

Colloquium

S-shaped bifurcation diagram for the perturbed Gelfand problem

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地 點：應用數學系多媒體教室（理 408 室）

摘 要：

We study the bifurcation curve and exact multiplicity of positive solutions of the positone problem

$$\begin{cases} u''(x) + \lambda f(u) = 0, & -1 < x < 1, \\ u(-1) = u(1) = 0, \end{cases}$$

where $\lambda > 0$ is a bifurcation parameter, $f \in C^2[0, \infty)$ satisfies $f(0) > 0$ and $f(u) > 0$ for $u > 0$, and f is convex-concave on $(0, \infty)$. Under a mild condition, we prove that the bifurcation curve is S-shaped on the $(\lambda, \|u\|_\infty)$ -plane. We give an application to the perturbed Gelfand problem

$$\begin{cases} u''(x) + \lambda \exp\left(\frac{au}{a+u}\right) = 0, & -1 < x < 1, \\ u(-1) = u(1) = 0, \end{cases}$$

where $a > 0$ is the activation energy parameter. We prove that, if $a \geq a^* \approx 4.166$, the bifurcation curve is S-shaped on the $(\lambda, \|u\|_\infty)$ -plane.