



A new fifth-order iterative method free from second derivative for solving nonlinear equations

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Abstract

In this recent work, a new two-step iterative method for solving nonlinear equations that have a fifth-order convergence is suggested and analyzed. This new iterative method is free from second derivative of functions and based on Halley's method and Taylor's expansion together by using Hermite orthogonal polynomials basis to implement a suitable approximation of second derivative of functions. In addition, the order of convergence and the corresponding error equations of the new method are proved. Finally, some numerical examples are given to show the efficiency and the performance of the new method as well as a comparison with the original well-known Newton's method and some other relevant methods are illustrated.

Keywords Taylor expansion · Hermite orthogonal polynomial · Iterative method · Order of convergence · Numerical example

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1 Introduction

In the recent years, a large number of iterative methods for solving nonlinear equations have been developed based on the well-known Newton's iterative method [3]. In fact,

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