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APPROXIMATE ANALYTICAL SOLUTION FOR KORTEWEG-DE VRIES EQUATION VIA THE METHOD OF DIRECTLY DEFINING INVERSE MAPPING

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In this study, we develop and apply a semi-analytical method called the Method of Directly Defining the inverse Mapping (MDDiM) to obtain a series solution for the Korteweg-de Vries (KdV) equation arise in the study of long solitary waves in lakes and estuaries. KdV is a mathematical model of waves on shallow water surfaces. Here, we obtained an eight-order approximate series solution for the elongation of the shallow water wave. The square residual error of the eight-order series solution was accurate up to eleven decimal places. Further, our results agreed with the exact solution, the solution obtained by Optimal Homotopy Analysis Method (OHAM), and the results available in the literature, obtained by several numerical methods. In MDDiM, we have the freedom to choose an inverse linear map, which saves computation time because we no longer need to solve systems of differential equations but systems of equations. Further, it is an open problem to apply this novel method to solve fuzzy partial differential equations and investigate various nonlinear partial differential equations arising in science and engineering.

Keywords: Korteweg-de Vries equation, Method of Directly Defining the inverse Mapping, Series solutions