Perturbation of the Robin eigenvalues of the p–Laplacian operator

Authors:

- José C. Sabina de Lis, Departamento de Análisis Matemático, Universidad de La Laguna (`josabina@ull.edu.es`)

- Sergio Segura de León, Departament d'Anàlisi Matemàtica, Universitat de Valéncia (`sergio.segura@uv.es`)

Abstract:

In this talk[1] we are concerned with the Robin eigenvalue problem for the p–Laplacian. Namely,

$$\begin{cases} -\Delta_p u = \lambda |u|^{p-2}u, & x \in \Omega \\ |\nabla u|^{p-2}\nabla u \cdot \nu + b|u|^{p-2}u = 0, & x \in \partial\Omega. \end{cases}$$

Here $\Omega \subset \mathbb{R}^N$ is a bounded smooth domain, ν stands for its unitary outward field, $-\Delta_p u = \operatorname{div} |\nabla u|^{p-2}\nabla u$ is the p–Laplacian operator and $b(x) \in L^\infty(\partial\Omega)$. Exponent $p > 1$ is regarded as the key parameter in our study. Some of the main features to be discussed are: i) the continuos dependence on p of the higher eigenvalues, ii) the existence of their limit as p goes to 1 and iii) the eigenvalue problem satisfied by the limit of the corresponding eigenfunctions as $p \to 1$. The so–called 1–Laplacian operator is involved in the latter problem. The reported research appears in [1] and provides the continuation of [2] to the Robin problem.

References:

[1] Sabina de Lis C., Segura de León S., *The limit as $p \to 1$ of the higher eigenvalues of the p–Laplacian operator Δ_p*. Indiana Univ. Math. J. **70** (2021), no. 4, 1395–1439.

[2] Sabina de Lis C., Segura de León S., *Higher Robin eigenvalues for the p–Laplacian operator as p approaches* 1. Submitted for publication (2024).

---

[1]It is going to be presented in a Mini symposium organized by Pedro Martínez Aparicio and Alexis Molino: M01, Advances in the Studies of PDE's.