Mathematical Physics

Pole-free solutions of the first Painlevé hierarchy and non-generic critical behavior for the KdV equation

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We establish the existence of real pole-free solutions to all even members of the Painlev\'e I hierarchy. We also obtain asymptotics for those solutions and describe their relevance in the description of critical asymptotic behavior of solutions to the KdV equation in the small dispersion limit. This was understood in the case of a generic critical point, and we generalize it here to the case of non-generic critical points.

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