Modified Homotopy Analysis Method: Application To Linear And Nonlinear Ordinary Differential Equations Of Fractional Order

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We present a modification of an analytic technique, namely the homotopy analysis method (HAM) to obtain symbolic approximate solutions for linear and nonlinear differential equations of fractional order. This method was applied to three examples: a fractional oscillation equation, a fractional Riccati equation and a fractional Lane-Emden equation which were presented as fractional initial value problems (FIVPs). We extend this modification to provide approximate solutions of linear and nonlinear fractional boundary value problems (FBVPs). Four examples are tested using the extended approach. Also, four physical problems are solved using the modification of the HAM. The HAM is a strong and easy-to-use analytic tool for nonlinear problems and does not need small / large parameters in the equations.Comparison of the results with those of Adomian decomposition method (ADM),variational iteration method (VIM), and homotopy perturbation method (HPM), has led us to significant consequences. The obtained results show that the present method is very effective and convenient in solving nonlinear cases and the ADM, VIM and HPM are special cases of the HAM.

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