obtained by removing the edge-cut. In this discussion we will denote this vertex set $F$. We will call the corresponding edge-cut the **boundary of $F$** and denote it with $\partial F$. Since there is no general formula that gives the isoperimetric constant for the particular type of graph we are investigating, it is our goal to produce better bounds than those currently in existence.

**Talk theme(s):** Graph Theory and Combinatorics

**Audience:** undergraduates or grad students of mathematics, and deals mostly with graph theory and addition/multiplication modulo $n$

**Themes:** Education/Pedagogy  
**Moderator:** Herbert Medina  
**Location:** Edmonds 114

**Talk 1 10:30 AM:**

**Presenter:** Jeremiah A. Gilbert (F), San Bernadino Valley College  
**Title:** Happy Numbers Save the Day.  
**Abstract:** What are happy numbers? Besides proving that mathematicians take joy in strange things, happy numbers also offer a way to engage students in a simple-to-follow and entertaining concept that can be explored in even some of the most basic mathematics courses. This presentation will cover both happy and sad numbers, along with some happy properties. Oh, and then there is the endless, fearsome, spiral of four and the time when happy numbers were used to save the day.  
**Talk theme(s):** Number Theory & History of Mathematics  
**Audience:** Any, though of added interest to teachers of lower-level math courses.

**Talk 2 10:50 AM:**

**Presenter(s):** Christina Tran (U), CSU Fullerton  
**Other Author(s):** Bogdan D. Suceava (F), CSU Fullerton  
**Title:** Fullerton Mathematical Circle: The First Three Years  
**Abstract:** The concept of the Fullerton Mathematical Circle is inspired from similar activities done in Central Europe over the last century with Universities offering enrichment programs to interested young gifted mathematicians. Our initiative is the only Mathematical Circle in the USA that draws its inspiration from the activities of **Gazeta mathematică**, a monthly journal with continuous publication since 1895 by the Romanian Society of Mathematical Sciences. The project consists of offering mathematical sessions for gifted middle school and high school students. We will show how several research projects have been developed starting from **Gazeta matematica**’s problems, and how our sessions inspired other published works, e.g. Kelly A. Hartmann’s book review to **Mathematics Circle Diaries, Year 1: Complete Curriculum for Grade 5 to 7**, by Anna Burago, *The Mathematical Intelligencer*, September 2014, Vol 36 (3), pp 92-93, or Bryan Brzyckis recent paper On a geometric locus in taxicab geometry, *Forum Geometricorum*, 14 (2014) 117–121.  
**Talk theme(s):** (1) Education/Pedagogy, and (2) Algebra
**Audience:** Undergraduate. All are welcome!

**Talk 3 11:10 AM:**

**Presenter(s):** Phong Tran (G), CSU Fullerton
**Other Author(s):** Bogdan D. Suceava (F), CSU Fullerton

**Title:** Engaging Gifted Students in Discovering Mathematics: Workshops for Students in Grades 5-6 at the Fullerton Mathematical Circle

**Abstract:** The first steps in establishing the algebra background for highly gifted middle-school students are particularly important for the students’ later mathematical development. The concept of the Fullerton Mathematical Circle is inspired from similar activities done in Central Europe over the last century, with Universities offering enrichment programs to interested young gifted mathematicians. The project consists of offering mathematical sessions for gifted middle school and high school students. Each session usually begins with a mini-lecture, then the students are divided into small groups thereby enabling active engagement in the problem solving process. We illustrate our outreach classroom work with students in grades 5-6, based on problems inspired by the tradition of Hungarian school (Abacus International Challenge) and Romanian school (Gazeta matematica).

