

Archived Colloquia

2010/11

September 24, 2010: Kent Pearce (Texas Tech University)

Title: *Use of Computer Technology for Insight and Proof: Strengths, Weaknesses and Practical Strategies* ([Flyer](#))

Abstract: We will consider the capability and role of computer algebra systems (CAS) in constructing proofs in particular in "proving" inequalities. Can you (your calculator or your computer) ever draw a graph and deduce from the drawn graph that you have a proof of an inequality? We will conclude that there is a role for CAS in analysis and, specifically, that there are various useful and practical strategies for rigorously establishing analytic inequalities.

October 15, 2010: Keith Mellinger (University of Mary Washington)

Title: *Kirkman's Schoolgirls Wearing Hats and Walking through Fields of Numbers* ([Flyer](#))

Abstract: The Kirkman schoolgirls problem, a famous gem due to T. P. Kirkman in the mid 19th century, asks for 7 distinct arrangements of 15 girls into 5 rows of 3 girls each, assuming that each girl walks in a row with every other girl exactly once. Solutions to this famous problem can be found in algebraic number fields, finite projective 3-space, and certain error-correcting codes. We'll discuss each of these areas, discover the connections, and explain the underlying mathematical objects.

November 12, 2010: Alissa Crans (Loyola Marymount University)

Title: *Quandles, Braids, and Tangles, Oh My!* ([Flyer](#))

Abstract: While it may sound surprising, algebra and topology actually have a very close relationship! One way to demonstrate this connection is through the language of quandles. A quandle is a set equipped with two binary operations which satisfy identities that are closely related to the properties satisfied by the operations of left and right conjugation. After examining examples of quandles, we will illustrate their connection to knot theory, and in particular, to the three Reidemeister moves. We will also explore the method which enables us to associate a quandle to a given knot. Finally, we will answer the question, Why should we even care about these things called quandles?

February 4, 2011: Kathryn Leonard (California State University, Channel Islands)

Title: *The Mathematics of Skeletal Shape Models* ([Flyer](#))

Abstract: A fundamental barrier to an automated image recognition system is the ability to recognize the shape of objects in an image. In order to recognize a shape, we must first

develop appropriate models for shape. One such model is the Blum medial axis, which can be thought of as the skeleton of the shape and the length of its ribs. The Blum axis has several beautiful mathematical properties as well as good shape modeling capabilities. We will define the Blum axis, discuss its history, explore its strengths, and compare its value as a shape model with the boundary curve of a shape. We will also discuss related work-in-progress for a generalization of the Blum axis, as well as a few related research projects involving undergraduates.

February 25, 2011: Tamas Forgacs (CSUF)

Title: *O Zeros Where Art Thou?*

Abstract: One of the most well known open questions in mathematics is the Riemann hypothesis, stating that the Riemann zeta function $Zeta(z)$ has all of its (non-trivial) zeros on the line $Re(z)=1/2$. Related to this conjecture is the investigation of the location of zeros of polynomials, and how the locations may change or be preserved under certain actions. In this talk we will investigate analytic and algebraic manipulations of polynomials and the geometric consequences of such actions. We will define multiplier sequences and will use them as a tool to answer some questions regarding the location of zeros of real-analytic functions. We will then generalize the notion of a multiplier sequence and present results of ongoing undergraduate research at Fresno State in this area.

March 25, 2011: Oscar Vega (CSUF)

Title: *The Math of Sudoku* ([Flyer](#))

Abstract: Sudoku is one of the most popular "math pastimes" there are. Its popularity has led to the publication of several books that collect sudoku grids and, sometimes, give insights on how to solve those diabolical ones.

In this talk I will present a few tricks, some info on how sudoku grids are constructed, and interesting statistics about the game. All this will yield interesting mathematical connections, which will be discussed in a fairly simple language.

April 8, 2011: Douglas Singleton (CSUF)

Title: *Unruh/Hawking Radiation for Undergraduates* ([Flyer](#))

Abstract: Using a wide range of tools from the advanced undergraduate physics major toolbox we give an introduction to Unruh/Hawking radiation the thermal radiation seen by an accelerating observer in an "empty" flat space-time, or the thermal radiation seen by an observer in the vicinity of a black hole.

These effects lie at the boundary between classical general relativity and quantum mechanics and as such are a promising area to search for a quantum theory of gravity.

May 6, 2011: Peter Tannenbaum (CSUF)

Title: *The Presidential Election Game and Political Prediction Markets: Can you make money gambling on presidential elections?* ([Flyer](#))

Abstract: Much like the Super Bowl and the stock market, a presidential election offers an opportunity to invest (or gamble, if you prefer) on various propositions. The markets (casinos?) where these types of investments are made are called political prediction markets. In this talk I will introduce a simple mathematical model of a presidential election (the presidential election game) and a particularly interesting prediction market called Intrade. Using the presidential election game together with data from Intrade, I will take a retrospective look at some investment opportunities that came up in the 2008 presidential election.