



# Denumerably Many Positive Radial Solutions to Iterative System of Nonlinear Elliptic Equations on the Exterior of a Ball

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**Abstract:** In this paper, by an application of Krasnoselskii's fixed point theorem, we establish the existence of denumerably many positive radial solutions to the iterative system of nonlinear elliptic equations of the form

$$\begin{aligned}\Delta u_j + P(|\mathbf{x}|)g_j(u_{j+1}) &= 0 \quad \text{in } \mathbb{R}^N \setminus \mathcal{B}_{r_0}, \\ u_j &= 0 \quad \text{on } |\mathbf{x}| = r_0, \\ u_j &\rightarrow 0 \quad \text{as } |\mathbf{x}| \rightarrow +\infty,\end{aligned}$$

where  $j \in \{1, 2, 3, \dots, \ell\}$ ,  $\mathbf{u}_1 = \mathbf{u}_{\ell+1}$ ,  $\Delta \mathbf{u} = \operatorname{div}(\nabla \mathbf{u})$ ,  $N > 2$ ,  $r_0 > 0$ ,  $\mathcal{B}_{r_0} = \{\mathbf{u} \in \mathbb{R}^N \mid |\mathbf{u}| < r_0\}$ ,  $P = \prod_{i=1}^n P_i$ , each  $P_i : (r_0, +\infty) \rightarrow (0, +\infty)$  is continuous,  $r^{N-1}P$  is integrable and may have singularities, and  $g_j : [0, +\infty) \rightarrow \mathbb{R}$  is continuous.

**Keywords:** *nonlinear elliptic systems; exterior of a ball; positive radial solution; Krasnoselskii's fixed point theorem.*

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