

## Symbol index

- $A^*$ , 4  
 $\mathbf{b}$ , 105  
 $\tilde{\mathbf{b}}$ , 123  
 $B(V)$ , 148  
 $B^m(M)$ , 180  
 $\mathbb{C}$ , 1  
 $c_k$ , 182  
 $\mathcal{C}_\phi$ , 170  
 $C(X)$ , 5  
 $c(V)$ , 195  
 $\text{Ch}$ , 197  
 $\mathbb{C}\mathbb{P}^n$ , 23  
 $\mathcal{D}(X, A)$ , 54  
 $\text{diag}$ , 9  
 $[E]$ , 20  
 $\text{exp B}$ , 14  
 $\mathcal{G}(A)$ , 30  
 $\text{GL}(C(X))$ , 63  
 $\text{GL}(n, C(X))$ , 10  
 $\text{GL}(n, C(X))_0$ , 13  
 $h(\phi)$ , 171  
 $H^*$ , 23  
 $H_V^*$ , 157  
 $H_V$ , 157  
 $H_{deR}^*(M)$ , 181  
 $\text{Hom}(A, B)$ , 43  
 $\text{Hom}(V, W)$ , 48  
 $\mathcal{I}(n, C(\mathcal{S}'X))$ , 89  
 $\mathcal{IP}(n, \mathbb{C})$ , 181  
 $\text{Idem}(C(X))$ , 20  
 $K^0(X)$ , 51  
 $K^0(X, A)$ , 56  
 $K^0(X)[[t]]$ , 146  
 $K^{-1}(X)$ , 63  
 $K^{-1}(X, A)$ , 65  
 $K^{-n}$ , 83  
 $\mathcal{L}^m(n, C(\mathcal{S}'X))$ , 88  
 $L(p, k)$ , 109  
 $L(X, A)$ , 133  
 $M(m, n, C(X))$ , 5  
 $M(n, C(X))$ , 5  
 $\text{Map}(X, M(m, n, \mathbb{C}))$ , 25  
 $\text{offdiag}$ , 132  
 $\mathcal{P}^m(n, C(\mathcal{S}'X))$ , 89  
 $\mathbb{P}(V)$ , 157  
 $\text{Ran } E$ , 33  
 $\text{Rot}$ , 10  
 $\mathbb{R}\mathbb{P}^2$ , 107  
 $S(V)$ , 148  
 $\mathcal{S}X$ , 110  
 $\mathcal{S}'X$ , 84  
 $\tilde{\mathcal{S}}X$ , 110  
 $\mathcal{T}(\mathcal{V})$ , 141  
 $\text{Triv}(X, A)$ , 131  
 $U_V$ , 152  
 $[V]$ , 22  
 $V|A$ , 22  
 $V^*$ , 25  
 $V^\perp$ , 37  
 $V_1 \boxplus V_2$ , 24  
 $V_1 \oplus V_2$ , 24  
 $V_1 \cup_\gamma V_2$ , 28  
 $V \boxtimes W$ , 118  
 $V \otimes W$ , 119  
 $\mathfrak{B}(X, A)$ , 130  
 $\text{Vect}(X)$ , 22  
 $\text{Vect}(X, A)$ , 130  
 $\mathcal{W}^\perp$ , 3  
 $X_1 \coprod X_2$ , 54  
 $X^+$ , 78  
 $(X, A)$ , 54  
 $(X \setminus A)^+$ , 60  
 $X \vee Y$ , 106  
 $X \wedge Y$ , 110

$\mathcal{Z}_\phi$ , 170  
 $Z^m(M)$ , 180  
 $\varepsilon$ , 150  
 $\Theta^n(X)$ , 21  
 $\Pi_f(V)$ , 195  
 $\Sigma_f(V)$ , 196  
 $\phi^+$ , 79  
 $\psi^k$ , 167  
 $\Omega^*(U)$ , 177  
 $\langle v, v' \rangle$ , 1  
 $\|v\|_{in}$ , 2  
 $\| \cdot \|$ , 6  
 $\| \cdot \|_{op}$ , 6  
 $\| \cdot \|_\infty$ , 7  
 $\infty_X$ , 78  
 $\sim_g$ , 30  
 $\sim_h$ , 18  
 $\sim_p$ , 23  
 $\sim_s$ , 18  
 $\nabla_E$ , 188  
 $\bigwedge(\mathcal{V})$ , 141  
 $\bigwedge^k(\mathcal{V})$ , 141  
 $\bigwedge^k(\pi^*V)$ , 149  
 $\bigwedge^{even}(\mathcal{V})$ , 141  
 $\bigwedge^{odd}(\mathcal{V})$ , 141

