# Singular second order ODE with regularly varying coefficients

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We investigate an asymptotic behaviour of solutions of the initial value problem with a time singularity

$$(p(t)u'(t))' + q(t)f(u(t)) = 0, \quad u(0) = u_0,\ u'(0) = 0$$

on the unbounded domain $[0, \infty)$. In particular, we consider function $f$, which is locally Lipschitz continuous on $\mathcal{R}$ and has at least three zeros $L_0 < 0$, $0$ and $L > 0$. Functions $p$, $q$ are continuous regularly varying functions and the assumption $p(0) = 0$ yields a singularity at $t = 0$. Asymptotic formulas for damped non-oscillatory solutions and their first derivatives are derived under some additional assumptions. In the case, where $q \equiv p$, sufficient conditions for existence of Kneser solutions are obtained. Further, we provide conditions for functions $p$ and $q$, which guarantee the existence of an escape solution.

*References*

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