Archived Seminars
2010/11

October 6, 2010: Larry Cusick (CSUF)

Title: ***Finite Groups of Derangements on the n-Cube II***

Abstract: Oscar and I have been able to prove the following theorem: If G is a finite group of order q and $\gcd(q, k) = 2^s$ for some s, then G acts as a group of symmetries on some n-cube in such a way that it acts freely on the set of k-faces. I will discuss the techniques we used to prove this theorem. Time permitting, I will wade into some murkier water.

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

Title: ***Coding, Cryptography, and Conics: Using What They Know to Introduce Research***

Abstract: I have had some success in recent years bringing my research in finite geometry to the undergraduate level. My technique has been to use topics that students are already familiar with in order to introduce research level topics. In this talk I will address my use of quadratic curves, but applied to finite projective geometry not Euclidean geometry, to study problems in coding theory and cryptography. Specifically, we look at applications to LDPC codes, secret-sharing schemes, and a certain cryptographic protocol. My expectations as well as student results will all be discussed. These range from in-house technical reports, to poster presentations, to refereed research publications.

November 19, 2010: Ana-Cristina Jimenez (CSUF)

Title: ***Games on Topological Spaces***

Abstract: Most people are familiar with the game of tic-tac-toe as played on $\mathbb{R}^2$, or a regular sheet of paper. The winning strategies of this game are well- known, and the game itself is not considered very challenging. This game is transformed, however, when we shift the playing field to different topological spaces, such as the torus and Klein bottle. The game remains fundamentally the same - 3 in-a-row as a winning condition - but the meaning of *3 in-a-row* changes drastically depending on the properties of the space. We explore new winning strategies, attempt to understand envisioning a game in 3-dimensional space on paper, and briefly explore how other games are affected when played on different topological spaces.

This presentation was created in conjunction with Danielle Belobraydich (McK endree University) and Clarissa Rupp (Metropolitan State College of Denver) during George Washington Universitys Summer Program for Women in Mathematics, Summer 2010.

November 19, 2010: Stefaan Delcroix (CSUF)

Title: ***An Elementary Proof of Waring's Theorem***

Abstract: I will go over an outline of an elementary proof of Waring's Theorem:

"Given a natural number k, there exists a number $g(k)$ such that every number is the sum of at most $g(k)$ k-th powers."

For example, it is know that every natural number is the sum of four squares.

I will start by going over some notion of density for sequences and Schnirelmann's Inequality. Then I illustrate how this can be used to prove Waring's Theorem. Time permitting, I will go over the Fundamental Theorem. The elementary proof of this theorem involves estimating the number of solutions to linear equations.

November 23, 2010: Oscar Vega (CSUF)

Title: ***Clean Rings***

Abstract: A clean ring is a ring in which every element is the sum of an idempotent and a unit. A set of idempotents E that contains enough elements so that every element in a ring can be written as $e + u$, for some e in E and a unit u, is said to be a clean set of idempotents. The cardinality of a minimal clean set of idempotents seems to be an interesting object to look at, and thus we will look at how to find this number for some "typical" rings. Sooner or later we will stumble into rings of matrices and interesting questions will arise. This (ongoing) research started when Oscar visited The University of Iowa last Summer. The problem is an offspring of research REU students did the previous Summer under the supervision of Vic Camillo. Students are encouraged to attend this talk, as only the basics of ring theory and linear algebra will be needed to follow it. Several examples will be given.

November 29, 2010: James Tipton (CSUF)

Title: ***Homfly Polynomial for Four Valent Graphs***

Abstract: The HOMFLY polynomial is a well known invariant of knots. A regular isotopic version of the HOMFLY polynomial can be used to construct a polynomial invariant of rigid vertex isotopy for four valent graphs embedded in $\mathbb{R}^3$.

December 1, 2010: Dhiraj Holden (CSUF)

Title: ***On the 3x + 1 and 3x + d Conjectures***

Abstract: We give results relating to the $3x+1$ and $3x+d$ conjectures, proposed by Collatz and Lagarias respectively. We give a condition for which a primitive cycle will exist for a certain d, and list the first few primitive cycles found in this way. We also define formal grammars from the inverse $3x + 1$ and $3x + d$ maps, and restate the conjectures of Collatz and Lagarias in terms of these formal grammars.

December 8, 2010: Stefaan Delcroix (CSUF)

Title: ***An Elementary Proof of Waring's Theorem, Part II***

Abstract: (A continuation of November 19, 2010 colloquium.)

February 14, 2011: Tamas Forgacs (CSUF)

Title: ***On Hermite Diagonal Operators***

Abstract: Any linear operator on $R[x]$ can be written as a formal power series in D^k with polynomial coefficient. In 2007 an appealing formula has been found for the coefficients of an operator which is diagonal with respect to the standard basis. In this talk we explore the coefficients of an operator which is diagonal with respect to the Hermite basis. We will present some results and describe how we arrived to the conjectured nice formula for these polynomials and how it is related to (a version of) Pascal's triangle. We will also describe some of the difficulties presenting themselves in the proof of this conjecture.

March 4, 2011: Mario Banuelos, Michelle Hoshiko (CSUF)

Title: ***On Multiplier Sequences of a Special Form for Finite Fields***

Abstract: In 1977 Craven and Csordas proposed the following question. If F is a finite field, $gamma_k$ is a multiplier sequence of elements of F and c is an element in F, under which conditions is the sequence $\{cgamma_k + kgamma_{k-1}\}$ also a multiplier sequence? We present some results toward the resolution of this question and discuss the methods used to obtain our results.

March 4, 2011: James Tipton, Ben Wright (CSUF)

Title: ***On Multiplier Sequences for Simple Sets of Polynomials***

Abstract: A sequence of real numbers Γ is called a Q- multiplier sequence if the pointwise product of Γ with any polynomial (expanded in the basis Q) with only real zeros gives a polynomial with real zeros. We present two results. The first describes all bases Q which share multiplier sequences with the classical basis. The second result tells us that the only sequences which are multiplier sequences for all bases are the constant sequences and sequences of the form $\{\gamma_0, \gamma_1, 0, 0, \}$ where if $\gamma_1 = 0$ then $\gamma_0 = 0$.

May 9, 2011: Carmen Caprau (CSUF)

Title: ***A Model for the Kauffman Polynomial***

Abstract: The scope of the talk is to introduce a model for the well-known two-variable Kauffman polynomial invariant for knots and links, via trivalent planar graphs. After giving the definition of the Kauffman polynomial and describing our new approach for obtaining it, we will construct a representation of the braid groups into a certain algebra given by generators and relations and use it to arrive to yet another definition of the Kauffman polynomial. If time permitting, we will show how our model yields an invariant for trivalent graphs embedded into 3-dimensional space.