206

Subject index

**Subject index**

- abelian monoid, 29
- Adams operations, 167
- adjoint, 4
- algebra, 9
- algebraic equivalence, 47
- antiderivation, 177
- atlas, 178
  
- ball bundle, 148
- Banach algebra, 9
- Banach space, 6
- base, 21
- base point, 76
- Bianchi identity, 190
- Bott periodicity, 83, 96, 99
- Brouwer fixed point theorem, 109
- bundle homomorphism, 22
- bundle homotopy, 48
  
- cancellation, 49
- category, 43
- Cauchy-Schwarz inequality, 2
- Cesàro mean, 86
- characteristic class, 193
  - $\hat{A}$ , 195
  - additive, 196
  - $L$ , 195
  - multiplicative, 195
  - Todd, 195
- characteristic number, 193
- chart, 178
- Chern character, 197
- Chern class, 193
  - total, 195
- Chern number, 193
- Chern-Weil theory, 190
- closed adapted cover, 127
- clutching, 28
  
- cohomology theory, 108
- commutative diagram, 41
- compact pair, 54
- complex projective space, 23
- complexification, 25
- cone, 110
- connecting homomorphism, 69, 81, 100
- continuous at infinity, 79
- curvature, 189
  
- de Rham cohomology, 181
- differential form, 177
  - closed, 180
  - exact, 180
- direct limit, 20
- direct limit topology, 20
- double, 54
- dual bundle, 25
- dual Hopf bundle, 157
  
- exact sequence, 39
  - short, 39
  - split, 39
- exponential map, 14
- exterior algebra, 141
- exterior differentiation, 177
- exterior product, 141
- external Whitney sum, 24
  
- family of vector spaces, 21
- Fejér kernel, 86
- fiber, 21
- fiberwise norm, 147
- finite type, 127
- five lemma, 42
- Fourier series, 86
- functor

- contravariant, 45
- covariant, 44
- half-exact, 58
- Gram-Schmidt process, 2
- Grothendieck completion, 30
- Hermitian metric, 35
- homogeneous coordinates, 23
- homomorphism of families, 22
- homotopic idempotents, 18
- homotopic vector bundles, 48
- Hopf bundle, 157
- Hopf invariant, 171
- idempotent, 17
  - smooth, 188
- inner product, 1
- inner product space, 1
- internal Whitney sum, 24
- invariant polynomial, 181
- join, 174
- $K^{-1}$ , 63
  - reduced, 76
  - relative, 65
- $K^0$ , 51
  - for locally compact spaces, 80
  - reduced, 76
  - relative, 56
- Künneth theorem, 127
- Laurent polynomial, 88
- lens space, 109
- Levi-Civita connection, 188
- line bundle, 22
- locally compact Hausdorff space, 78
- magnitude, 2
- mapping cone, 170
- mapping cylinder, 170
- Mayer-Vietoris exact sequence, 113
  - reduced, 173
- module, 114
  - free, 114
  - projective, 174
- natural transformation, 46
- Newton's identities, 185
- one-point compactification, 78
- operation, 166
- operator norm, 6
- orthogonal complement, 3
- orthogonal decomposition, 4
- orthogonal projection, 4
- orthonormal basis, 2
- partition of unity, 26
- pointed space, 76
- projection map, 21
- projective bundle, 157
- proper map, 79
- pullback, 24
- Puppe sequence, 170
- quotient bundle, 49
- rank, 22
- real projective plane, 107
- real vector bundle, 25
- rotation matrix, 10
- section, 50
- Serre-Swan Theorem, 175
- similar idempotents, 18
- simple tensors, 115
- simple wedge, 141
- smash product, 110

208

Subject index

smooth function, 178  
smooth manifold, 178  
    orientable, 179  
sphere bundle, 148  
splitting principle, 166  
stably isomorphic, 201  
Stokes's theorem, 180  
subbundle, 24  
supremum norm, 7  
suspension  
    reduced, 110  
    unreduced, 110  
symmetric function, 183  
    elementary, 183  
  
tautological line bundle, 23  
tensor algebra, 141  
tensor product  
    external, 118  
    internal, 119  
    of linear maps, 116  
    of matrices, 117  
    of modules, 115  
    of vector spaces, 116  
Thom class, 152  
Thom isomorphism, 156  
triangle inequality, 3  
trivial family, 22  
  
vector bundle, 22  
  
wedge, 106  
wedge product, 141  
winding number, 200