CONTENTS

	Prej	face	ix
1	Foundational Material		1
	1.1 1.2 1.3 1.4	Categories generated by a set of maps 2 Bornologies and ℓ^{∞} -structures 6 Difference quotients 12 Lipschitz structures and smooth structures 22	
2	Con	venient Vector Spaces	27
	2.1 2.2 2.3 2.4 2.5 2.6	ℓ^{∞} -vector-spaces and $\mathcal{L}i\rho^{k}$ -vector-spaces 41 Preconvenient vector spaces 47	35
3	Mu	ltilinear Maps and Categorical Properties	60
	3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8 3.9	Products 65 Coproducts or direct sums 68 Inductive limits 70 Function spaces of linear maps 71 Function spaces of multilinear maps 75	
4	Calculus in Convenient Vector Spaces		81
	4.1 4.2	Differentiable curves 83 Curve spaces 93	

viii Contents

	4.3	Dinerentiable maps 99			
	4.4	Function spaces and exponential laws 114			
	4.5	Partial differentiability 134			
	4.6	Spaces of sections of vector bundles 138			
	4.7	Certain function spaces are manifolds 145			
	4.8	Theorems on inverse and implicit functions 151			
5	Diff	ferentiable Maps and Categorical Properties	154		
	5.1	Free convenient vector spaces 155			
	5.2	Convenient co-algebras 165			
	5.3	Cartesian closed categories of convenient vector spaces	173		
	5.4	Reflexivity 179			
6	The	Mackey Closure Topology	188		
	6.1	Comparison with other topologies 189			
	6.2	Continuity of the addition and regularity 192			
	6.3	The Mackey closure of subsets 197			
	6.4	Convex functions 199			
7	Peri	Permanence Properties and Counter-examples 20			
	7.1	Extension and lifting properties 205			
	7.2	Preservation of categorical limits 209			
	7.3	Preservation of initiality and finality 216			
	7.4	Various counter-examples 221			
8	Some Categorical Notions and Notations				
	8.1	Categories 224			
	8.2	Functors and natural transformations 225			
	8.3	Limits and colimits 226			
	8.4	Adjoint functors 228			
	8.5	Adjoint functors and limits 229			
	8.6	Cartesian closed categories 229			
	8.7	Initial sources and final sinks 230			
	8.8	Embeddings and quotient maps 232			
	Bibliography				
		of Symbols	236		
		of Categories	239		
		of Functors	240		
	Inde	x	242		