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Definition of the Riesz derivative and its application to space fractional quantum mechanics.

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Summary: We investigate and compare different representations of the Riesz derivative, which plays an important role in anomalous diffusion and space fractional quantum mechanics. In particular, we show that a certain representation of the Riesz derivative, R_x^α , that is generally given as also valid for $\alpha = 1$, behaves no differently than the other definition given in terms of its Fourier transform. In the light of this, we discuss the $\alpha \rightarrow 1$ limit of the space fractional quantum mechanics and its consistency.

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MSC:

- [81Q05](#) Closed and approximate solutions to the Schrödinger, Dirac, Klein-Gordon and other equations of quantum mechanics
[26A33](#) Fractional derivatives and integrals

Cited in **3** Documents

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