On a Generalized Fifth-Order Integrable Evolution Equation and its Hierarchy

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   A general form of a fifth-order nonlinear evolution equation is considered. The Helmholtz solution of the inverse variational problem is used to derive conditions under which this equation admits an analytic representation. A Lennard type recursion operator is then employed to construct a hierarchy of Lagrangian equations. It is explicitly demonstrated that the constructed system of equations has a Lax representation and two compatible Hamiltonian structures. The homogeneous balance method is used to derive analytic soliton solutions of the third- and fifth-order equations. – PACS numbers: 47.20.Ky, 42.81.Dp, 02.30.Jr