Matemática nas Américas

Titles and Abstracts

Javier Bracho
(Tuesday, 17 / 9:30 – 10:00 am)

A Helly type theorem for abstract projective geometries.

Abstract:
At the heart of some results about flat transversals to families of convex sets, a "strange" Helly type theorem arises. It holds in very abstract settings for projective geometry. The talk will address its "strangeness" and how it came to be.

Robert Bryant
(Tuesday, 17 / 12:00 – 12:30pm)

On the Affine Bonnet Problem

Abstract:
The classical Euclidean problem studied by Bonnet was to determine whether, and in how many ways, a Riemannian surface can be isometrically embedded into Euclidean 3-space so that its mean curvature is a prescribed function. He found that, generically, specifying the metric and mean curvature allowed no solution but that there are special cases in which, not only are there solutions, but there are even 1-parameter families of distinct solutions. Much later, these `Bonnet surfaces' were found to be intimately connected with integrable systems and Lax pairs.

In this talk, I will consider the analogous problem in affine geometry: To determine whether, and in how many ways, a surface endowed with a Riemannian metric g and a function H can be immersed into affine 3-space in such a way that the induced Blaschke metric is g and the induced affine mean curvature is H. This affine problem is, in many ways, richer and more interesting than the corresponding Euclidean problem. I will classify the pairs (g, H) that display the greatest flexibility in their solution space and tell what is known about the (suspected) links with integrable systems and Lax pairs.

Brian Conrey
(Monday, 16 / 05:00 – 5:30pm)

L-functions and random matrix theory

Abstract:
In the last 10 years Random Matrix Theory has had a large influence in Analytic Number Theory. We'll describe some of the results and ideas that have come out of the interpaly between these two fields.

Carlos Di Prisco
(Monday, 16 / 04:30 – 5:00pm)

Ramsey properties of sets of real numbers.

Abstract:
The fast development of Ramsey theory has uncovered its deep connections with other areas of mathematics. We will review some aspects of the theory, focusing on those which refer to properties of sets of real numbers. We will consider the Ramsey property for subsets of the Baire space, and a variation defined in terms of product of finite sets. This variation is motivated by the following question: Given a subset A of the Baire space, is there s sequence of finite sets of natural numbers whose product is either contained in A or disjoint from A?
The answer to this and some related question is positive if the set A is Borel, or even analitic. We explore what is the case for more general classes of subsets of the Baire space and present some open questions.

Isabel Dotti
(Monday, 16 / 04:00 – 4:30pm)

Geometric structures on nilmanifolds. Some algebraic restrictions.

Walter Ferrer
(Monday, 16 / 03:00 – 3:30pm)

Integral methods vs differential methods in invariant theory

Abstract:
One of the more important pioneering results in modern algebraic invariant theory is due to Hilbert that used Cayley's differential operator (the Ω process) to prove the finite generation of rings of invariants of the general linear group. After the work of Hurwicz and Weyl, the differential methods were substituted by integral averaging methods -- Reynolds operators-- that allowed to produce large numbers of invariants in a natural manner. Recently --in joint work with A. Rittatore -- we have defined Ω process for general reductive monoids, and used them to prove "à la Hilbert" the finite generation of the invariants.

José Ramírez
(Monday, 16 / 02:30 – 3:00pm)

Universality for Wigner Matrices

Abstract:
We consider Wigner random matrices, hermit an random matrices with independent entries. We review some recent results which prove that, under certain quite general conditions, the two point correlation function for the eigenvalues in the bulk converges to the Dyson sine kernel. It means that all Wigner random matrices behave like the Gaussian ones in the above sense.

Geraldo Silva - UNESP
(Monday, 16 / 02:00 – 2:30pm)

Dynamical Inclusions in Time Scales: Compactness and Existence of Solutions

Abstract:
We consider vector dynamic inclusions on time scales. We extended to this class of inclusions the result of compactness of trajectories. This result is combined with solutions of Euler, which is also introduced in this work, to ensure the existence of trajectory when the vector field of the dynamic inclusion is upper semicontinuous, besides usual hypotheses of convexity and compactness. We also provide existence of solutions to the dynamic inclusion in time scales when the vector field is lower semicontinuous. This is accomplished by taking a continuous vector field selection and applying to the resulting equation the Shauder´s Fixed point theorem. We also consider a related optimal control problem and show that it has admissible optimal trajectories whenever the admissible solution set is nonempty and the field satisfies standard measurability, convexity, compactness and linear growth hypotheses.

J. A. de La Peña
(Monday, 16 / 06:00 – 6:15pm)

The Mexican bid

C. Montenegro
(Monday, 16 / 05:45 – 6:00pm)

The Colombian bid

Alf Onshuus
(Tuesday, 17 / 11:30am – 12:30pm)

The algebraic numbers definable in complex exponential fields.

Abstract:
We prove the following theorems:

Theorem 1: For any exponential complex field (E-field) with cyclic kernel --in particular for $\mathbb C$ or the Zilber fields-- all real abelian algebraic numbers are pointwise definable.
Theorem 2: For the Zilber fields,the only pointwise definable algebraic numbers are the real abelian numbers.

In particular, this completes the characterization of the definable algebraic numbers in the complex exponential field assuming Schanuel's conjecture.

Luis Ramiro Piñeiro
(Tuesday, 17 / 10:00 – 10:30am)

Aproximación racional y ortogonalidad

Luis Miguel Torres
(Tuesday, 17 / 11:00 – 11:30am)

Optimization at 2,800m: Introducing the RGO at EPN-Quito

Abstract:
This talk is a survey about the current status of research on mathematical optimization in Ecuador. More specifically, I will refer to the case of the Research Group in Optimization at the Escuela Politécnica Nacional in Quito, describe how it was born as the product of international cooperation and how it has been changing (and continues to change) the landscape of applied mathematics research in Ecuador. Moreover, the role of the Ecuadorian Society of Mathematics within this process will also be addressed.