Lie Symmetries, Painlev\'{e} analysis and global dynamics for the temporal equation of radiating stars

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Abstract

We study the temporal equation of radiating stars by using three powerful methods for the analysis of nonlinear differential equations. Specifically, we investigate the global dynamics for the given master ordinary differential equation to understand the evolution of solutions for various initial conditions as also to investigate the existence of asymptotic solutions. Moreover, with the application of Lie's theory, we can reduce the order of the master differential equation, while an exact similarity solution is determined. Finally, the master equation possesses the Painlev\'{e} property, which means that the analytic solution can be expressed in terms of a Laurent expansion.

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