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*Numerical solutions of Riemann–Hilbert problems on disjoint intervals*

We present a general approach to numerically compute the solutions of Riemann–Hilbert problems with jump conditions supported on disjoint intervals. Applied to the Fokas–Its–Kitaev Riemann–Hilbert problem, this enables the computation of Chebyshev-like polynomials on multiple intervals, requiring only $\mathrm{O}(N)$ arithmetic operations to compute the first $N$ recurrence coefficients. Moreover, expansions in these orthogonal polynomials yield a novel iterative method for solving indefinite linear systems and computing matrix functions. This method applies in settings where classical polynomial approximations behave poorly and are therefore not applicable. We also discuss an application to the computation of finite-genus and soliton gas solutions of the Korteweg–de Vries equation.