论文

一类非线性奇异微分方程正解的存在性定理

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摘要：

设(i) f(t,u): (0,1)×(0,+∞)→[0,+∞)连续，关于u 单调增加; (ii) 存在函数g:[1,+∞)→(0,+∞),g(b)<b且g(b)b+2 在(1,+∞)上可积，使得对任何(t,u)∈(0,1)×(0,∞)有f(t,bu)≤g(b)f(t,u).则奇异边值问题{u″(t)+f(t,u(t))=0, 0<t<1,au(0)-βu′(0)=0,γu(1)+δu′(1)=0)有C\[0,1\]正解的充分必要条件为0<∫\+1\-0G(s,s)f(s,1)ds<∞, 有 C^1[0,1]正解的充分必要条件为0<∫^1_0f(s,G(s,s))ds<∞，也得到正解的唯一性及其迭代方法. 其中 a,β,δ,γ≥0,aγ+aδ+βγ>0,G(t,s)是相应问题的Green函数。

关键词： 奇异边值问题,正解,充分必要条件

分类号：

On Existence Theorems of Positive Solutions for Nonlinear Singular Differential Equations

DIAO Ceng-Qi

Abstract:

Suppose (i) f(t,u):(0,1)×(0,+∞)→[0,+∞) is continuous and is increasing on u; (ii) there exists a function g:[1,+∞)→ (0,+∞),g(b)<b and g(b)b^2 is integrable on (1,+∞) such that f(t,b u)≤g(b)f(t,u),   (t,u)∈(0,1)×(0,∞).Consider the singular problem{u″(t)+f(t,u(t))=0, 0<t<1,au(0)-βu′(0)=0,γu(1)+δu′(1)=0.) (*)Then a necessary and sufficient condition for the equation (*) havingC[0,1] positive solutions is that 0<∫^1_0G(s,s)f(s,1)ds<∞, a necessary and sufficient condition for the equation (*) having C^1[0,1] positive solutions is that 0<∫^1_0f(s,G(s,s))ds<∞, and obtain the uniqueness, iterativ e method of the positive solutions. Where a,β,δ,γ≥0, aγ+aδ+δγ>0,G(t,s) is the Green function of the problem (*).

Keywords: Singular boundary value problem　 Positive solution　 Necessary and sufficient condition.

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