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Celso Melchiades Doria

# Differentiability in Banach Spaces, Differential Forms and Applications

- The differential forms formalism is explained through the classical theorems of integrations and applied to obtain topological invariants
- Includes applications to the study of harmonic functions and to the formulation of the Maxwell's equations using differential forms
- Avoiding complicated notation

This book is divided into two parts, the first one to study the theory of differentiable functions between Banach spaces and the second to study the differential form formalism and to address the Stokes' Theorem and its applications. Related to the first part, there is an introduction to the content of Linear Bounded Operators in Banach Spaces with classic examples of compact and Fredholm operators, this aiming to define the derivative of Fréchet and to give examples in Variational Calculus and to extend the results to Fredholm maps. The Inverse Function Theorem is explained in full details to help the reader to understand the proof details and its motivations. The inverse function theorem and applications make up this first part. The text contains an elementary approach to Vector Fields and Flows, including the Frobenius Theorem. The Differential Forms are introduced and applied to obtain the Stokes Theorem and to define De Rham cohomology groups. As an application, the final chapter contains an introduction to the Harmonic Functions and a geometric approach to Maxwell's equations of electromagnetism.

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