Bridging Analytical and Numerical Techniques in Ordinary Differential Equations

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Abstract: *Ordinary Differential Equations (ODEs) are essential tools for modeling dynamic systems in science and engineering. While analytical methods provide exact solutions and theoretical insights, many real-world problems are too complex to be solved analytically. Numerical methods offer approximate solutions using computational algorithms. This presents a comprehensive study of both analytical and numerical techniques and emphasizes the importance of integrating these approaches. It discusses various solution methods, error analysis, stability considerations and real-world applications. This concludes that a hybrid approach significantly improves accuracy, efficiency and applicability in solving complex ODEs.*

Keywords: Ordinary Differential Equations, Analytical Methods, Numerical Methods, Error Analysis & Stability

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DOI: 10.48175/568

ISSN
2581-9429
IJARSCT

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