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Asymptotic bifurcation for elliptic equations on $\mathbb{R}^N$

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Abstract

We consider solutions of equations having the form

$$-\Delta u + Vu + g(u) = \lambda u \text{ where } V \in L^\infty(\mathbb{R}^N) \text{ and } g \in C(\mathbb{R}) \text{ with } g(0) = 0$$

in the usual Sobolev spaces $W^{2,p}(\mathbb{R}^N)$ for $1 \leq p < \infty$. We present a variant of the standard notion of asymptotic linearity of a mapping $M : X \to Y$ acting between Banach spaces X and Y. For the associated inversion, $M^*(u) = \|u\|^2 M(u/\|u\|^2)$, this new property is equivalent to Hadamard differentiability at 0. New results about bifurcation for Hadamard differentiable problems then lead to conclusions about asymptotic bifurcation for the nonlinear elliptic equations on $\mathbb{R}^N$.

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