

OSCILLATION CRITERIA FOR SECOND ORDER  
NONLINEAR DIFFERENTIAL EQUATIONS WITH  
DAMPING AND MIXED NONLINEARITIES

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**Abstract.** In this paper we present some oscillation criteria for the second order differential equation of the form

$$(r(t)x'(t))' + p(t)x'(t) + q(t)x(t) + \sum_{j=1}^n q_j(t)|x^{\alpha_j}(t)| \operatorname{sgn} x(t) = e(t), t \geq 0$$

where  $r(t) \in C^1[0, \infty)$ ,  $p(t)$ ,  $q(t)$ ,  $q_j(t)$ ,  $e(t) \in C[0, \infty)$ ,  $r(t) > 0$ ,  $\alpha_1 > \dots > \alpha_m > 1 > \alpha_{m+1} > \dots > \alpha_n > 0$  ( $n > m \geq 1$ ) without assuming that  $p(t)$ ,  $q(t)$ ,  $q_j(t)$  and  $e(t)$  are nonnegative. In particular, for  $n = 1$ , we obtain some new oscillation criteria. The results obtained in this paper extend and improve some of the existing results.

**AMS(MOS) subject classification.** 34C10, 34C15

**Key Words.** Nonlinear differential equation, damping term, mixed nonlinearities, second order, oscillation.

**1. Introduction.** Consider the following second order differential equation of the form

$$(1.1) \quad (r(t)x'(t))' + p(t)x'(t) + q(t)x(t) + \sum_{j=1}^n q_j(t)|x^{\alpha_j}(t)| \operatorname{sgn} x(t) = e(t), t \geq 0$$

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