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PERIODIC SOLUTIONS OF SINGULAR DUFFING EQUATIONS UNDER ONE-SIDED LIPSCHITZ CONDITION

Congmin Yang — Zaihong Wang — Tiantian Ma

Abstract. In this paper, we study the existence and multiplicity of periodic solutions for singular Duffing equations $x'' + g(x) = p(t)$. When g satisfies one-sided Lipschitz condition and the related time map satisfies oscillation property, we prove that the given equation has infinitely many periodic solutions.

1. Introduction

We consider the existence and multiplicity of periodic solutions of singular Duffing equations

$$x'' + g(x) = p(t), \tag{1.1}$$

where $g\colon (0,+\infty) \to \mathbb{R}$ is continuous and has a singularity at $x = 0$, $p\colon \mathbb{R} \to \mathbb{R}$ is continuous and periodic, whose least period is 2π.

The existence and multiplicity of periodic solutions of differential equations with singularities have been extensively studied because of their applications in mechanics, electronics and so on [2], [3], [8], [11], [14]–[17]. In [11], Lazer and Solimini proved that, if $\gamma \geq 1$, then equation

$$x'' - \frac{1}{x^\gamma} = p(t) \tag{1.2}$$

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