Accepted Manuscript

Positive radial solutions for a class of singular superlinear problems on the exterior of a ball with nonlinear boundary conditions

D.D. Hai, R. Shivaji

Positive radial solutions for a class of singular superlinear problems on the exterior of a ball with nonlinear boundary conditions

D. D. Hai* and R. Shivaji**
*Department of Mathematics and Statistics
Mississippi State University
Mississippi State, MS 39762, USA
and
**Department of Mathematics and Statistics,
University of North Carolina at Greensboro
Greensboro, NC 27402, USA

July 10, 2017

Abstract

We discuss existence and nonexistence results of positive radial solutions to the problem

$$\begin{cases} -\Delta u = \lambda K(|x|)f(u) \text{ in } |x| > r_0, \\ \frac{\partial u}{\partial n} + \tilde{c}(u)u = 0 \text{ on } |x| = r_0, \quad u(x) \to 0 \text{ as } |x| \to \infty. \end{cases}$$

where $\Omega = \{x \in R^N : |x| > r_0 > 0\}, N > 2, \ f : (0, \infty) \to \mathbb{R}$ is continuous, superlinear at ∞, and is allowed to be singular at 0 with no sign conditions near 0.

1. INTRODUCTION

Consider the boundary value problem

$$\begin{cases} -\Delta u = \lambda K(|x|)f(u) \text{ in } \Omega, \\ \frac{\partial u}{\partial n} + \tilde{c}(u)u = 0 \text{ on } |x| = r_0, \\ u(x) \to 0 \text{ as } |x| \to \infty, \end{cases} \qquad (1.1)$$

1