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On the eigenvalues of a Robin problem with a large parameter. (English) Zbl 1340.35238
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Summary: We consider the Robin eigenvalue problem $\Delta u + \lambda u = 0$ in Ω, $\partial u/\partial \nu + \alpha u = 0$ on $\partial\Omega$ where $\Omega \subset \mathbb{R}^n$, $n \geqslant 2$ is a bounded domain and α is a real parameter. We investigate the behavior of the eigenvalues $\lambda_k(\alpha)$ of this problem as functions of the parameter α. We analyze the monotonicity and convexity properties of the eigenvalues and give a variational proof of the formula for the derivative $\lambda_1'(\alpha)$. Assuming that the boundary $\partial\Omega$ is of class C^2 we obtain estimates to the difference $\lambda_k^D - \lambda_k(\alpha)$ between the k-th eigenvalue of the Laplace operator with Dirichlet boundary condition in Ω and the corresponding Robin eigenvalue for positive values of α for every $k = 1, 2, \ldots$.

MSC:

35P15 Estimates of eigenvalues in context of PDEs
35J05 Laplace operator, Helmholtz equation (reduced wave equation), Poisson equation

Cited in **7** Documents

Keywords:

Laplace operator; Robin boundary condition; eigenvalues; large parameter

Full Text: Link

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