Instituto Universitario de Investigación de Matemáticas y Aplicaciones Universidad Zaragoza

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Seminario Rubio de Francia

Conferencia

por

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Título:

Fractional derivatives, their properties and the consequences for numerical solution of a time-fractional initial-boundary value problem of diffusion type

Resumen: An introduction to fractional derivatives and some of their properties is presented. This information is then used to discuss the regularity of a solution to an initial-boundary value problem of diffusion type in one space dimension, where the time derivative is fractional, of Caputo type. (This is a fractional-derivative generation of the classical heat equation.) It is shown that in general the unknown solution of this problem will have a weak singularity at the initial time $t = 0$, and sharp pointwise bounds on the derivatives of this solution are displayed. The presence of the singularity implies that standard numerical methods will not give very accurate solutions for this problem, so a special mesh is introduced that places more points near $t = 0$; a sharp analysis shows exactly how these mesh points should be placed to give optimal accuracy for a typical finite difference method that is used to solve the initial-boundary value problem.

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Web: `http://www.unizar.es/analisis_matematico/seminario.html`