
Contents – Volume 1:

Foundations and Integral Representations

Chapter 1	Differentiation and Integration on Manifolds . . .	1
1	The Weierstraß Approximation Theorem	2
2	Parameter-invariant Integrals and Differential Forms	12
3	The Exterior Derivative of Differential Forms	23
4	The Stokes Integral Theorem for Manifolds	30
5	The Integral Theorems of Gauß and Stokes	39
6	Curvilinear Integrals	56
7	The Lemma of Poincaré	67
8	Co-derivatives and the Laplace-Beltrami Operator	72
9	Some Historical Notices to Chapter 1	89
Chapter 2	Foundations of Functional Analysis	91
1	Daniell's Integral with Examples	91
2	Extension of Daniell's Integral to Lebesgue's Integral	96
3	Measurable Sets	109
4	Measurable Functions	121
5	Riemann's and Lebesgue's Integral on Rectangles	134
6	Banach and Hilbert Spaces	140
7	The Lebesgue Spaces $L^p(X)$	151
8	Bounded Linear Functionals on $L^p(X)$ and Weak Convergence	161
9	Some Historical Notices to Chapter 2	172
Chapter 3	Brouwer's Degree of Mapping	175
1	The Winding Number	175
2	The Degree of Mapping in \mathbb{R}^n	184
3	Topological Existence Theorems	194
4	The Index of a Mapping	196
5	The Product Theorem	205
6	Theorems of Jordan-Brouwer	211

Chapter 4	Generalized Analytic Functions	215
1	The Cauchy-Riemann Differential Equation	215
2	Holomorphic Functions in \mathbb{C}^n	219
3	Geometric Behavior of Holomorphic Functions in \mathbb{C}	233
4	Isolated Singularities and the General Residue Theorem	242
5	The Inhomogeneous Cauchy-Riemann Differential Equation	255
6	Pseudoholomorphic Functions	266
7	Conformal Mappings	270
8	Boundary Behavior of Conformal Mappings	286
9	Behavior of Cauchy’s Integral across the Boundary	296
10	Some Historical Notices to Chapter 4	303
Chapter 5	Potential Theory and Spherical Harmonics	305
1	Poisson’s Differential Equation in \mathbb{R}^n	305
2	Poisson’s Integral Formula with Applications	317
3	Dirichlet’s Problem for the Laplace Equation in \mathbb{R}^n	329
4	Theory of Spherical Harmonics in 2 Variables: Fourier Series	342
5	Theory of Spherical Harmonics in n Variables	347
Chapter 6	Linear Partial Differential Equations in \mathbb{R}^n	363
1	The Maximum Principle for Elliptic Differential Equations	363
2	Quasilinear Elliptic Differential Equations	373
3	The Heat Equation	378
4	Characteristic Surfaces and an Energy Estimate	392
5	The Wave Equation in \mathbb{R}^n for $n = 1, 3, 2$	403
6	The Wave Equation in \mathbb{R}^n for $n \geq 2$	411
7	The Inhomogeneous Wave Equation and an Initial-boundary-value Problem	422
8	Classification, Transformation and Reduction of Partial Differential Equations	427
9	Some Historical Notices to the Chapters 5 and 6	436
References	439
Index	443



<http://www.springer.com/978-1-4471-2980-6>

Partial Differential Equations 1
Foundations and Integral Representations
Sauvigny, F.
2012, XV, 447 p. 16 illus., Softcover
ISBN: 978-1-4471-2980-6