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Peter A Loeb* (ploeb@illinois.edu), Department of Mathematics, University of Illinois, 1409 West Green Street, Urbana, IL 61801. *Forming generalized derivatives in analysis and probability theory.*

The talk discusses a powerful technique for showing that a given limit of ratios yields a Radon-Nikodym derivative. This technique, developed by Jürgen Bliedner and the speaker, casts new light on the martingale convergence theorem and significantly simplifies the treatment of fine limit theorems in potential theory and measure differentiation theorems. An important consequence is the existence of simple boundary approach neighborhood systems in probability and potential theory that, after fixing a suitable normalization, are the "best" possible in terms of producing Radon-Nikodym derivatives as limits at the boundary. An analogous construction for the differentiation of measures also exists. Each measurable set acts as a functional on measures: The value of the functional is the measure of the set. The larger the collection of sets one has at any stage of the filtration process associated with a point, the more information one obtains when a limit exists. Given a suitable normalization, there is an "optimal", i.e. coarsest filtration process that can be used to differentiate measures. Ongoing applications include the use of local maximal functions to considerably simplify the material on measure differentiation and absolute continuity in a graduate real variable course. (Received July 24, 2015)