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A multiplicity result for periodic solutions of forced nonlinear second order ordinary differential equations. (English) [Zbl 0586.34038](#)

Bull. Lond. Math. Soc. 18, 173-180 (1986).

The main result of this paper is a multiplicity result concerning 2π -periodic solutions of the Liénard differential equation (1) $x'' + f(x)x' + g(t, x) = s$ where s is a real parameter, f and g are continuous functions, and g is 2π -periodic in t . Assuming that g satisfies the condition $\lim_{|x| \rightarrow +\infty} g(t, x) = +\infty$ (uniformly in t), it is shown that a number s_0 exists with the following property: i) for $s < s_0$, equation (1) has no periodic solution; ii) for $s = s_0$, equation (1) has at least one 2π -periodic solution; iii) $s > s_0$, equation (1) has at least two 2π -periodic solutions. That result is prepared by partial results along the same lines for more general second order equations. The method of proof is based on the use of upper and lower solutions and on the additivity property of the topological degree.

MSC:

[34C25](#) Periodic solutions to ordinary differential equations

[34C15](#) Nonlinear oscillations and coupled oscillators for ordinary differential equations

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Keywords:

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