AN INVERSE STURM–LIOUVILLE PROBLEM
FROM PARTS OF THREE SPECTRA

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Abstract. Certain parts of the spectra of three Robin boundary value problems are used to find the potential of the Sturm-Liouville equation on a finite interval. The inverse problem possesses a unique solution. Conditions are found necessary and sufficient for three sequences to be the corresponding parts of the three spectra. Different from previous research, this paper emphasizes the importance of Robin boundary conditions in the study of three spectral inverse problem.

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REFERENCES

[1] N. I. AKHIEZER AND I. M. GLAZMAN, *Theorey of Linear Operators in Hilbert Space*, Ungar, New York, 1961.
[2] G. BORG, *Eine Umkehrung der Sturm-Liouvilleschen Eigenwertaufgabe*, Acta Math. **78** (1946), 1–96.
[3] L. A. CHUDOV, *The inverse Sturm-Liouville problem*, Mat. Sbornik N. S. **25** (1949), 451–456 (in Russian).
[4] G. FREILING AND V. YURKO, *Inverse Sturm-Liouville Problems and Their Applications*, NOVA Science Publishers, New York, 2001.
[5] B. M. LEVITAN, *Inverse Sturm-Liouville Problems*, VNU Science Press, Utrecht, 1987.
[6] B. M. LEVITAN AND M. G. GASYMOV, *Determination of a differential equation by two of its spectra*, Russ. Math. Surv. **19** (1964), 1–63.
[7] B. JA. LEVIN, *Distribution of Zeros of Entire Functions* (rev. ed.), Amer. Math. Soc., Providence, RI, 1980.
[8] B. JA. LEVIN AND YU. I. LYUBARSKII, *Interpolation by entire functions of special classes and related expansions in series of exponents*, Izv. Akad. Nauk SSSR **39** (1975), 657–702 (in Russian).
[9] N. LEVINSON, *The inverse Sturm-Liouviile problem*, Mat. Tidsskr. **13** (1949), 25–30.
[10] M. M. MALAMUD, *Uniqueness of the Matrix Sturm-Liouville Equation Given a Part of the Monodromy Matrix, and Borg Type Results*, in: Sturm-Liouville Theory: Past and Present, Birkhäuser Verlag, Basel, 2005, 237–270.
[11] V. A. MARCHENKO, *Sturm-Liouville Operators and Applications*, Birkhäuser Verlag, Basel, 1986.
[12] V. PIVOVARCHIK, *An inverse Sturm-Liouville problem by three spectra*, Integr. Equ. Oper. Theory **34** (1999), 234–243.
[13] V. PIVOVARCHIK, *An inverse problem by eigenvalues of four spectra*, J. Math. Anal. Appl. **396** (2012), 715–723.
[14] R. M. YOUNG, *An Introduction to Nonharmonic Fourier Series*, Academic Press, New York, 1980.