Archived Seminars
2014/15

May 12, 2015; 11:00am in PB 390: Steven Garside (Fresno State)

Title: *Analysis of Financial Time Series using Multivariate Adaptive Regression Splines (MARS)*

Abstract: We examine how Multivariate Adaptive Regression Splines (MARS) performs when compared to parametric models such as autoregressive (AR), moving average (MA), and autoregressive integrated moving average (ARIMA) models. We want to determine the circumstances in which it would be better to use a nonparametric model over a parametric model. Using the right model can lead to maximizing our returns when we place money in financial markets. We used eight different time series datasets: S&P 500 and the seven major foreign exchange rates. Our investigation shows that the non-parametric model MARS is a better fit for the S&P 500 data than the other three parametric models, while the parametric model AR(1) is a better fit for the seven major foreign exchange rates data than the other three models.

May 07, 2015; 1:00pm in S2 309: Marat Markin (Fresno State)

Title: *On the Mean Ergodicity of Bounded Weak Solutions of an Abstract Evolution Equation - Part 2*

Abstract: Click here.

April 30, 2015; 1:00pm in S2 309: Marat Markin (Fresno State)

Title: *On the Mean Ergodicity of Bounded Weak Solutions of an Abstract Evolution Equation - Part 1*

Abstract: Click here.

April 23, 2015; 1:00pm in UBC 192: Steven Chung (Fresno State)

Title: *Hypothesis Testing in Clinical Trials: A Case Study*

Abstract: In this talk, I will discuss how hypothesis testing is used in clinical trials through a case study. The study is based on recent collaborative research with pharmacists from Community Regional Medical Center (CRMC) and University of California, San Francisco. The data came from a retrospective cohort of neonates, treated in the neonatal intensive care unit (NICU) at CRMC between September 2011 and December 2013 who received a single dose of poractant alfa (Curosurf) for neonatal respiratory distress syndrome (RDS). The objective of this study is to determine the non-inferiority of a single dose regimen of poractant alfa to the multiple dose regimen recommended by the manufacturer. Oxygen status at 28 days of life was assessed and compared with a historical cohort receiving a multiple dose regimen of poractant alfa. A significantly greater percentage of neonates in the control group were alive and oxygen independent at 28 days of life than in the single

dose cohort. Comparing only alive babies, fewer in the control cohort than in the single dose cohort were oxygen dependent, but the difference was not statistically significant. The single dose cohort had significantly lower 28-day mortality, duration of intubation, and ¿40% FiO2 requirement. The non-inferiority of a single dose regimen compared to a multiple dose regimen of poractant alfa cannot be ruled out. Using a single dose of poractant alfa instead of multiple doses may lead to a significant increase in cost savings and decrease in adverse drug reactions.

April 16, 2015; 1:00pm in UBC 192: Eleina Aceves (Fresno State)

Title: *From Knot Theory to Pseudoknots*

Abstract: In knot theory, mathematicians study mathematical knots which are circles embedded in a three dimensional space. Because of this research, we have found several connections between knots and objects in the real world. Sometimes, however, when observing an object, we may not have all of the information about the object. For example, we may not know which strand lies over the other at a crossing if we have a blurry picture of the object. Thus, the theory of pseudoknots was created to approach this problem. Pseudoknots are mathematical knots where crossing information is missing at some of the crossings. This presentation explores the concept of pseudoknots, the ability to determine if a given pseudoknot represents a trivial circle or a nontrivial knot, and invariants that can be used to distinguish between pseudoknots.

March 9, 2015; 9:00am in PB 390: Jenna Tague (Ohio State University)

Title: *Conceptions of Rate of Change: An Exploratory Study*

Abstract: Jenna Tague's dissertation focuses on mapping a trajectory of how students understand rate of change from middle school through post-calculus undergraduate. This presentation will offer an analysis of 191 responses by 7th and 8th grade students and 167 responses by 5th grade students to two rate of change tasks and sources that may have contributed to the types of responses they produced. One task involved describing change as depicted graphically. The second task required the students to discern rate of change within a pattern context. The findings indicated that the participants viewed rate as discrete and categorical in graphic context and tented to produce patterns with additive growth. This may be due to their early exposure to graphs as tools for organizing categorical data in elementary school and a lack of experience with patterns that represent multiplicative growth.

