

Alaidarous, Eman S.; Ullah, Malik Zaka; Ahmad, Fayyaz; Al-Fhaid, A. S.

An efficient higher-order quasilinearization method for solving nonlinear BVPs. (English)

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Summary: In this research paper, we present higher-order quasilinearization methods for the boundary value problems as well as coupled boundary value problems. The construction of higher-order convergent methods depends on a decomposition method which is different from Adomain decomposition method [*S. S. Motsa and P. Sibanda*, Numer. Algorithms 63, No. 3, 399–417 (2013; Zbl 1271.65115)]. The reported method is very general and can be extended to desired order of convergence for highly nonlinear differential equations and also computationally superior to proposed iterative method based on Adomain decomposition because our proposed iterative scheme avoids the calculations of Adomain polynomials and achieves the same computational order of convergence as authors have claimed in [loc. cit.]. In order to check the validity and computational performance, the constructed iterative schemes are also successfully applied to bifurcation problems to calculate the values of critical parameters. The numerical performance is also tested for one-dimension Bratu and Frank-Kamenetzki equations.

MSC:

- 34B15 Nonlinear boundary value problems for ordinary differential equations
- 65L10 Numerical solution of boundary value problems involving ordinary differential equations
- 65L20 Stability and convergence of numerical methods for ordinary differential equations
- 65Y20 Complexity and performance of numerical algorithms

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