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NEW ITERATIVE METHODS FOR SOLVING NONLINEAR EQUATIONS BASED ON MODIFIED OPEN MIDPOINT INTEGRATION FORMULA

NOORI YASIR ABDUL-HASSAN[1*]

[1]Department of Mathematics, College of Education for Pure Sciences, University of Basrah, Basrah, Iraq.

AUTHOR'S CONTRIBUTION

The sole author designed, analyzed, interpreted and prepared the manuscript.

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ABSTRACT

In this paper, we propose and analyze three new iterative methods with third- and sixth-order convergence for solving nonlinear equations based on the modified open midpoint integration formula and fundamental theorem of calculus. The convergence analysis of our methods is discussed. Some numerical examples are given to demonstrate the performance of the proposed methods. Comparisons with the classical Newton's method, Halley's method and some other similar methods are included.

Keywords: Nonlinear equations; iterative methods; predictor-corrector technique; open mid-point integration formula; order of convergence; numerical examples.

1 Introduction

The important problem, which arise in various fields of pure and applied sciences, is finding the zeros of nonlinear equations of the form:

$$f(x) = 0 \tag{1}$$

where $f: I \subseteq R \to R$ for an open interval I. Many researchers have been constructed various iterative methods for solving nonlinear equations in (1) by using different techniques such as Taylor series, decomposition techniques, homotopy perturbation method and its variant forms, quadrature formulae and predictor-corrector technique. These methods can be classified as one-step, two-step, three-step and four-step methods.

**Corresponding author: Email: nooriyasir65@gmail.com;*