Summary: This study aims to use the Taylor wavelet method to solve linear and nonlinear Lane-Emden equations. An advantage of the method is the orthonormality property of the polynomials which reduce the computational cost. Another advantage is that the nonlinear terms do not need to be approximated. The application of the method reduces the differential equations to a system of algebraic equations. Six differential equations that model different physical problems with initial and boundary conditions are solved to illustrate the efficiency and accuracy of the Taylor wavelet method. The results obtained from the method are compared with other numerical results and exact solutions and presented in terms of absolute error tables and graphics. We observe from these results that the method is highly accurate and capable of obtaining the exact solution when it is in the form of a polynomial.

MSC:
65T60 Numerical methods for wavelets
42C40 Nontrigonometric harmonic analysis involving wavelets and other special systems

Keywords:
Lane-Emden equation; Taylor wavelets; initial value problems; boundary value problems

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