SUBJECT INDEX

Abelian group 390f locally compact 390f solenoidal 391 abscissa - of absolute convergence 103f - of simple convergence 103 - of holomorphy 101 absolute value 235, 239 abstract Cauchy problem 4, 26ff, 98ff, 336 adjoint 16f, 400 - generator 17f - operator 16, 64f, 77, 141 - semigroup 16ff admissible function 154ff algebraic multiplicity 73 AL-space 239	characterization - of generators
AM-space 239 approximation theorems 32f, 44, 81, 116	Datko's theorem 108f
asymptotics 98ff, 204ff, 342ff, 352, 406ff	decomposition 68 ff, 325 ff, 351 ff delay
automorphism group 146ff	- differential equation 219ff - equation 356ff
	derivation 143ff derivative first order - 9ff, 146, 184f,
Banach lattice 235 complex 243, 260, 288	220, 265, 276, 308f, 357 higher order - 267f
real 243 band 236	second order - 11f, 34f, 179, 185, 249f, 308f
- projection 237	differential equation
boundary spectrum 189ff,	homogeneous 4, 98f
296ff, 302ff, 305, 379ff, 387	inhomogeneous 112ff, 340ff ordinary 152f, 197f, 219ff
	partial 26
	retarded 134f, 142, 179f, 219ff
	system of 365
C*-algebra 117, 369	differential operator 9ff, 11ff,
Calkin algebra 73 Cauchy problem 4, 26ff	34f, 146, 179, 185, 220, 259f, 265, 267f, 276, 308f, 357
abstract 4, 26ff, 98ff, 336	disjointness preserving
autonomous 4, 26ff	operator 281
homogeneous 4, 98ff	semigroup 281ff
inhomogeneous 112ff, 340ff	dispersive 249ff
retarded 279ff, 356ff	strictly - 249ff
well-posed 26ff center 246, 272, 279f, 288	dissipative 47 ff p- 48 ff, 128 ff
Césaro	strictly - 48ff
- mean 346, 406, 408	Doeblin's condition 218, 345
- summable 93f	domain 3, 9, 46f
Chapman-Kolmogorov equation 213f	Fredholm - 73f
characteristic equation 180, 229, 382 generalized 226, 362	domain of uniqueness 46f

Gateaux-derivative 50, 136, 257, 283 dominant spectral value 177ff, 304, 318ff generalized solution 99, 112 strictly --generator 3ff 177ff, 210, 217, 318ff adjoint - 16 bounded - 2, 7, 54ff, 129, 247, domination 269ff, 371 16 255, 288, 376ff dual weak* - 16 semigroup -16 f Dunford-Pettis property 56 geometric multiplicity 73 graph graph norm -5 Grothendieck space 55ff group 1, 6, 9, 34, 66, 146ff, 64, 86 64, 387 326f, 352ff, 390f eigenspace automorphism - 146ff eigenvalue approximate - 64, 314 simple - 73, 305, 310, 388 lattice homomorphism 202one-parameter - 1, 6, 31 positive - 146, 148ff, 295, 326f normalized - 389 eigenvector 64, 387 10, 69, 352ff rotation approximate - 64, 314 13 unitary growth bound elliptic differential operator 2, 6, 60ff -- of a semigroup 2, 6, 60ff, 74, 99ff, 130, 168, 204ff, 295, 185, 190f, 260, 305, 312 equation differential - 4 334ff, 343, 400ff heat - 13 -- of mild solutions of a Cauchy problem 229, 344f, 354f, 364ff population -99f f retarded -356ff -- of solutions of a Cauchy problem 309f, 320 transport -99ff, 204ff, 336ff essential -- 74, 343 example counter -3, 61ff, 105, 131, 265ff, 311 standard - 7ff, 9, 10, 11, 12, 42ff, 100f, 124, 280, 416 exponential estimate 2f half-norm 51ff, 127ff canonical - 51ff, 127ff, 255ff strict - 51ff, 127ff heat equation 13 13, 62, 94ff, 105, 403 Hilbert space 20f, 298ff, 314ff F-product Hille-Yosida theorem 32 F-product with respect to a semigroup 20f, 74ff, 192 388 face invariant - 388, 410 faithful subset 380 ideal 236 Féjer's theorem algebraic -118 closed - 118, 236 Feller property strong -- 213 182ff, 303, 306ff, 317 invariant -343ff, 374ff, 380ff, 414 fixed space 236 lattice imaginary additively cyclic subset 143ff flow continuous - 148, 192ff, 330 172ff, 192ff, 297 semi - 143ff, 328ff inhomogeneous differential equation seperately continuous -149 f 112ff, 340ff forcing term 112ff, 340ff integral equation 363 interpolation 335, 348, 352 periodic -- 116 p-periodic -- 113ff invariant 182ff, 303, 306ff, 317 12f, 91, 252 - ideals Fourier transformation inverse -- 13, 91 24, 346 - subset reducible 138ff, 256ff, 414
