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Sesión Especial “Análisis Armónico y Mecánica de Fluidos”

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Global in time solutions for the two-phase gravity Stokes flow.

Elena Salguero

Palabras clave: Gravity-Stokes flow, Incompressible fluids, Global solutions

Resumen

The gravity-Stokes system serves as a fundamental model for understanding the dynamics of incompressible fluids in certain regimes. We focus on the scenario where two fluids of different densities interact in a two-dimensional region without mixing. The density difference together with the gravity influence induce the dynamics of the two fluids and hence the evolution of the free interface arising between them. Through a contour dynamics approach, we address questions such as the existence of global solutions for this system and their asymptotic behavior, making emphasis on the properties of the free boundary. This talk is based in joint work with F. Gancedo and R. Granero Belinchón.

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Unidirectional flocks in Collective Dynamics

Daniel Lear Claveras

Palabras clave: Cucker-Smale model, Collective Dynamics

Resumen

In this talk we will focus on the so-called Cucker-Smale model, which encode one of the simplest communication protocols that lead to emergence of two fundamental phenomena of collective action: alignment and flocking. Such systems arise in a variety of applications including biological, social and technological contexts. The problems of global well-posedness, long time behavior, and stability of flocks on the macroscopic level will be addressed. In addition, we introduce and discuss unidirectional flocks, which allows us to obtain some results in higher dimensions.

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Turning Singularities for the Muskat problem with quadratic growth

Omar Sánchez

Palabras clave: Muskat problem, Turning singularities

Resumen

In this talk, we focus on the study of turning singularities for the Muskat problem when the interface is parameterized as

$$\mathbf{z}(\alpha, t) = \mathbf{d}(\alpha, t) + (\alpha, \alpha^2 + ct).$$

As a first step, we apply the Cauchy–Kovalevskaya theorem to obtain local existence of solutions in an analytic setting. Thus, we will define an operator F over a scale of Banach X_r . The second step will be the construction of an initial data that turn over in a finite time.

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On the analyticity of the trajectories of the particles in the patch problem for some active scalar equations.

Joan Mateu Bennassar

Palabras clave: Euler equation, Patch problem

Resumen

Let Ω be a bounded domain in \mathbb{R}^n whose boundary is $C^{1,\gamma}$ for $\gamma \in (0, 1)$. Consider 2D Euler equation for the vorticity or the n -D aggregation equation in the case of the initial condition being a positive multiple of the characteristic function of Ω . In this talk we discuss on global in time analyticity of the flow generated by the velocity field which propagates the vorticity or density solution respectively. These results are obtained from a detailed study of the Beurling or Riesz transform, that represents derivatives of the velocity field. The precise estimates obtained for the solutions of an equation satisfied by the Lagrangian flow, are a key point in the development.

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Cousin's Problems I and II: The bicomplex Case

Luis Manuel Tovar S.

Palabras clave: Cousin's problems, Mittag–Leffler's theorems

Resumen

I present the bicomplex versions of Cousin's problems I and II, as well as their relationship with the bicomplex versions of Weierstrass' and Mittag-Leffler's theorems. We establish relations between these theorems and Cousin's problems, which reveal peculiarities of bicomplex meromorphic function theory and harmonic function theory.

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Espacios alcanzables de una ecuación parabólica degenerada/singular en el semieje

Francisco Marcos López García

Palabras clave: Espacios de Hilbert, Espacio de Bergman ponderado, Ecuación parabólica degenerada/singular

Resumen

Recientemente se probó que el espacio alcanzable de la ecuación del calor es un espacio de Bergman definido en un cuadrado del plano complejo. En esta plática mostramos que los espacios alcanzables de cierta ecuación parabólica degenerada/singular en el semieje, también son espacios de Hilbert con núcleo reproductor, uno de los cuales está relacionado con un espacio de Bergman ponderado.

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Conjugate Complex Harmonic Functions

Yesenia Bravo Ortega

Palabras clave: Bicomplex holomorphic function

Resumen

This paper presents several properties and relations that satisfy the components of a bicomplex holomorphic function. It also exhibits several analogies and differences with the case of analytic functions.

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Bicomplex Cauchy's Theorem: several versions

Lino F. Reséndis Ocampo

Palabras clave: Bicomplex Holomorphic Theory, Cauchy's theorem

Resumen

Ghosh and Mondal in [GhMo] study bicomplex line integrals through idempotent decomposition. In this talk the same is done but using the canonical bicomplex notation $Z_1 + jZ_2$, finding in a very different way the results of that article with several additional properties and consequences. In particular we present the bicomplex generalizations of various versions of Cauchy's theorem given in John B. Conway's book [Co]. In the book of Luna et al [LuShStVa] Theorem 11.1.1, they present a bicomplex version of Cauchy's Theorem by integrating on a piecewise smooth curve which is the boundary of a two dimensional, piecewise smooth surface. In this paper we just require that the curve be closed rectifiable and homotopic to zero in the domain or that the first group of homotopy of the domain be zero. Some results on primitives and Morera's Theorem for bicomplex holomorphic functions are obtained. Although the idempotent version of bicomplex numbers and bicomplex holomorphic functions is very useful to generalize results in Bicomplex Holomorphic Theory in this paper it is not the fundamental tool at all.

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