

Equivalence method for the construction of exact solutions of generalized Korteweg-de Vries equations

The transformational properties of two classes of generalized Korteweg-de Vries (KdV) equations with coefficients dependent on the time variable are investigated, and the effectiveness of the equivalence method for constructing exact solutions to such equations is demonstrated. Specifically, the equivalence groupoids for both classes of equations are identified, and it is proven that both classes are normalized. A criterion for the reducibility of variable-coefficient equations from the class $u_t + f(t)u^2u_x + g(t)u_{xxx} + h(t)u + p(t)u_x + k(t)uu_x + l(t) = 0$ to the standard modified Korteweg-de Vries equation is established. For the second class of equations, $u_t - 3Mg(t)uu_x + g(t)u_{xxx} + 2q(t)u + (p(t) + q(t)x)u_x = 0$, full similarity to the classical Korteweg-de Vries equation is demonstrated. It is shown that the equivalence method for finding exact solutions is more effective for these classes of equations compared to methods used by other authors previously. Consequently, formulas for generating exact solutions of generalized Korteweg-de Vries equations with variable coefficients are derived, and examples of constructing exact solutions using these formulas are provided.

The talk is based on the work:

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