

# Emden - Fowler type equations. An approach to regularity via strongly nonlinear multiplicative inequalities

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## Abstract

We deal with Emden–Fowler -type equations like:  $f''(x) = g(x)f^{-\theta}(x)$ , where  $\theta \in \mathbf{R}$ ,  $x \in (a, b)$ ,  $g$  belongs to  $L^p((a, b))$ , and their  $n$ -dimensional counterparts:  $\Delta f(x) = g(x)f^{-\theta}(x)$ , where  $x \in \Omega \subset \mathbf{R}^n$ . We obtain the *a priori* estimates for the solutions, information about their asymptotic behavior near boundary points and some existence results. As a tool we use certain nonlinear Poincaré inequalities, and some variants of strongly nonlinear multiplicative inequalities:

$$\int_{\{x \in (a,b): f(x) > 0\}} |f'(x)|^p (f(x))^{\theta p} dx \leq C \int_{\{x \in (a,b): f(x) > 0\}} \sqrt{|f(x)f''(x)|}^p (f(x))^{\theta p} dx,$$

where  $f$  is nonnegative.

Results are based on several works obtained together with Jan Peszek, Katarzyna Mazowiecka and Tomasz Choczewski.