İSTANBUL ANALYSIS SEMINARS

CHARACTERIZATION OF POTENTIAL SMOOTHNESS OF THE HILL OPERATOR AND RIESZ BASIS PROPERTY IN TERMS OF PERIODIC, ANTIPERIODIC AND NEUMANN SPECTRA

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Abstract: The Hill operators $Ly = -y'' + v(x)y$, considered with periodic, antiperiodic or Neumann boundary conditions have discrete spectra. For sufficiently large n close to n^2 there are two periodic (if n is even) or antiperiodic (if n is odd) eigenvalues λ_n^- , λ_n^+, and respectively, one Neumann eigenvalue ν_n. We study the geometry of "spectral triangle" with vertices $(\lambda_n^+, \lambda_n^-, \nu_n)$, and show that the rate of decay of triangle size characterizes the potential smoothness. Moreover, it is proved that the periodic (antiperiodic) root function space contains a Riesz basis if and only if for even n (respectively, for odd n) $\sup_{\lambda_n^+ \neq \lambda_n^-} \{|\lambda_n^+ - \nu_n|/|\lambda_n^+ - \lambda_n^-|\} < \infty$.

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