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Title. *Asymptotics of Real Solutions of the sinh-Gordon Equation*

Abstract. *We consider the asymptotic behavior of the real-valued solutions $u(x)$ of the sinh-Gordron reduction of the Painlevé III equation ($\mathrm{P}_{\mathrm{III}}^{\mathrm{shG}}$ in short) on the positive real line as $x \to 0^+$ and $x \to +\infty$. Our methodology is to solve the associated Riemann-Hilbert problem with $\mathrm{P}_{\mathrm{III}}^{\mathrm{shG}}$ using the nonlinear steepest descent method of Deift and Zhou. In this way, we obtain the desired asymptotics along with the asymptotic locations of the poles of $\mathrm{P}_{\mathrm{III}}^{\mathrm{shG}}$ accumulating at 0 and ∞. This presentation is based on the work [IMY25] with Alexander Its and Maxim Yattselev.*

References

[IMY25] Alexander R. Its, Kenta Miyahara, and Maxim L. Yattselev. The non-linear steepest descent approach to the singular asymptotics of the sinh-Gordon reduction of the Painlevé III equation. <u>Lett. Math. Phys.</u>, 115(1):Paper No. 6, 2025.