

Contents

1	Introduction	1
1.1	The Holomorphic Lefschetz Fixed Point Formula	1
1.2	The Heat Kernel	2
1.3	The Results	3
2	The Dolbeault-Dirac Operator	7
2.1	The Dolbeault Complex	7
2.2	The Dolbeault-Dirac Operator	12
3	Clifford Modules	19
3.1	The Non-Kähler Case	19
3.2	The Clifford Algebra	22
3.3	The Supertrace	27
3.4	The Clifford Bundle	29
4	The Spin Group and the Spin-c Group	35
4.1	The Spin Group	35
4.2	The Spin-c Group	37
4.3	Proof of a Formula for the Supertrace	39
5	The Spin-c Dirac Operator	41
5.1	The Spin-c Frame Bundle and Connections	41
5.2	Definition of the Spin-c Dirac Operator	47

6	Its Square	53
6.1	Its Square	53
6.2	Dirac Operators on Spinor Bundles	61
6.3	The Kähler Case	63
7	The Heat Kernel Method	69
7.1	Traces	69
7.2	The Heat Diffusion Operator	72
8	The Heat Kernel Expansion	77
8.1	The Laplace Operator	77
8.2	Construction of the Heat Kernel	79
8.3	The Square of the Geodesic Distance	81
8.4	The Expansion	92
9	The Heat Kernel on a Principal Bundle	99
9.1	Introduction	99
9.2	The Laplace Operator on P	100
9.3	The Zero Order Term	105
9.4	The Heat Kernel	108
9.5	The Expansion	110
10	The Automorphism	117
10.1	Assumptions	117
10.2	An Estimate for Geodesics in P	121
10.3	The Expansion	125
11	The Hirzebruch-Riemann-Roch Integrand	131
11.1	Introduction	131
11.2	Computations in the Exterior Algebra	133
11.3	The Short Time Limit of the Supertrace	143

12 The Local Lefschetz Fixed Point Formula	147
12.1 The Element g_0 of the Structure Group	147
12.2 The Short Time Limit	151
12.3 The Kähler Case	155
13 Characteristic Classes	157
13.1 Weil's Homomorphism	157
13.2 The Chern Matrix and the Riemann-Roch Formula	159
13.3 The Lefschetz Formula	164
13.4 A Simple Example	169
14 The Orbifold Version	171
14.1 Orbifolds	171
14.2 The Virtual Character	176
14.3 The Heat Kernel Method	177
14.4 The Fixed Point Orbifolds	179
14.5 The Normal Eigenbundles	181
14.6 The Lefschetz Formula	183
15 Application to Symplectic Geometry	187
15.1 Symplectic Manifolds	188
15.2 Hamiltonian Group Actions and Reduction	192
15.3 The Complex Line Bundle	201
15.4 Lifting the Action	205
15.5 The Spin-c Dirac Operator	213
16 Appendix: Equivariant Forms	221
16.1 Equivariant Cohomology	221
16.2 Existence of a Connection Form	225
16.3 Henri Cartan's Theorem	227
16.4 Proof of Weil's Theorem	234
16.5 General Actions	234