LXXXVI Encuentro Anual. Talca 2017
Sociedad de Matemática de Chile

Quantum resonances and exponential decay

Claudio Fernández *

Abstract

We present a strategy to establish almost exponential decay for quantum resonances. This is based in estimating, in an explicit manner, the behavior of the Fourier transform of functions resembling a Lorenztian,

$$\frac{1}{\pi}\frac{\epsilon}{(\lambda-\lambda_0)^2+\epsilon^2}$$

We use this result in the case of a Hamiltonian having an embedded eigenvalue that's dissolved after adding a small perturbation.

Above is a collaboration with O. Bourget (PUC, Chile), V.Cortés (PUC, Chile) and R. Del Río (UNAM, México).

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One the shape of one-phase free boundaries in the plane

Nikola Kamburov *

Abstract

The one-phase free boundary problem in the plane models 2D jet flows and hollow vortices. We study its solutions under a topological constraint and obtain rigidity estimates on the shape of their free boundaries. Our results turn out to be direct counterparts to theorems in the minimal surface literature. This is joint work with David Jerison (MIT).

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LXXXVI Encuentro Anual. Talca 2017
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MULTI-FOLD CONTOUR INTEGRALS OF CERTAIN RATIOS OF EULER GAMMA FUNCTIONS FROM FEYNMAN DIAGRAMS

IGOR KONDRASHUK *

Abstract

We construct a family of contour integrals of ratio of certain products of Euler gamma functions and show that the result is a linear combination of several ratios of other products of Euler gamma functions. This result corresponds to a diagrammatic relation from quantum field theory representing Belokurov-Usyukina method of loop reduction. These integrals were calculated via an implicit trick in Refs. [1, 2, 3] and in an explicit way were calculated in Ref. [4]. The integrals of this family come from Mellin-Barnes representation of Feynman diagrams related by various diagrammatic relations. Graphically the corresponding diagrammatic relations look like Bethe-Salpeter equations or like Dyson-Schwinger equations. The results presented in this talk are generalization of the results published in Ref. [4].

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LXXXVI Encuentro Anual. Talca 2017
Sociedad de Matemática de Chile

Resonancias en guías de ondas torcidas

Pablo Miranda *

Abstract

En esta charla consideraremos el Laplaciano para una guía de ondas recta, la cual será torcida localmente. Se sabe que tal perturbación no crea nuevos valores propios. Sin embargo, es posible definir una extension meromorfa de la resolvente del Laplaciano perturbado, la que nos permite mostrar que existe exactamente una resonancia cerca de ínfimo del espectro esencial. Calcularemos también el comportamiento asintótico de esta resonancia, en función del tamaño del torcimiento. Por último daremos una idea de como extender estos resultados para los "umbrales" superiores en el espectro del Laplaciano no perturbado.

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LXXXVI Encuentro Anual. Talca 2017
Sociedad de Matemática de Chile

From Anderson models to GOE statistics

Christian Sadel *

Abstract

We first prove some SDE limit result for products of random matrices. We then apply this to transfer matrices of block-Jacobi operators which we use to obtain limiting statistics for Anderson models on long strips under proper re-scaling of the randomness. With the correct sequence of limits we obtain a random matrix ensemble and finally the Sine_1 kernel. Finally we construct a sequence of graphs (antitrees) where some averaging effect of a random potential mimics the re-scaling in the step before. This way we obtain a sequence of random matrices with randomness of fixed strength (disorder) only along the diagonal for which we have limiting GOE statistics (Sine_1 process).

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LXXXVI Encuentro Anual. Talca 2017
Sociedad de Matemática de Chile

Quantizations on general locally compact groups

Maximiliano Sandoval *

Abstract

This mini-talk consist of an brief introduction to the theory of Quantizations and Pseudo-differential calculus in the case when one Replaces the Additive group of real numbers with a general locally compact group. We show how the theory looks in the special case of Nilpotent groups, where we can make use of Kirillov's Orbit method.

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Interacting bosons in a double-well potential: localization regime

Dominique Spehner *

Abstract

We study the ground state of a large bosonic system trapped in a symmetric double-well potential, letting the distance between the two wells increase to infinity with the number of particles. In this context, one expects an interaction-driven transition between a delocalized state (the particles are independent and live in both wells) and a localized state (half of the particles live in each well). We start from the full many-body Schrdinger Hamiltonian in a large-filling situation where the on-site interactions and kinetic energies are comparable. When tunneling is negligible against the interaction energy, we prove a localization estimate showing that the particle number fluctuations in each well are strongly reduced. The modes in which the particles condense are minimizers of nonlinear-Schrdinger-type functionals.

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LXXXVI Encuentro Anual. Talca 2017
Sociedad de Matemática de Chile

Bispectralidad y Sistemas de Partículas Cuánticas Integrables

Jan Felipe van Diejen *

Abstract

En 1985 Duistermaat y Grnbaum introdujeron el concepto del llamado "problema bispectral". En breve, un problema espectral se llama bispectral si la función propia satisface además una ecuación diferencial lineal en el parámetro espectral. En esta charla explicaremos como la noción de bispectralidad nos provee de una herramienta poderosa en el estudio de las funciones propias de sistemas de partículas cuánticas integrables.

(Trabajo en conjunto con Erdal Emsiz, PUC.)

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