- semigroup 130, 182ff, 210, 306ff, 311ff, 315ff, 409ff 80 coefficient irreducible Fredholm - domain 73f - operator 73f W*-- 388

closed - 5f Jordan decomposition 384, 389, 420 47ff contractive densely defined - 4 differential - gff dissipative - 47ff Kakutani-Krein theorem 240, 297, dispersive 249ff 313, 334 elliptic -185, 190f, 260, 305, 312 kernel - 184, 189f, 308ff, 320, Kato's 138ff, 285ff, 325f 349f, 363, 367 equality - inequality 139, 256ff, 258ff, 285 classical - 139f, 258f lattice - 120, 242 local - 146f, 268f, 282, 287 Laplace - 13, 34f, 100, 110, 139, distributional -259 f Krein-Rutman theorem 130, 167, 334 168, 185, 205, 250f, 258, 338 multiplication -7f, 89f, 246, 287 positive - 120ff p-contractive -48ff 48ff, 128ff p-dissipative -Laplace transform 101, 107 resolvent positive - 127ff 13, 34f, 100, 110, 139, Schrödinger - 179, 273, 278f, 336 Laplacian 168, 185, 205, 250f, 258, 338 strictly dissipative - 48ff strictly p-dissipative lattice - homomorphism 120, 243, 244, 281 strictly dispersive 249ff - norm 235weakly compact - 181, 211f 146f, 268f, 282, 287 operator semigroup 1ff, 406 locality long term behavior 98ff, 204ff, weakly compact --406f 342ff, 352, 406ff order bounded 238 order Lumer-Phillips theorem 53f - complete 234 - continuous norm 241 interval 235 239, 286, 287ff order continuity Markov order unit 238 algebra homomorphism *143*ff weak --238 - lattice homomorphism 120, ordered 192ff, 200f - Banach space 234, 295 - operator 120, 191 - vector space 234 - process 213f - semigroup 144, 191 - transition function 213f, 347f matrix semigroup 185, 190 maximum principle periodic mild solution 99, 112 semigroup 10, 79ff, 85, 313, 416 modulus *136, 257, 278*ff, 281 p-periodic *113*ff multiplication Perron-Frobenius theory 163ff, 172ff, ~ operator 7f, 89f, 246 292ff, 296ff, 379ff 7f, 42ff, 65f, 287ff perturbation - semigroup 73ff additive -*43*ff multiplicity algebraic -73f, 209, 310 bounded 🝝 44ff, 307 - as a pole 73 compact -215f, 319 73, 310 geometric multiplicative - 131ff, 141 perturbation by multiplication operators 179, 183, 188, 274ff, 279, 307 perturbation theorems *43*ff Phillip's theorem 249 negative part 235polar decomposition 380, 392 norm pole 67f, 72ff, 76, 209ff, 305, 315ff graph -Sobolev -18ff algebraically simple - 73f, normal linear functional 369 181, 185, 209ff, 216, 315ff - of order k 73f, 86, 174f, 295, 303ff simple - 73f, 209ff, 310, 315ff operator first order - 73f, 180 closable -5f

population equation 229ff, 344f, Schwarz inequality 370 354f, 364ff Schwartz space 12, 250 positive part self-adjoint part 235positive minimum principle semiflow 143ff, 328ff 125ff, 133ff, 253ff, 268 continuous - 144ff, 192 positive subeigenvector 261 injective - 193 positivity 118, 119, 120, surjective - 193 123ff, 238, 242, 244, 370 semigroup Iff adjoint - 18ff, 77, 400 370, 403 strict - 118, 119, 120, 238, 242, 310, 316 analytic - 33ff bounded predual 369 bounded holomorphic (of angle α) projection 72, 209ff, 343ff, 33ff, 110 compact - 40ff 410ff, 423 ergodic - 410ff, 424 commuting - 24 contraction - 3, 47ff, 247ff, recurrent ~ 407 297_f, 397 semigroup -209ff, 310, 343ff, 411 convolution - 12 differentiable - 37f, 41 spectral - 68ff pseudo-resolvent 298ff, 314ff, 372ff, 383ff, 392ff, 419ff diffusion - 11ff disjointness preserving positive -299f f eventually compact - 40ff, 209, 211, 214 eventually differentiable eventually norm continuous - 38ff, 41, 87ff, 106, 178, 304f, 318, 337, 345 F-product - 20f, 74ff, 192 quasi-compact 214ff, 343ff quasi-interior point 238, 306 holomorphic (of angle a) -33ff, 41, 100, 183, 305ff, 311ff 370ff, 379ff, identity preserving -389ff, 408ff, 424f implemented - 403range condition 53f, 146f, 249, 270 regular mapping 242, 272, 279f induced - 14f, 74ff, 298, 374 irreducible - 182ff, 