Ramadan, Mohamed A.; Radwan, Taha; Nassar, Mahmoud A.; Abd El Salam, Mohamed A.
A comparison study of numerical techniques for solving ordinary differential equations defined on a semi-infinite domain using rational Chebyshev functions. (English)

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Summary: A rational Chebyshev (RC) spectral collocation technique is considered in this paper to solve high-order linear ordinary differential equations (ODEs) defined on a semi-infinite domain. Two definitions of the derivative of the RC functions are introduced as operational matrices. Also, a theoretical study carried on the RC functions shows that the RC approximation has an exponential convergence. Due to the two definitions, two schemes are presented for solving the proposed linear ODEs on the semi-infinite interval with the collocation approach. According to the convergence of the RC functions at the infinity, the proposed technique deals with the boundary value problem which is defined on semi-infinite domains easily. The main goal of this paper is to present a comparison study for differential equations defined on semi-infinite intervals using the proposed two schemes. To demonstrate the validity of the comparisons, three numerical examples are provided. The obtained numerical results are compared with the exact solutions of the proposed problems.

MSC:
65-XX Numerical analysis

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References:


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