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**Quasi-classical approach to the inverse scattering problem for the KdV equation, and solution of the Whitham modulation equations.** (English. Russian original) [Zbl 0888.35098](#)

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**Summary:** We consider an initial value problem for the KdV equation in the limit of weak dispersion. This model describes the formation and evolution in time of a nondissipative shock wave in plasma. Using the perturbation theory in power series of a small dispersion parameter, we arrive at the Riemann simple wave equation. Once the simple wave is overturned, we arrive at the system of Whitham modulation equations that describes the evolution of the resulting nondissipative shock wave. The idea of the approach developed in this paper is to study the asymptotic behavior of the exact solution in the limit of weak dispersion, using the solution given by the inverse scattering problem technique. In the study of the problem, we use the WKB approach to the direct scattering problem and use the formulas for the exact multisoliton solution of the inverse scattering problem. By passing to the limit, we obtain a finite set of relations that connects the space-time parameters  $x$ ,  $t$  and the modulation parameters of the nondissipative shock wave.

**MSC:**

**35Q53** KdV equations (Korteweg-de Vries equations)  
**35A22** Transform methods (e.g., integral transforms) applied to PDEs  
**35R30** Inverse problems for PDEs  
**35P25** Scattering theory for PDEs

Cited in **2** Documents

**Keywords:**

[KdV equation](#); [nondissipative shock wave in plasma](#); [Riemann simple wave equation](#); [Whitham modulation equations](#)

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