A Toy Model of $\mathcal{PT}-$Symmetric Quantum Mechanics, the Squire Equation and UV-IR-Duality

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Some facts about the spectrum of a $\mathcal{PT}-$symmetric quantum mechanical (PTSQM) toy model with potential $V(x) = Gx^2(ix)^\nu$ in a box $x \in [-L, L]$ are presented for the parameter region $\nu \in [-2, 0]$. The corresponding Hamiltonian is selfadjoint in an appropriately chosen Krein space and for $\nu = -1$ the spectral problem maps into that of the hydrodynamic Squire equation. It is shown that in the limit $L \to \infty$ a spectral singularity occurs and that the PTSQM $\rightleftarrows$ Squire mapping can be interpreted as a special type of strong-coupling—weak-coupling (UV-IR) duality. Finally, the system behavior in the vicinity of a spectral triple point is sketched.