Cafasso, Mattia; Claeys, Tom; Ruzza, Giulio
Airy kernel determinant solutions to the KdV equation and integro-differential Painlevé equations. (English) Zbl 07383226

This paper is concerned with the Korteweg-de Vries (KdV) differential equation
\[ u_t + 2uu_x + \frac{1}{6} u_{xxx} = 0. \]

The authors obtain the family of unbounded solutions of KdV equation, which can be constructed as log-derivatives of the deformed Airy kernel Fredholm determinants. They study the asymptotic behavior of these solutions and show that the constructed solutions are connected to integro-differential versions of other known equations, such as the second and the fifth Painlevé equations. As an application of the results, estimates for the tails of the narrow wedge solution of the Kardar-Parisi-Zhang equation are improved.

Reviewer: Andrei Pranevich (Grodno)

MSC:
37K40 Soliton theory, asymptotic behavior of solutions of infinite-dimensional Hamiltonian systems
37J65 Nonautonomous Hamiltonian dynamical systems (Painlevé equations, etc.)
35Q53 KdV equations (Korteweg-de Vries equations)
34M55 Painlevé and other special ordinary differential equations in the complex domain; classification, hierarchies
45J05 Integro-ordinary differential equations
15B52 Random matrices (algebraic aspects)
60B20 Random matrices (probabilistic aspects)

Keywords:
Korteweg-de Vries equation; integro-differential equation; second Painlevé equation; Kardar-Parisi-Zhang equation

Software:
DLMF

Full Text: DOI

References:

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