

ON EXACT MULTIPLICITY FOR A SECOND ORDER EQUATION WITH RADIATION BOUNDARY CONDITIONS

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ABSTRACT. A second order ordinary differential equation with a superlinear term $g(x, u)$ under radiation boundary conditions is studied. Using a shooting argument, all the results obtained in the previous work [2] for a Painlevé II equation are extended. It is proved that the uniqueness or multiplicity of solutions depend on the interaction between the mapping $\frac{\partial g}{\partial u}(\cdot, 0)$ and the first eigenvalue of the associated linear operator. Furthermore, two open problems posed in [2] regarding, on the one hand, the existence of sign-changing solutions and, on the other hand, exact multiplicity are solved.

1. Introduction

In [2], the following problem arising on a two-ion electro-diffusion model (see [3], [5]) was studied:

$$(1.1) \quad u''(x) = Ku(x)^3 + L(x)u(x) + A$$

with

$$(1.2) \quad u'(0) = a_0u(0), \quad u'(1) = a_1u(1).$$

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