The heat semigroup and equation related to a Bessel-type operators and the canonical Fourier Bessel transform

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June 8, 2021

Abstract

In this paper we study a translation operator associated with the canonical Fourier Bessel transform $\mathcal{F}_{\nu}^{\mathbf{m}}.$ We then use it to derive a convolution product and study some of its important properties. As a direct application, we introduce the heat semigroup generated by the Bessel-type operators $$\Delta_{\nu}^{\mathbf{m}^{-1}}=\frac{d^{2}}{dx^{2}}+\left(\frac{2\nu +1}{x}+2i \frac{a}{b} x\right) \frac{d}{dx}-\left(\frac{a^{2}}{b^{2}}x^{2}-2i\left(\nu +1\right) \frac{a}{b}\right) $$ and use it to solve the initial value problem for the heat equation governed by $\Delta_{\nu}^{\mathbf{m}^{-1}}.$

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