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Asymptotic Expansion of the Korteweg-de Vries-Burgers Equation

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Abstract : It is common knowledge that many physical problems (such as non-linear shallow-water waves and wave motion in plasmas) can be described by the Korteweg-de Vries (KdV) equation, which possesses certain special solutions, known as solitary waves or solitons. As a marriage of the KdV equation and the classical Burgers (KdVB) equation, the Korteweg-de Vries-Burgers (KdVB) equation is a mathematical model of waves on shallow water surfaces in the presence of viscous dissipation. Asymptotic analysis is a method of describing limiting behavior and is a key tool for exploring the differential equations which arise in the mathematical modeling of real-world phenomena. By using variable transformations, the asymptotic expansion of the KdVB equation is presented in this paper. The asymptotic expansion may provide a good gauge on the validation of the corresponding numerical scheme.

Keywords : asymptotic expansion, differential equation, Korteweg-de Vries-Burgers (KdVB) equation, soliton
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