DEFINING NEW GENERALIZED FUNCTIONS BY NONSTANDARD DISCRETE FUNCTIONS AND DIFFERENCE QUOTIENTS

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By using nonstandard analysis, we define new generalized functions as discrete functions, and their derivatives are defined as difference quotients. For Gevrey's ultradistributions, including Schwartz' distributions, we prove that difference quotients are indeed good replacements of generalized derivatives. Relations of our new generalized functions with Sobolev theory are presented. It is expected that this theory will be useful for nonlinear partial differential equations with distributional data.

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