

Contents

Preface

v

1 Hyperfunctions	1
1.1 Introduction	1
1.2 Hyperfunctions of One Variable: Basic Definitions	2
1.3 Hyperfunctions of One Variable: Main Results	20
1.4 Hyperfunctions of Several Variables: Basics	42
1.5 Hyperfunctions of Several Variables: Main Results	60
1.6 Historical Notes	72
1.6.1 Sato's Discovery	73
1.6.2 Analytic Functionals	75
1.6.3 Generalized Fourier Integrals	79
1.6.4 Hyperfunctions in Several Variables	80
1.6.5 Infinite Order Differential Equations	83
1.6.6 The Edge of the Wedge Theorem	85
2 Microfunctions	91
2.1 Introduction	91
2.2 Singular Support, Essential Support and Spectrum	92
2.3 Microfunctions of One Variable	113
2.4 Microfunctions of Several Variables	115
2.5 Microlocal Operators	122
2.6 Historical Notes	134
2.6.1 Physical Origins for the Theory of Microfunctions	134
2.6.2 Hörmander's Analytic Wave Front Set	141
3 \mathcal{D}-Modules	151
3.1 Introduction	151
3.2 Algebraic Geometry and Algebraic Analysis	156
3.3 Filtrations and Characteristic Varieties	169
3.4 \mathcal{E} -Modules	176
3.5 Historical Notes	179

4	Functors Associated with \mathcal{D}-modules	183
4.1	Introduction and Preliminary Material	183
4.2	The de Rham Functor	187
4.3	Algebraic Local Cohomology	200
4.4	Cohomological Properties of \mathcal{D}_X	203
5	Holonomic \mathcal{D}-modules	209
5.1	Introduction	209
5.2	Inverse Image and Cauchy Problem	209
5.3	Direct Image	218
5.4	Holonomic \mathcal{D} -Modules	222
5.5	Historical Notes	236
6	Systems of Microdifferential Equations	239
6.1	Introduction	239
6.2	The Invertibility of Microlocal Operators	241
6.3	A First Approach to Bicharacteristic Strips	249
6.4	Contact Transformations	255
6.5	Structure of Systems of Differential Equations	261
6.6	Historical Notes	272
Bibliography		275
Index		291