On the Existence of Vanishing at Infinity Solutions to a Second Order Differential Equation with Hyperbolic Nonlinearity

Astashova I. V.

Lomonosov Moscow State University,
Plekhanov Russian University of Economics, FMESI
ast@diffiety.ac.ru

For the differential equation

$$y''(x) = p(x)y(x)^{-\lambda}, \tag{1}$$

where $\lambda > 0$, and p is a positive continuous on $(-\infty; +\infty)$ function satisfying

$$\int_{x_0}^{\infty} xp(x)dx < \infty, \tag{2}$$

sufficient conditions age given for the existence of vanishing at infinity positive solutions to equation (1).

Theorem 1. *Suppose q is a $\mathcal{C}^2$ function tending to 0 as $x \to \infty$, and for any $\beta > 0$ the function q^β has a monotone derivative. Then equation* (1) *with $\lambda > 0$ and $p = q''$ has a solution tending to 0 as $x \to \infty$.*

Theorem 1 contains a partial solution to the problem set by I.T. Kiguradze.