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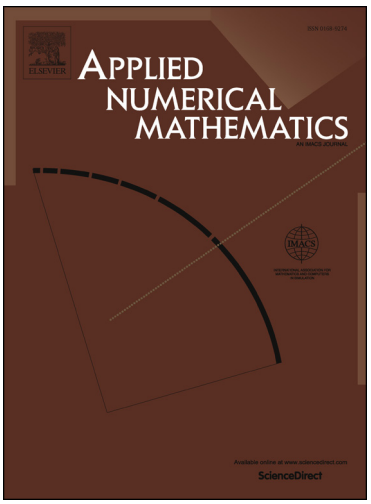

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Convergence and dynamics of structurally identical root finding methods

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Abstract

The behavior of an iterative method applied to nonlinear equations may be considerably sensitive to the starting points. Comparisons between iterative methods are supported by the study of the basins of attraction in the complex plane $\mathbb{C}$. However, usually, nothing is said about the rate of convergence. In this paper, by making recourse to several examples of algebraic and transcendental equations, a numerical comparison is performed between three methods with the same structure, namely BSC, Halley's and Euler-Chebyshev's methods. The study takes into account both the basins of attraction and the rate of convergence which is measured as the number of iterations required to obtain an equation root with a given tolerance.

Keywords: nonlinear equations, iterative methods, order of convergence, basins of attraction

1. Introduction

Finding roots of nonlinear equations constitutes an issue for many real-world problems. Very frequently, solving these problems involves finding the roots of nonlinear equations by recurring to numerical methods. A great variety of iterative methods has been developed and proposed in the literature [7], [1], [11], [9], [27], [25], [8], [13] [12] [14]. To measure the quality and compare the different iterative methods, several measures have been used by researchers. Some measures involve the choice of nonlinear equations

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