
Separation structure of positive radial solutions for semilinear elliptic equations

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Abstract

We consider positive radial solutions of the semilinear elliptic equation

$$-\Delta u = f(u) \quad \text{in } \mathbf{R}^N,$$

where $N \geq 3$, $f \in C^1$, and $f(u)$ is non-negative, non-decreasing, and convex for $u \geq 0$. We are interested in separation phenomena of positive radial solutions. In a typical case $f(u) = u^p$, it is well known that, if $N \geq 11$ and

$$p \geq \frac{(N-2)^2 - 4N + 8\sqrt{N-1}}{(N-2)(N-10)},$$

then any two radial solutions do not intersect each other. In this talk, for general non-linearity, we give a classification of the solution structures, and then we show separation and intersection properties of solutions. In particular, we find that the equation changes its nature drastically according to the behavior and some other properties of $f(u)$.

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