This is a review text file submitted electronically to MR.

Reviewer: Znojil, Miloslav

Reviewer number:

Address:
NPI ASCR,
250 68 Rez,
Czech Repubic
znojil@ujf.cas.cz

Author: Midya, Bikashkali; Dube, P. P.; Roychoudhury, Rajkumar

Short title: Non-isospectrality of the generalized Swanson Hamiltonian and harmonic oscillator.

MR Number: 2763430

Primary classification: 81Q05

Secondary classification(s): 46C20 47N50 34Q40 47B50

Review text:

An energy spectrum $\{E_n\}$ is assumed prescribed by the self-adjoint Schrödinger-type Hamiltonian $\tilde{h}$ defined, on the real line of x, by Eq. (8). As long as it contains an optional mass-function $A(x)$, the change of variables (13) is performed replacing $x \to z(x)$. In a way known from Ref. [11] this transforms the initial eigenvalue problem into the exactly solvable confluent hypergeometric differential Schrödinger Eq. (17). Naturally, the original Dirichlet boundary conditions imposed at $x = \pm\infty$ are translated into the "new" boundary conditions imposed at $z_\pm = z(\pm\infty)$. In Tables 1 and 2 a few examples are listed. In the former cases the original model (with $E_n \sim n$ since $(z_-, z_+) = (-\infty, \infty)$) is, by construction, isospectral to harmonic oscillator. In the latter cases (with the choice of $A(x) \equiv 1/\sqrt{m(x)}$ such that $(z_-, z_+) < (-\infty, \infty)$ and, hence, $E_n \sim n^2$, this isospectrality is broken.

In section 1 (NOT recommended to be read first) the authors emphasize that the warning "be careful" as mediated by Table 2 is particularly important in the context of the recent growth of popularity of such representations of observables in quantum mechanics (as admirably reviewed, e.g., by Ref. [6]) which the present reviewer would recommend calling cryptohermitian (cf. also MZ, Three-Hilbert-space formulation of Quantum Mechanics, SIGMA 5 (2009), 001, for the reasons).