

EXISTENCE AND COMPUTATION OF MULTIPLE POSITIVE SOLUTIONS OF SINGULAR NONLINEAR BOUNDARY VALUE PROBLEMS

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We consider singular nonlinear boundary value problems of the form $y'' + f(t, y) = 0$, $0 \leq t \leq 1$, with boundary conditions $y(0) = 0$, $y'(1) = 0$ or $y(0) = 0$, $y(1) = 0$. We allow the singular behavior $f(t, y) \rightarrow \infty$ as $y \rightarrow 0^+$. Our existence results represent a first step toward a synthesis of two strands of research. The first strand deals with existence of unique positive solutions of such singular problems, beginning with work by Taliaferro in 1979 and continued by Waltman, the author and others in the next twenty years. The second strand deals with existence of multiple positive solutions of nonsingular problems where f is independent of t , beginning with work of Parter and Leggett and Williams (1979) and continued by Henderson and Thompson (2000), the author and others. The computational work is a continuation of work begun by the author in collaboration with Thompson in the nineties and with Ballard and Libbus in the last five years.