An exponential Chebyshev second kind approximation for solving high-order ordinary differential equations in unbounded domains, with application to Dawson’s integral.  

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Summary: A new exponential Chebyshev operational matrix of derivatives based on Chebyshev polynomials of second kind (ESC) is investigated. The new operational matrix of derivatives of the ESC functions is derived and introduced for solving high-order linear ordinary differential equations with variable coefficients in unbounded domain using the collocation method. As an application the introduced method is used to evaluate Dawson’s integral by solving its differential equation. The corresponding differential equation to Dawson’s integral is a boundary value problem with conditions tends to infinity. The obtained numerical results are compared with the exact solution and showed good accuracy.

MSC:

65L60 Finite element, Rayleigh-Ritz, Galerkin and collocation methods for ordinary differential equations
65D25 Numerical differentiation
34B05 Linear boundary value problems for ordinary differential equations

Keywords:

exponential second kind Chebyshev functions; collocation method; Dawson’s integral; exponential Chebyshev operational matrix of derivatives; high-order linear ordinary differential equations; boundary value problem; numerical results

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References:


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