IMS PDE Workshop

July 15-16, 2016 (Friday & Saturday)

TITLE & ABSTRACT

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On the function Spaces for liquid crystals

Dr. Yutao DING
The Institute of Mathematical Sciences, The Chinese University of Hong Kong

Motivated by the report of John Ball on "Workshop on Solid and Liquid Crystal" recently, we'll discuss some comprehension and problems on the function Spaces for liquid crystals.

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Global well-posedness of the Boltzmann equation

Professor Renjun DUAN
Department of Mathematics, The Chinese University of Hong Kong

We give two results on global well-posedness of the Cauchy problem on the Boltz-mann equation. The first one is concerned with strong solutions in spatially critical Besov space in L^2 framework for small initial data around global Maxwellians, and the second one is related to mild solutions in L^∞ framework for initial data allowed to have large amplitude and contain vacuum.

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Qualitative analysis, exact solutions and numerical solutions of several dynamic equations on time scales and fractional differential equations

Professor Qinghua FENG
School of Science, Shandong University of Technology

The following three topics are included. First, qualitative analysis such as boundedness, continuous dependency on initial value, oscillatory and asymptotic properties for several dynamic equations on time scales and fractional differential equations will be discussed. Second, methods for finding exact solutions of fractional differential equations, differential-difference equations, and fractional differential-difference equations will be discussed. Finally, alternating group parallel algorithms for fractional differential equations will be discussed.

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Free boundary problem of incompressible MHD equations

Professor Xumin GU
School of Mathematics, Shanghai University of Finance and Economics

In this talk, we will discuss local well-posedness of incompressible MHD equations with free boundary. This system is one of mathematical models which describe the evolution of vacuum-plasma interface.

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Maximal hypoellipticity and compactness of the resolvent for the Witten Laplacian

Professor Wei-Xi LI
School of Mathematics and Statistics, Wuhan University

In this talk we will give a sufficient condition for the maximal hypoellipticity for some systems related to Witten Laplacian, and the compactness criteria for the resolvent of Witten Laplacian.

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Existence of Magnetic Compressible Fluid Stars

Professor Tao LUO
Department of Mathematics, City University of Hong Kong

In this talk, I will present a result of the existence of magnetic star solutions which are axi-symmetric stationary solutions for the EulerPoisson system of compressible fluids coupled to a magnetic field , proved by a variational method. The method of proof consistsin deriving an elliptic equation for the magnetic potential in cylindrical coordinates in R^3, and obtaining the estimates of the Greens function for this elliptic equation by transforming it to 5-Laplacian.

This is a joint work with Paul Federbush and Joel Smoller.

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Nonlinear instability of the gaseous stars with surface tension

Professor Xueke PU
School of Mathematics and Statistics, Chongqing University

In this talk, we consider the nonlinear instability of the Lane-Emdem type solutions for the spherically symmetric motions of the inviscid polytropic gaseous stars with surface tension under the Euler-Poisson equation when $6/5 < \gamma < 4/3$.

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Existence and multiplicity of solutions for several categories Choquard equations with general nonlinearities

Professor Zifei SHEN
Department of Mathematics, Zhejiang Normal University

We main introduce some existence and multiplicity results for the critical nonhomogeneous Choquard equation, and a class of nonlinear Choquard equation with Hardy-Littlewood-Sobolev critical exponents, and nonlinear Choquard equation with Dirichlet boundary condition by using variational methods.

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Dissipativity and stability of BDFs for fractional nonlinear ODEs

Professor Dongling WANG
School of Mathematics Science and Center for Nonlinear Studies, Northwest University

In the recent paper [D. Wang and A. Xiao, Nonlinear Dynam., 80 (2015), pp. 287-294], we established the dissipativity and contractivity of Caputo fractional nonlinear systems. In this paper, we further study the corresponding numerical properties of fractional backward differentiation formulas (F-BDFs). Firstly, we construct the F-BDFs based on three popular numerical approximations to Caputo derivative, including the Grunwald-Letnikov formula, L1 method and Lubichs linear multistep methods. Secondly, we provide a new asymptotic property for the solution of a linear Volterra difference equation to show that all the above methods are numerical dissipative and contractive, and the methods are also proved to be exactly capable of the contractivity rate as the continuous equations. Finally, several numerical examples are given to illustrate the advantages of the structure-preserving numerical methods, and some possible interesting extensions are also discussed.

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Stability of Viscous Contact Wave for compressible Navier-Stokes equations and bipolar Vlasov-Poisson-Boltzmann system

Dr. Teng WANG
Department of Mathematics, School of Science, Beijing Forestry University

In this talk, I will show that the viscous contact wave for the non-isentropic polytropic gas is stable under large initial perturbation without the condition that the adiabatic exponent γ is close to 1. And the time-asymptotic stability of the viscous contact wave is proved for the bipolar Vlasov-Poisson-Boltzmann system by a new micro-macro decomposition around the local Maxwellian related to the bipolar VPB system.

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The Vlasov-Poisson-Landau system in R_x^3

Professor Yanjin WANG
School of Mathematical Sciences, Xiamen University

We construct the global unique solution near a global Maxwellian to the Vlasov-Poisson-Landau system in the whole space. The total density of two species of particles decays at the optimal algebraic rates as the Landau equation in the whole space, but the disparity between two species and the electric potential decay atthe faster rates as the Vlasov-Poisson-Landau system in a periodic box.

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Recent progress on classical solutions for compressible isentropic Navier-Stokes equations with degenerate viscosities and vacuum

Dr. Shengguo ZHU
The Institute of Mathematical Sciences, The Chinese University of Hong Kong

We survey some of our recent progress on the well-posedness problem for classical solutions to the multi-dimensional compressible Navier-Stokes Equations with density dependent viscosities when initial density does not have a uniform positive lower bound.