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Spectral approximation for singular differential operators via domain truncation

Abstract

We study spectral convergence for sequences of unbounded linear operators T_n, $n \in \mathbb{N}$, that converge to some operator T in strong resolvent sense. It is well known that, even in the case of purely discrete spectra, the eigenvalues of T_n may accumulate at a point that is not an eigenvalue of T. In addition to the occurrence of such spurious eigenvalues, for non-selfadjoint operators not every eigenvalue of T may be approximated. We present sufficient conditions and perturbation results that prevent the occurrence of these two unwanted phenomena. The results are applied to non-selfadjoint Schrödinger operators in $L^2(\mathbb{R}^d)$ that are truncated to bounded but expanding domains in $\mathbb{R}^d$ (based on joint work with P. Siegl and C. Tretter).