



Comparative study of numerical techniques for solving ordinary differential equation with initial conditions

• Julee Shahni • Noor Afshan • Anshu Priya • Prerna Raj • Priya Kumari

Received : October, 2024

Accepted : January, 2025

Corresponding Author : **Julee Shahni**

Abstract: In this paper, the initial value problem of ordinary differential equations has been solved by using different numerical methods, namely Euler's method, modified Euler's method, and Runge-Kutta method. By using MATLAB programming language, the approximate numerical solutions of some ordinary differential equations were found and then the accuracy level of the proposed method was determined. All

these solutions were compared with the exact solution. Lastly, the error of each proposed method was determined and represented graphically, which reveals the superiority among all three methods.

Keywords: Ordinary differential equations, Euler's method, Modified Euler's method, Runge-Kutta method, Error Analysis.

Julee Shahni

Assistant Professor, Department of Mathematics,
Patna Women's College (Autonomous),
Bailey Road, Patna-800 001, Bihar, India
E-mail: juleeshahni.maths@gmail.com

Noor Afshan

B.Sc. III year, Mathematics (Hons.), Session : 2022-2025,
Patna Women's College (Autonomous),
Patna University, Patna, Bihar, India

Anshu Priya

B.Sc. III year, Mathematics (Hons.), Session : 2022-2025,
Patna Women's College (Autonomous),
Patna University, Patna, Bihar, India

Prerna Raj

B.Sc. III year, Mathematics (Hons.), Session : 2022-2025,
Patna Women's College (Autonomous),
Patna University, Patna, Bihar, India

Priya Kumari

B.Sc. III year, Mathematics (Hons.), Session : 2022-2025,
Patna Women's College (Autonomous),
Patna University, Patna, Bihar, India

Introduction:

In mathematics, a differential equation represents a relationship between one or more unknown functions and their derivatives. Numerous real-world problems manifest in the form of differential equations, many of which are partial differential equations. Numerical approximation techniques are commonly applied to address mathematical challenges where finding exact solutions proves challenging or unattainable. Although a variety of analytical methods exist for solving ordinary differential equations, many such equations cannot be resolved through analytical techniques. In such cases, numerical methods play a critical role in providing approximate solutions to ordinary differential equations (Hossain et. al., 2017).

Several researchers have extensively explored numerical solutions for ordinary differential equations (Hong- Li, 2000), employing various methods like Euler's method, the modified Euler's method, and the Runge-Kutta method. In this study, the Runge-Kutta method, the modified Euler's method, and Euler's method were applied to solve ordinary differential equations without