

Table of Contents

Introduction

Introduction from a Physicist's Viewpoint (by Ian McArthur)

§ 1. Manifolds	1
(a) Generalities	1
(b) Complex Manifolds	4
(c) The Classification Problem	7
§ 2. Topology of Riemann Surfaces	10
(a) Fundamental Group	10
(b) Simplicial Homology	14
(c) Universal Covering Space	21
§ 3. Analytic Structure	25
(a) Holomorphic and Meromorphic Functions	25
(b) Divisors and the Theorem of Riemann-Roch	30
(c) Meromorphic Functions on the Torus	33
§ 4. Differentials and Integration	37
(a) Tangent Space and Differentials	37
(b) Differential Forms of Second Order	43
(c) Integration	45
§ 5. Tori and Jacobians	48
(a) Higher Dimensional Tori	48
(b) Jacobians	51
§ 6. Projective Varieties	56
(a) Generalities	56
(b) Embedding of 1-Dimensional Tori	61
(c) Theta Functions	62
§ 7. Moduli Space of Curves	67
(a) The Definition	67
(b) Methods of Construction	70
(c) The Geometry of the Moduli Space and the Compactification	76

§ 8. Vector Bundles, Sheaves and Cohomology	85
(a) Vector Bundles	85
(b) Sheaves	90
(c) Cohomology	94
§ 9. The Theorem of Riemann-Roch for Line Bundles	101
(a) Divisors and Line Bundles	101
(b) An Application: The Krichever-Novikov Algebra	109
§ 10. The Mumford Isomorphism on the Moduli Space	119
(a) The Mumford Isomorphism	119
(b) The Grothendieck-Riemann-Roch Theorem	125
Appendix : p -adic Numbers	134
Index	144