

Radial Solutions to Equation with Inhomogeneous Operator

Zuzana Došlá

Department of Mathematics and Statistics, Masaryk University,
Brno, Czech Republic
DOSLA@MATH.MUNI.CZ

Abstract

A nonlinear and non-autonomous second-order differential equation of the form

$$(a(t)\Phi(x'))' + b(t)F(x) = 0, \quad t \geq t_0,$$

is considered. Here, the function $\Phi(u) = \Phi_p(u)L(u)$ generalizes the classical p -Laplacian $\Phi_p(u) = |u|^{p-2}u$ for $p > 1$ and L is an even, continuous and positive function that is slowly varying at zero in the sense of Karamata, and defined in a neighborhood of $u = 0$. Several applied examples of such Φ are presented and, in particular, a specific differential equation involving an inhomogeneous operator used to model material deformation under stress is given.

Moreover, the existence of global positive bounded solutions on the half-line with the Neumann type boundary conditions is studied by means of an abstract fixed point theorem and certain properties of an associated half-linear equation. The results do not require the explicit form of the inverse operator of Φ , and are completed by an asymptotic analysis of these solutions near infinity.

This is a joint research with Mauro Marini and Serena Matucci, University of Florence, Italy.

References

- [1] Z. Došlá, M. Marini, S. Matucci, Global positive bounded solutions for equations with regularly varying operator, *J. Math. Anal. Appl.* (2026), <https://doi.org/10.1016/j.jmaa.2026.130443>
- [2] Z. Došlá, M. Marini, S. Matucci, Zero-convergent solutions for equations with generalized relativistic operator: a fixed point approach, *J. Nonlinear Convex. Anal.* **8** (2025) 2583–2599.
- [3] Z. Došlá, S. Matucci, Ground state solutions to nonlinear equations with p -Laplacian, *Nonlinear Anal.* **184** (2019) 1–16.
- [4] M. Bocea, M. Mihailescu, On a family of inhomogeneous torsional creep problems, *Proc. Amer. Math. Soc.* **145** (2017), 4397–4409.