March 11, 2015; 9:00am in PB 390: Ravi Somayajulu (Eastern Illinois University)

Title: *Preservice Teachers' Noticing and Analysis of Students' Geometric Work*

Abstract: Dr. Somayajulu?s talk will consist of two parts. The first part will focus on the results of his dissertation research in which he traced changes in pre-service secondary teachers' evaluation of school learners' dilemmas associated with Geometry. This was traced

through case based scenarios of student work as pre-post technique for cohort data analysis. Results indicted there was a mismatch between what the program had intended to nurture and what preservice teachers seemingly gained from those experiences. These findings inspired the second line of inquiry, currently ongoing, focusing on what preservice teachers' actually notice when they consider school learners' mathematical work. Dr. Somayajulu's work is geared towards building a developmental theory of teacher growth that offer an explanation for why certain elements of teacher education programs may go unnoticed by novice teachers.

February 18, 2015; 9:00am in PB 390: Khang Tran (Truman State University)

Title: *Zero Distribution of Sequences of Polynomials.*

Abstract: We introduce an approach which shows that the zeros of various sequences of polynomials lie on fixed curves on the complex plane. In a simple application of this approach, we prove that the zeros of the polynomial, obtained from the expansion of the binomial polynomial by only keeping the terms whose exponents are in the same congruence class modulus n, lie on the n radial rays emanating from the origin. In another application, we study the complex zeros of a sequence of polynomials satisfying a three-term recurrence of degree n. In particular, given any two polynomials $A(z)$ and $B(z)$ with complex coefficients, we form a sequence of polynomials defined recursively by taking $A(z)$ times the previous polynomial in the sequence plus $B(z)$ times the n-th polynomial before that. We prove that with appropriate initial conditions, the zeros of all the large degree polynomials in this sequence lie exactly on a curve whose equation is given explicitly by the two polynomials $A(z)$ and $B(z)$. The zeros will be dense on this curve when the degree approaches infinity. At the end of the talk, we provide a list of experimental conjectures to which this approach may apply. The author appreciates any possible extension of this list from the audience.

February 2, 2015, 3:00am: Emily Miller (University of Delaware)

Title: *Examining Factors Associated with the Retention of Female Mathematics Doctoral Students.*

Abstract: Although the gender gap in participation in undergraduate mathematics has all but closed, significant disparities still exist at the doctoral level. Multiple studies hypothesizing a biological basis for this disparity have been inconclusive or have failed to find significant results. So, why then does this gender gap persist? In this presentation, I will describe two studies aimed at identifying factors associated with the success of female students in mathematics doctoral programs. In the first study, I designed and administered a survey to a sample of 142 female mathematics professors employed at prestigious U.S. universities. While not generalizable to the larger population, the results of this study shed light on the negative experiences of even the most successful female students. The second study, designed to be more generalizable and provide more nuanced results, aims to identify factors that are most crucial to success for female graduates employed at a wide range of post-secondary institutions and to compare these factors to those identified as most crucial by male graduates employed at the same institutions. To achieve these goals, the survey instrument from the first study was revised and administered to a stratified, random sample

of male and female mathematics professors at colleges and universities in the U.S. Together, these studies provide a better understanding of issues of doctoral student retention and enable the formulation of an initial set of "best practices" so that more female students can be successful in doctoral-level mathematics.

December 05, 2014, 11:00am: Marat Markin (Fresno State)

Title: *On an Abstract Evolution Equation with a Normal Operator: Weak Solutions and Their Differentiability*

Abstract: We shall see that the use of the well-known exponential formula

$$y(t) = e^{tA} f$$

can be naturally extended to the case of a *normal operator* A in a complex Hilbert space H to describe *generalized (weak) solutions* of the evolution equation

$$y'(t) = Ay(t), \qquad\qquad t \geq 0.$$

We are also going to outline proofs of conditions necessary and sufficient for the *weak solutions*, which a priori need not be differentiable, to be *infinite differentiable* on $[0, \infty)$ or $(0, \infty)$ and observe certain interesting effects of their *smoothness improvement*.

The talk represents a characteristic segment of the reporter's research.

November 21, 2014, 11:00am: Carmen Caprau (Fresno State)

Title: *The Kauffman bracket for singular links*

Abstract: A singular link is an immersion of a disjoint union of circles into the three-dimensional space that admits only finitely many singularities that are all transverse double points.

