A key to reading of this paper is the formulation and an inversion-related proof of several discrete version(s) of the Levinson theorem and of the related spectral analysis (by the authors' own statement, the discretization approach to differential equations is a topic of independent interest). This is what leads to the main application, viz., to a successful determination of asymptotics of generalized (i.e., difference-equation-interpreted) eigensolutions of certain specific (two classes of) Jacobi matrices (with vanishing main diagonal and periodically perturbed power-law elements).

Primary Classification:

47B36 - Jacobi tridiagonal operators matrices and generalizations

Secondary Classification:

47B37 - Operators on special spaces weighted shifts, operators on sequence spaces, etc.

39A11 - Stability and asymptotics of difference equations; oscillatory and periodic solutions, etc.

39A12 - Discrete version of topics in analysis

Keywords:

Jacobi matrix; difference equation; asymptotic solution; generalized eigenvectors, spectral analysis; discrete Levinson theorem; power-law weights; periodic perturbation