

## CONTENTS

Introduction	V
I. Continuous Cohomology of Lie Groups and Lie Algebras	1
1. Basic Definitions	1
2. Some Applications of $H^1$	5
3. An Application of $H^2$	9
II. Continuous Tensor Products, Infinitely Divisible and Factorizable Representations	11
1. Continuous Tensor Products (CTPs)	11
2. Infinitely Divisible Projective Representations and First Order Cocycles	14
3. Necessary and Sufficient Conditions for the Existence of a CTP of Projective Representations	16
4. CTPs of Representations of $C_e^\infty(\mathbb{R}, G)$	18
5. Factorizable Projective Representations of Current Groups and Fock Space	19
6. Coboundaries and their Associated Representations	26
7. Factorizable Representations and CTPs	30
III. First Order Cohomology Groups for Certain Semi-Direct Products	32
1. The General Theory	32
2. The Cohomology of the Euclidean Motion Groups	38
3. The Cohomology of the First Leibniz-Extension of Compact Lie-Groups	40
4. The First Leibniz-Extension of $SL(2, \mathbb{R})$	42
IV. First Order Cohomology for $SL(2; \mathbb{R})$ and $SL(2; \mathbb{C})$	48
1. Preliminaries	48
2. The Construction of the Principal Series for $SU(1,1)$	51

# IV

3.	Necessary Conditions for the Unitarity of Induced Representations of $SU(1,1)$	54
4.	The Complementary and the Discrete Series of $SU(1,1)$	61
5.	The First Order Cocycles of $SU(1,1)$	66
6.	The First Order Cocycles of $SL(2, \mathbb{C})$	74

V.	Further Results on Semi-Simple Lie Groups	78
1.	Kazdan's Result	78
2.	Spherical Functions	84
3.	The Connection between the Cohomology of the Lie Algebra and Lie Group with Applications to $SU(n;1)$ and $SO(n;1)$	100

VI.	"Genuine" Infinitely Divisible Representations	104
1.	General Definitions	104
2.	Infinitely Divisible Positive Functions for $SO(n) \otimes \mathbb{R}^n$ , $n \geq 3$	105
3.	Infinitely Divisible Positive Functions on the First Leibniz-Extensions of Certain Compact Lie Groups	108
4.	Infinitely Divisible Positive Functions on the First Leibniz-Extension of $SL(2; \mathbb{R})$	111
5.	The Explicit Formula for the Representations	112
6.	Some Remarks on Irreducibility	115

Appendix	121
----------	-----

References	124
------------	-----