In this talk, I will introduce a polynomial invariant for singular links. Specifically, I will provide two approaches (combinatorial and algebraic) to a version of the Kauffman bracket polynomial for singular links. If time permits, I will finish with a brief discussion of the corresponding polynomial for virtual singular links.

This talk should be accessible to students. In fact, it reflect work done by some of my former research students.

November 14, 2014, 11:00am: Doug Singleton (Fresno State)

Title: *The Time-Dependent Aharonov-Bohm Effect and Stokes' Theorem*

Abstract: Stokes' theorem is investigated in the context of the time-dependent Aharonov-Bohm effect – the two-slit quantum interference experiment with a *time varying* solenoid between the slits. The time varying solenoid produces an electric field which leads to an additional phase shift which is found to exactly cancel the time-dependent part of the usual

magnetic Aharonov-Bohm phase shift. This electric field arises from a combination of a non-single valued scalar potential and/or a 3-vector potential. The gauge transformation which leads to the scalar and 3-vector potentials for the electric field is non-single valued. This feature is connected with the non-simply connected topology of the Aharonov-Bohm set-up. The non-single valued nature of the gauge transformation function has interesting consequences for the 4-dimensional Stokes' theorem for the time-dependent Aharonov-Bohm effect. An experimental test of these conclusions is proposed.

November 7, 2014, 11:00am: Adnan Sabuwala (Fresno State)

Title: *MyMathLab: An Overview and More!*

Abstract: In this talk, I plan to demonstrate features of MyMathLab (MML) that would be useful for instructors. Most of us teach (or will teach) calculus using the Briggs/Cochran textbook which is complemented with this LMS. I will use both the first and second editions of this textbook to demonstrate these features and also answer as many questions or desired features that instructors have or would like to see in MML. This talk will be a live demonstration and it will help if you can bring your laptops with you.

October 31, 2014, 11:00am: Támas Forgács (Fresno State)

Title: *The nonexistence of cubic Legendre multiplier sequences.*

Abstract: In this talk I will describe the work I did with three students in the Fresno State REU during the summer of 2013. We proved that there are no cubic polynomials which interpolate cubic Legendre multiplier sequences (LMS). In addition, we provided a new method to decide whether a given polynomial $p(x)$ interpolates a LMS, and used it to reprove the fact that there are no linear LMS. I will discuss the current use of this newly developed method in a paper I am writing with A. Piotrowski and M. Chasse.

October 24, 2014, 11:00am: Támas Forgács (Fresno State)

Title: *Classical multiplier sequences: a special class, continuous transformations, and connections to special functions.*

Abstract: This talk considers a special class of classical multiplier sequences, which are interpolated by either logarithmic functions, or 'power' functions of the form $f(z) = \dfrac{(z+a)^s}{\Gamma(z+1)}$, $(a, s \in \mathbb{R})$. After presenting some results and problems which remain open, we discuss the notion of continuous transformation of a classical multiplier sequence (in one or more parameters), and highlight some unexpected, but beautiful connections between classical multiplier sequences, Laguerre polynomials, and hypergeometric functions.

October 17, 2014, 11:00am: Oscar Vega (Fresno State)

Title: *I didn't do it... my students did!*

Abstract: Undergraduate students who think there must be something beyond coursework

are totally right. Besides independent study courses, students may have an undergraduate research experience at their own institution, or by visiting another college/university during a summer.

Fresno State has had a Summer REU (Research Experience for Undergraduates) for three years now, and also has had several 'local' undergraduates doing research under the supervision of our faculty.

Attend this talk if you want to know what students like you have the potential to do. All you need is to know some Linear Algebra, and to have the curiosity to learn a little more during this talk.

August 29, 2014, 11:00am: Oscar Vega (Fresno State)

Title: *Coloring graphs, not graph colorings*

Abstract: Given a graph G, we can construct a graph $\mathcal{C}_k(G)$ with vertices the k-colorings of G, and edges connecting vertices if and only if the two colorings differ in exactly one vertex (of G). The graph $\mathcal{C}_k(G)$ is the kth coloring graph of G.
In this talk we will take a look at basic properties of coloring graphs, and show a few interesting results on the kinds of graphs that can be realized as the coloring graph of some G.
Most of the ideas in this talk should be accessible to students.