Applications of Topological Fixed Point Theory to Nonlocal Differential Equations with Convolution Coefficients

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In this talk I will discuss how a nonstandard cone together with topological fixed point theory can be used to deduce existence results for boundary value problems involving a nonlocal differential equation. A model case is the equation

$$-A\Big(\Big(b*(g\circ u)\Big)(1)\Big)u''(t)=f\Big(t,u(t)\Big),\ 0<t<1$$

subject to some boundary conditions. The notation $*$ denotes the finite convolution operator, and in this way a variety of nonlocal coefficients can be accommodated – for example, fractional integrals and derivatives. I will discuss the various assumptions imposed on the functions b and g, and how these assumptions are affected by the use of the nonstandard cone.

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