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The Convenient Setting of Global Analysis

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ABSTRACT. The aim of this book is to lay foundations of differential calculus in infinite dimensions and to discuss those applications in infinite dimensional differential geometry and global analysis which do not involve Sobolev completions and fixed point theory. The approach is very simple: A mapping is called smooth if it maps smooth curves to smooth curves. All other properties are proved results and not assumptions: Like chain rule, existence and linearity of derivatives, powerful smooth uniformly boundedness theorems are available. Up to Fréchet spaces this notion of smoothness coincides with all known reasonable concepts. In the same spirit calculus of holomorphic mappings (including Hartogs' theorem and holomorphic uniform boundedness theorems) and calculus of real analytic mappings are developed. Existence of smooth partitions of unity, the foundations of manifold theory in infinite dimensions, the relation between tangent vectors and derivations, and differential forms are discussed thoroughly. Special emphasis is given to the notion of regular infinite dimensional Lie groups. Many applications of this theory are included: manifolds of smooth mappings, groups of diffeomorphisms, geodesics on spaces of Riemannian metrics, direct limit manifolds, perturbation theory of operators, and differentiability questions of infinite dimensional representations.

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To Elli, who made working on this book into a culinary experience.

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