**Talk theme(s):** (1) Education/Pedagogy, and (2) Algebra

**Audience:** Undergraduate. All are welcome!

**Talk 4 11:30 AM:**

**Presenter(s):** Hala King (F), Cal Lutheran U
**Other Author(s):** Dr. Nathan Carlson, Dr. Michael Gagliardo, Cal Lutheran U

**Title:** The Thousand Oaks Math Teachers Circle: Finding purpose

**Abstract:** There is a growing Math Teachers’ Circle movement in the U.S. endorsed by national math organizations. The mission of the national Math Teachers’ Circle (MTC) program, developed at the American Institute of Mathematics (AIM), is to create the foundation for a culture of problem-solving and love of discovery among middle and high school math teachers. The first MTC was started at AIM in 2006, and there are currently more than 50 active circles. The seeds for the Thousand Oaks MTC were planted four years ago, and bloomed after attending a workshop at AIM. Since then, we have grown from an idea to an established and well-attended circle thanks to the dedication of many, to the support or our colleagues in the School of Education, and to the grants we received. In this talk, we discuss the evolution of our circle.

**Talk theme(s):** Education/pedagogy

**Audience:** Undergraduate. All are welcome!

**Themes:** History of Math; Geometry and Lineary Algebra

**Moderator:** Berit Givens

**Location:** Lincoln 01-125
Talk 1 10:30 am:

**Presenter(s):** Isabel Serrano (U), CSU Fullerton  
**Other Author(s):** Bogdan D. Suceavă (F), CSU Fullerton  
**Title:** Remarks on Nicole Oresme’s Definition of Curvitas  
**Abstract:** In a paper published in 1952, J. L. Coolidge points out that “the first writer to give a hint of the definition of curvature was the fourteenth century writer Nicolas Oresme”. Coolidge also comments: “Oresme conceived the curvature of a circle as inversely proportional to the radius; how did he find this out?” This question is the starting point of our investigation. It is established that the *Tractatus de configurationibus qualitatum et motuum* has been written by Orseme sometime between 1351 and 1355. We study N. Orseme’s original work in the scholarly environment of his time and describe the originality of his contribution.  
**Talk theme(s):** (1) History and Philosophy of Mathematics, and (2) Geometry  
**Audience:** Undergraduate. All are welcome!

Talk 2 10:50 am:

**Presenter(s):** James Shade (U), CSU Fullerton  
**Other Author(s):** Adam Glesser (F), Bogdan D. Suceavă (F), CSU Fullerton  
**Title:** On the Inverse Curvature Problem  
**Abstract:** The present work aims to explore a question that may be classical in differential geometry, and could turn out to be a nice training ground at the calculus level, either as a research project or as class project: *how much about a curve is determined by its curvature?* Inverse problems are fairly ubiquitous in mathematics (e.g., the inverse Galois problem, or the inverse geodetic problem) and are, frequently, as or more difficult than the original problem. We pose and investigate the Inverse Curvature Problem, that is, we explore when elements of a certain family of monomials represent the curvature function of a curve specified by combinations of elementary functions. The main result utilizes an integration theorem of Chebyshev.  
**Talk theme(s):** (1) Analysis, and (2) Geometry  
**Audience:** Undergraduate. All are welcome!

Talk 3 11:10 am:

**Presenter(s):** Brenna Biggs (U), CSU Fullerton  
**Other Author(s):** Bogdan D. Suceavă (F), CSU Fullerton  
**Title:** Remarks on the Maximum Values for Classical Curvature Invariants for Smooth Three-Dimensional Hypersurfaces  
**Abstract:** The mean curvature $H$, scalar curvature $s$ and Gauss-Kronecker curvature $K$ are the natural curvature invariants for a three-dimensional smooth hypersurface in the four dimensional Euclidean ambient space. At every point of the hypersurface $H$, $s$, and
$K$ can be defined in function of the principal curvatures. The present project studies the range of these classical curvature invariants, $H$, $s$, and $K$, for a compact three-dimensional smooth hypersurface in the four dimensional Euclidean ambient space, under certain natural constraints described also in terms of curvature.

