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Gustavo de Oliveira - DM-UFSCar

Quantitative derivation of the Gross-Pitaevskii equation

Abstract: In experiments, Bose-Einstein condensates are prepared by cooling a dilute gas
of Bosons confined in a trap. After the condensate phase is reached, the trap is switched off and the evolution of the condensate is observed. Microscopically, this dynamics is described by the N-body Schrödinger equation. In our work, we construct a class of initial data in Fock space, which are energetically close to the ground state of the condensate, and prove that their evolution is effectively described by the Gross-Pitaevskii equation. The key idea is to model the two-particle correlation by using a Bogoliubov transformation. We will present the main steps of this construction. (This is joint work with Niels Benedikter and Benjamin Schlein).

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Title: Super-Stable Points & Phase Transitions

Author: Nerses S. Ananikian - Yerevan (Armenia)

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Abstract: It is providing the analytical solutions for the super-stable cycles of the second order for the Q-state Potts (QSP) and the three-site interaction anti-ferromagnetic Ising (TSAI) models. A particular attention is devoted to the period three window and presented an exact result for the third order super-stable orbit for the QSP and a numerical solution for the TSAI models of 1D rational mapping.

By using dynamical approach for multi-dimensional mappings (recursion relations) of the partition function it is found the existence of magnetization plateaus in the third layer of 3He absorbed on the surface of graphite on a kagome chain. The maximal Lyapunov exponent exhibits also plateau coinciding with the magnetization one.

The exactly solvable spin-1/2 Ising–Heisenberg model on a diamond chain has been considered by using two-dimensional rational mapping. The existence of the magnetization plateau has been observed in the anti-ferromagnetic case at low temperatures. For the first time it is shown that the super-stable point coincides with phase transition one of the spin-1/2 Ising–Heisenberg model. The partition function zeros are studied also in the anti-ferromagnetic spin-1/2 Ising–Heisenberg model on a diamond chain.

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Pedro Lopes - DM-UFSCar

Regularity in Gelfand-Shilov spaces and exponential decay for elliptic boundary value problems.

In this talk we will present some partial results obtained for the regularity in Gelfand-Shilov spaces for elliptic boundary value problems.

It will be divided in three parts:

1) We present the recent results obtained by Capiello, Nicola, Rodino among others about the exponential decay of certain elliptic differential equations using Gelfand-Shilov functions. They deal mainly with SG pseudodifferential operators, with applications on traveling waves equations and with Shubin pseudodifferential operators with applications on the quantum mechanics' harmonic oscillator differential equation.

2) We review some results that use exactly the same type of pseudodifferential operators in the study of elliptic boundary value problems.

3) We will show some results obtained about regularity of Gelfand-Shilov type for elliptic boundary value problems with equations of the same type of the first and second part.

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Silas Carvalho - DM- UFMG

Title: Spectral Packing Dimensions through Power-Law Subordinacy

Abstract: We offer a method of classification of spectral measures of discrete one-dimensional Schrödinger operators with respect to packing measures, which can be seen as dual to results for Hausdorff measures in subordinacy theory. We apply this method to classes of sparse operators, and give an example whose spectral measure has different Hausdorff and packing dimensions, and others for which such dimensions coincide. Some dynamical motivations are also mentioned.

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Renan Romano - DM-UFSCar

Title: The Aharonov-Bohm effect without interaction with the solenoid border.

Abstract: One of the biggest problem in the mathematical modeling of the Aharonov-Bohm Effect is the interaction between the electron and the solenoid border. Such interaction translates into boundary conditions on that border, which causes great ambiguity. In quantum mechanics this conditions represents self-adjoint extensions of the Schrödinger operator of the problem.

On the other hand, recent works has demonstrated that it is possible to confine quantum particles in certain regions of R^{n} with magnetic fields sufficientily intense near the border of that region.

In this work we intend to combine the two situations mentions above to study the Aharonov-Bohm effect in the plane, adding then external magnetic fields and potentials that are suffiently intense in the solenoid border so that the related Schrödinger operator is essentially self-adjoint.

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Ricardo Gallego - DM-UFSCar

Title: A new observable for radiation reaction in point particle classical electrodynamics models

Abstract: In this talk, after reviewing several models for radiation reaction in classical electrodynamics, the actions of parity inversion, time inversion and charge conjugation transformations on the corresponding differential equations for a classical point charged particle are described. Based on such symmetries, we consider a new observable quantity Δ_q which is sensitive to deviations from the standard Lorentz force equation when radiation reaction is present. We argue that Δ_q could be observable with present or near future technology.