

Singular elliptic problems on unbounded domains

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Abstract

We consider the problem

$$\begin{cases} -\Delta u = \lambda K(x)f(u) & \text{in } B_1^c, \\ u = 0 & \text{on } \partial B_1, \\ u(x) \rightarrow 0 & \text{as } |x| \rightarrow \infty, \end{cases}$$

where $B_1^c = \{x \in \mathbb{R}^n \mid |x| > 1\}$, λ is a positive parameter, K belongs to a class of functions which satisfy certain decay assumptions and f belongs to a class of functions which are asymptotically linear and may be singular at the origin, namely $\lim_{s \rightarrow 0^+} f(s) = -\infty$. We discuss the existence and non existence of a positive solutions to such problems for certain values of parameter λ . We also obtain similar existence results when the domain is \mathbb{R}^n .