The Painlevé VI tau-function of Kerr-AdS5

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Propositions

accompanying the dissertation

The Painlevé VI τ-function of Kerr-AdS$_5$

by

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1. This thesis focuses on scalar and vector fields propagating in a five-dimensional Kerr-AdS black hole, although the formalism developed here can be used to treat linear perturbations in other space-times as well.

2. The method of isomonodromy relies on the existence of families of Fuchsian systems with the same monodromy data, that can be isomonodromically deformed and lead to the Painlevé equations.

3. The Painlevé transcendents solve the connection problem for the Heun type of differential equations, and provide new tools to explore several problems in Mathematics and Physics.

4. A Fuchsian system with four regular singular points can be deformed while preserving its monodromy data. The equations governing the deformation can be reduced to the Painlevé VI equation. (Chapter 3)

5. The eigenvalue problem of the radial and angular differential equation can be reformulated in terms of an initial value problem for the associated Painlevé VI τ-function. (Chapter 3)

6. An asymptotic expansion for the separation constant can be computed in terms of the angular accessory parameter for slowly rotating or near equally rotating black holes. (Chapter 4)

7. Scalar quasi-normal modes for the s-wave case are stable in the small radius black hole limit. On the other hand, numerical evidence suggests that modes with odd orbital quantum number can develop instabilities for $r_+ \sim 10^{-3}$. (Chapter 4)

8. Massless vector perturbations on Kerr-AdS$_5$ lead to separable equations through the introduction of a new parameter μ, which can be associated to the apparent singularity of the isomonodromy method by a Möbius transformation. (Chapter 5)