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Review text:

Schroedinger equation on a line is considered as a homework toy terrain for interrelating the mathematical theory of self-adjoint extensions (by returning, in particular, to the idea of Griffiths [7] who contemplated a - for simplicity, central - potential in the form, roughly speaking, of the n-th derivative of the delta function) with something which I would call a non-Hermitian extension of Quantum Mechanics [may be also called pseudo-Hermitian or quasi-Hermitian or PT-symmetric - for a compact introductory reading see, e.g., the fresh “proceedings” of the related international Workshop, to appear in the September issue of Czechosl. J. Phys., vol. 55, pp. cca 1048 - 1196 (2005)] and which, in particular, admits the mathematically as well as physically fully consistent work with an apparently inconsistent concept of the energy-dependent quantum Hamiltonians (sorry for self-citation: M. Znojil, Linear representation of energy-dependent Hamiltonians, Phys. Lett. A 326 (2004) 70 - 76). On this background the authors reveal that, unexpectedly, their S-matrix remains unitary but that it still proves suitable for the inverse-scattering reconstruction of the present specific singular potential from any prescribed scattering data (due to the precise match of their number of the number of parameters in the interaction in question). The authors argue that and why their recipes may be extended to the coupled-channel situation and/or, in some sense, to non-stationary states.