**Talk theme(s):** (1) Geometry (namely Differential Geometry), and (2) Linear Algebra

**Audience:** Undergraduate. All are welcome!

**Talk 4 11:30 am:**

**Presenter(s):** Yevgeniya Tarasova (U), UCSB

**Other Author(s):** Lee Kennard (postdoc), UCSB

**Title:** On linear Weingarten surfaces

**Abstract:** A Weingarten surface is a smooth surface in Euclidean 3-space where there exists some relation $f(\kappa_1, \kappa_2) = 0$ among the principal curvatures $\kappa_1$ and $\kappa_2$. Examples include the sphere, as well as surfaces with constant Gauss curvature or constant mean curvature. Linear Weingarten surfaces are a subcategory where the function $f$ is linear, but not even these are classified. Indeed, minimal surfaces are examples of linear Weingarten surfaces. The simplest case of a linear Weingarten surface is an isoparametric surface, where both principal curvatures are constant. These were classified by Levi-Cevita in the 1930s. In a generalization of this work, Massey and Shiohama-Takagi in the 1960s classified surfaces for which one of the principal curvatures is constant. In this talk, we will review this work and discuss our current work on the classification of surfaces where the difference between the principal curvatures is constant.

**Talk theme(s):** Geometry and Linear Algebra

**Audience:** Desired background: calculus and linear algebra

**Talk 5 11:50 am:**

**Presenter(s):** Christopher Knowles (U), CSU Channel Islands

**Other Author(s):** Jessica Adlolf (U), Gradon Faulkner (U), Dr. Ivona Grzegorczyk (F), CSU Channel Islands

**Title:** Properties of Degree Four Algebraic Surfaces: Dance, Helix, and Miau

**Abstract:** We study the properties of three degree four algebraic surfaces, in particular the algebraic varieties $x^4 - x^2 - (yz)^2 = 0$ (Dance), $2x^4 + y^2z^2 - 6x^2 = 0$ (Helix), and $2x^2yz + x^2z^2 + 2y^3z + 3y^3 = 0$ (Miau). We will be looking at the singularities, symmetry groups, tangent planes, curvatures, deformations, and projective spaces of our surfaces. We show some new properties.

**Talk theme(s):** Geometry and Linear Algebra

**Audience:** Graduate. Undergraduates are welcome!

**Talk 6 12:10 pm:**

**Presenter(s):** Marshall Whittlesey (F), CSU San Marcos
Title: Inequalities in Spherical Geometry - Ancient and Modern

Abstract: We discuss a number of inequalities in spherical geometry, some of which are the same as in plane geometry (e.g., the triangle inequality) and others which are not (e.g., the exterior angle theorem.) We give some simple proofs of them and show some connections via duality relationships in spherical geometry. We also discuss their appearance in ancient work of Menelaus and make connections to problems in astronomy.

Talk theme(s): Geometry and Linear Algebra

Audience: high school geometry is enough. Main theme: Geometry/linear algebra

Themes: Number Theory; Applied Math

Moderator: Bruce Yoshiwara

Location: Lincoln 01-135

Talk 1 10:30 AM:

Presenter(s): Alvin Kim, Calle Mayor Middle School student

Other Author(s): Bogdan D. Suceavă (F), CSU Fullerton

Title: Solutions to Number Theory Problems

Abstract: We present solutions to several number theory problems. Some of the problems have originally been published in Gazeta matematica and distributed during the workshops of the Fullerton Mathematical Circle, while the others come from the American Invitation Mathematics Examination. The techniques used in the solutions consists of mainly two things: divisibility and factorization.

Talk theme(s): (1) Number Theory, and (2) Education/Pedagogy

Audience: Undergraduate. All are welcome!

Talk 2 10:50 AM:

Presenter(s): Shreya Havaldar, 10th grade student, Troy High School

Other Author(s): Bogdan D. Suceavă (F), CSU Fullerton

Title: On Elementary Number Theory

Abstract: The presentation solves a few Number Theory problems previously published in the Revista Matematica din Timisoara journal. This journal has printed many interesting problems in several areas of mathematics, especially in elementary number theory. The selected problems in this presentation, originating from the 1930s, all deal with interesting twists around squares of numbers. The presentation showcases solutions to these problems using high school math knowledge at the sophomore level and some elementary number theory understanding. The solutions were inspired by a workshop on number theory at the Fullerton Mathematical Circle earlier this year.

Talk theme(s): Number Theory

Audience: Undergraduate. All are welcome!