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Solutions of the Harmonic Oscillator Equation in a B-polynomial basis MUHAMMAD BHATTI, The University of Texas-Pan American — A method to construct approximate solutions for a quantum mechanical system has been introduced in a Bernstein-polynomial (B-polynomial) basis. The B-polynomial-Galerkin method is applied to produce the energy spectrum of quantum harmonic oscillator equation. The discrete eigenstates are produced after applying the initial condition to the generalized eigenvalue problem which was constructed from the exact analytic matrix elements in the basis. The numerical discrete eigenvalues and the corresponding eigenstates are in excellent agreement with the exact results of the harmonic oscillator. However, the accuracy of the results depends on the number of B-polynomials chosen to construct the approximate solutions. To check the quality of the spectrum and the wave functions, the resulting basis set is used to evaluate the Thomas-Reiche-Kuhn (TRK) sum rules. In addition, perturbations through 5^{th} order are calculated to first excited state of harmonic oscillator using a perturbation potential and excellent agreement has been observed with exact results.

Muhammad Bhatti
The University of Texas-Pan American

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