

Iterated Robin Problem for the Higher Order Poisson Equation

Serkan Emek

Abstract

Prescribing Robin boundary conditions for the iterated Poisson equation

$$(\partial_z \partial_{\bar{z}})^n w = f$$

leads to Robin- n problems. Extending the concept of the Robin function for the Laplacian to Robin functions for powers of the Laplacian leads to explicit representations of the solution of the Robin- n problem for $(\partial_z \partial_{\bar{z}})^n w = f$. For the unit disc of the complex plane the Robin functions for $n = 2$ and 3 are explicitly constructed and the corresponding solutions for the Robin- n problem with the respective solvability conditions are given.

The results are a generalization of [2] where the polyharmonic case was solved for the poly-Neumann problem here the limiting case for $\alpha = 0$ and a generalization of [1] where the modified harmonic Robin function was introduced. The more general setting with the Robin boundary condition in the polyharmonic case leads to Robin functions that contain the corresponding Green and Neumann functions as limiting cases.

Literatur

- [1] H. Begehr and T. Vaitekhovich. Modified harmonic Robin function. *Complex Var. Elliptic Equ.*, 58(4): 483–496, 2013.
- [2] H. Begehr and C. J. Vanegas. Iterated Neumann problem for the higher order poisson equation. *Mathematische Nachrichten*, 279(1-2): 38–57, 2006.