unnatural, or simply left unjustified) for establishing te^{rt} as a solution when r is the only real root. Here we outline a seldom-used but more natural approach better suited to the calculus curriculum. Complex numbers are not needed, and the solution te^{rt} arises constructively.

10:55-11:10

Elena Constantin, University of Pittsburgh at Johnstown, constane@pitt.edu
Second Order Sufficient Conditions for Smooth Minimization Problems via Tangential Cones

Our goal is to give some second order sufficient optimality conditions for a set constrained minimization problem with twice continuously differentiable data. Our conditions are formulated in terms of the tangent vectors to the constrained set D at the extremum point when D is convex and in terms of the contingent vectors to the constrained set when D is an arbitrary set.

Our results are used to solve problems to which the classical second order sufficient conditions cannot be applied.

11:15-11:30

Rich Marchand, Slippery Rock University, richard.marchand@sru.edu
Boundary Stabilization of a Thermoelastic Beam

A system of coupled partial differential equations is used to model the vibrations of a thermoelastic beam. The goal is to uniformly damp undesirable vibrations as quickly as possible. It has been shown that a thermoelastic beam is uniformly stabilized via thermal effects alone. However, the level of damping may be improved by adding mechanical damping (damping the moment) at one end. This talk presents a comparison of thermal and mechanical damping under different modeling assumptions.

Krebs Hall, Room 221

10:15-10:30

Beverly Michael, University of Pittsburgh,bkm@pitt.edu
Applied College Algebra for the Non-Math Non Science Majors

At the University of Pittsburgh, we have two versions of College Algebra, one for those going on to Calculus and one for non-math/science majors, called Applied College Algebra. My study shows that the students in the Applied course did significantly better, than those in the traditional College Algebra, on certain questions on the final exam.

10:35-10:50

Ryan Higginbottom, Washington & Jefferson College, rhigginbottom@washjeff.edu
Teaching LaTeX to a General Science Audience

Most mathematicians have heard of LaTeX and the many benefits to be gained by typesetting mathematics with this software. In January 2009, I offered a class on LaTeX to a general science audience at my school. I offered a much better version of the same class this past January. I will discuss the topics covered in my class as well as the lessons I learned and the improvements I made after the first year.

10:55-11:10
David Miller, West Virginia University, millerd@math.wvu.edu
Using Geogebra to develop applets for the web

This talk will give a introduction to Geogebra, describe how you can create applets that students can access on the web, and show you other resources.

Krebs Hall, Room 209

10:15-10:30

Hollie L. Buchanan II, West Liberty University, hbuchanan@westliberty.edu
What I Learned from the Scarecrow

In the MGM film, the Scarecrow states a mangled version of the Pythagorean Theorem. We investigate the stated condition and some variations as a Geometry problem (and, briefly, as a Number Theory problem).

10:35-10:50

Matt Pascal, West Virginia University, matt.pascal@math.wvu.edu
The Killer Problem Phenomenon

In the spirit of a famous series of studies by Selden and other collaborators, an analysis of student performance on a simple trigonometry problem shows it to be void of predictability and trends.

10:55-11:10

Carl F. Letsche, California University of Pennsylvania, letsche@calu.edu
My favorite integral, or a one-problem Calculus II exam

Several years ago I was introduced to a deceptively simple integral with an extremely ugly solution that was used to test computer algebra systems. The solution uses a combination of nearly every technique of integration covered in calculus!