

Xavier ROS-OTON, Universitat Politècnica de Catalunya, Barcelona, Spain

THE POHOZAEV IDENTITY FOR THE FRACTIONAL LAPLACIAN

A celebrated result of S. I. Pohozaev states that every solution of $-\Delta u = f(u)$ in Ω , $u = 0$ on $\partial\Omega$, satisfies an identity, which is known as the Pohozaev identity.

The aim of the talk is to present the fractional version of this identity, that is, the Pohozaev identity for the fractional Laplacian.

In a joint work with Joaquim Serra, we establish a new identity satisfied for every bounded solution of the nonlocal semilinear Dirichlet problem $(-\Delta)^s u = f(u)$ in Ω , $u \equiv 0$ in $\mathbb{R}^n \setminus \Omega$. Here, $s \in (0, 1)$, $(-\Delta)^s$ is the fractional Laplacian in \mathbb{R}^n , and Ω is a bounded $C^{1,1}$ domain. Surprisingly, from a nonlocal problem we obtain an identity with a boundary term (an integral over $\partial\Omega$) which is completely local.

As an application of our identity, we deduce the nonexistence of nontrivial bounded solutions in star-shaped domains for supercritical nonlinearities.

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