

Regularity of the solution to 1-D fractional order diffusion equations

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Abstract

In this article we investigate the solution of the steady-state fractional diffusion equation on a bounded domain in \mathbb{R}^1 . The diffusion operator investigated, motivated by physical considerations, is neither the Riemann-Liouville nor the Caputo fractional diffusion operator. We determine a closed form expression for the kernel of the fractional diffusion operator which, in most cases, determines the regularity of the solution. Next we establish that the Jacobi polynomials are pseudo eigenfunctions for the fractional diffusion operator. A spectral type approximation method for the solution of the steady-state fractional diffusion equation is then proposed and studied.

Keyword

Fractional diffusion equation | Jacobi polynomials | Spectral method