

**VECTOR GRÜNWARD FORMULA FOR
FRACTIONAL DERIVATIVES**

Mark M. Meerschaert ¹, Jeff Mortensen ², Hans-Peter Scheffler ³

Abstract

The Grünwald formula is used to estimate numerically fractional derivatives. It is an extension of the finite difference formula for integer order derivatives. This paper develops an extension of the Grünwald formula for vector fractional derivatives. This result should be useful for numerical solution of fractional partial differential equations where the space variable is a vector.

Mathematics Subject Classification: 26A33

Key Words and Phrases: Grünwald formula, vector fractional derivative, finite differences, numerical solution, fractional partial differential equation