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Boundary value problems for higher order ordinary differential equations

Comment.Math.Univ.Carolinae 35,3 (1994) 451-466.

Abstract: Let $f : [a, b] \times \mathbb{R}^{n+1} \rightarrow \mathbb{R}$ be a Carathéodory's function. Let $\{t_h\}$, with $t_h \in [a, b]$, and $\{x_h\}$ be two real sequences. In this paper, the family of boundary value problems

$$\{ x^{(k)} = f(t, x, x', \dots, x^{(n)}) \ x^{(i)}(t_i) = x_i, \quad i = 0, 1, \dots, k-1 \quad (k = n+1, n+2, n+3, \dots) \}$$

is considered. It is proved that these boundary value problems admit at least a solution for each $k \geq \nu$, where $\nu \geq n+1$ is a suitable integer. Some particular cases, obtained by specializing the sequence $\{t_h\}$, are pointed out. Similar results are also proved for the Picard problem.

Keywords: higher order ordinary differential equations, Nicoletti problem, Picard problem

AMS Subject Classification: 34B15, 34B10, 34A12