

Estimates of the principal eigenvalue of the p -Laplacian and the p -biharmonic operator

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We provide estimates from below and from above for the principal eigenvalue of the eigenvalue problem for the p -Laplacian with Dirichlet boundary conditions

$$\begin{cases} -\operatorname{div}(|\nabla u|^{p-2}\nabla u) = \lambda|u|^{p-2}u & \text{in } \Omega, \\ u = 0 & \text{on } \partial\Omega, \end{cases}$$

and the eigenvalue problem for the p -biharmonic operator with Navier boundary conditions

$$\begin{cases} \Delta(|\Delta u|^{p-2}\Delta u) = \lambda|u|^{p-2}u & \text{in } \Omega, \\ u = \Delta u = 0 & \text{on } \partial\Omega, \end{cases}$$

where Ω is a bounded open subset of \mathbb{R}^N , $N \geq 1$, $p > 1$. We apply these estimates to study the asymptotic behavior of the principal eigenvalue for $p \rightarrow 1_+$ and $p \rightarrow +\infty$.

References

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