Grupo de Física Matemática
da Universidade de Lisboa

SEMINÁRIO DE FÍSICA-MATEMÁTICA

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"Isoperimetric Inequalities for the Robin Laplacian"

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Abstract

Isoperimetric inequalities link partial differential equations with certain basic and fundamental geometric properties of the underlying domains on which they are defined. The typical problem is to identify the domain of given area on which a particular eigenvalue, or function of eigenvalues, of a PDE is minimised or maximised. Much attention has been devoted over the last century to various isoperimetric inequalities for the Dirichlet and Neumann Laplacians, such as the celebrated Faber-Krahn inequality for the first Dirichlet eigenvalue.

In this talk we will discuss some recent results concerning the Laplacian with Robin, or third, boundary conditions $\frac{\partial u}{\partial \nu} + \alpha u = 0$, $\alpha > 0$. We will give isoperimetric inequalities for the first two eigenvalues, and discuss some properties of potential minimising domains for the higher eigenvalues, a topic of ongoing research here within the GFM. We will also briefly discuss the case $\alpha < 0$, where far less is known, except in the asymptotic case that $\alpha \to -\infty$. Part of the new material presented is joint work with Daniel Daners.

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