Acta Univ. Palacki. Olomuc., Fac. rer. nat.,
Mathematica **43** (2004) 135–139

Zeros of Derivatives of Solutions to Singular $(p, n-p)$ Conjugate BVPs *

Irena RACHŮNKOVÁ [1], Svatoslav STANĚK [2]

Department of Mathematical Analysis and Applications of Mathematics,
Faculty of Science, Palacký University,
Tomkova 40, 779 00 Olomouc, Czech Republic
e-mail: [1] *rachunko@inf.upol.cz*
[2] *stanek@inf.upol.cz*

(Received January 10, 2004)

Abstract

Positive solutions of the singular $(p, n-p)$ conjugate BVP are studied. The set of all zeros of their derivatives up to order $n-1$ is described. By means of this, estimates from below of the solutions and the absolute values of their derivatives up to order $n-1$ on the considered interval are reached. Such estimates are necessary for the application of the general existence principle to the BVP under consideration.

Key words: Singular conjugate BVP, positive solutions, zeros of derivatives, estimates from below.

2000 Mathematics Subject Classification: 34B15, 34B16, 34B18

1 Introduction

Let $n, p \in \mathbb{N}$, $n > 2$, $p \leq n-1$, and T be a positive number. In [3] (for $p = 1$) and [6], the authors have considered the singular $(p, n-p)$ conjugate boundary value problem (BVP)

$$(-1)^p x^{(n)}(t) = f(t, x(t), \ldots, x^{(n-1)}(t)), \tag{1.1}$$

*Supported by Grant No. 201/04/1077 of the Grant Agency of the Czech Republic and by the Council of Czech Government J14/98 153100011