210, 315ff, regularity 242, 272, 279f 388ff, 409ff residue 67f, 72ff, 309ff, 395ff resolvent 63ff, 370 lattice homomorphism -135ff, 143ff, compact - 40, 73, 130, 166, 792ff, 285, 320ff Markovian - 144ff, 191 matrix - 7 177, 305, 318, 336 positive - 123ff pseudo - 298ff, 314ff, 372ff, mean-ergodic - 346 modulus - 278ff, 282ff 383ff, 392ff, 419ff multiplication - 7f, 42ff, 65f, 287ff slowly growing - 301ff resolvent θ , $\theta 3 ff$, 370nilpotent - 11, 41f, 74ff - equation 127, 298 38ff, 41 norm continuous -- integral representation θ , 293ff - of Schwarz type 370ff. 379ff, 127 positive 408ff, 424f 63ff, 75 - set one-parameter -1 retarded 352ff, 416ff partially periodic periodic - 79ff, 85, 313, 416 - differential equation 219ff equation 356f f positive - 123ff Riesz Decomposition theorem 237 preadjoint - 414 quasi-compact - 214ff, 343ff quotient - 15, 74Riesz Schauder theory reduced -374, 407 14 rescaled -10, 69, 189, 313, 352ff rotation ~ Schrödinger operator 273f, 278f, 336 similar -13f Schwarz map 370ff, 379ff, 381ff, 407ff Sobolev -18ff identity preserving -- 370ff, 379ff, strongly continuous -2ff strongly ergodic - 406, 408ff, 424f subspace - 14f, 74 381ff, 408ff

```
tensor product - 21ff, 88f
                                            strictly positive
  translation - 9f, 11, 15, 18, 41,
                                                  118, 119, 120, 238, 242, 261
      66ff, 205
                                              -- element
                                                          261
 uniformly continuous - 2, 7, 54ff,
                                              -- functional 238, 261
      129, 247, 255, 288, 376ff
                                              -- operator 242
  uniformly ergodic - 391ff, 416,
                                              -- subset 261ff
      419, 424f
                                            subdifferential 48ff, 128ff
 weakly continuous -
                                            subeigenvector 261
  weak* continuous - 16, 370ff, 403
weak*-irreducible - 388, 414, 424f
                                              positive - 261
                                            subinvariant subset
                                                                   380
semigroup dual 16f, 77
                                            sublattice 236
signum 137ff, 256ff, 276, 296f
                                            sublinear function
             170ff, 245, 256ff, 296

    operator

singularity
  isolated -
              72ff
Sobolev space 18ff
  classical -- 19
                                            tensor product
solid subset 236
                                              -- of Banach spaces 21ff
solution of a Cauchy problem
                               4, 27ff
                                              -- of operators 21ff
                                              -- of semigroups 27ff, 88f
  generalized - 99, 112ff
 mild - 99, 112ff
                                            translation property
                                                                    220, 358
 p-periodic - 113ff
                                            translation semigroup
                                                                   9f, 15, 18,
 strong - 27ff, 99, 112ff,
                                                  61f, 66ff, 75, 205
      219ff, 356ff
                                              nilpotent -- 11, 41f, 83, 164f
                                              periodic --
                                                            66
spectral
 - decomposition 68ff, 325ff, 351f
                                            transformation
  - projection 69f, 79
                                              Fourier - 12f
                                              Laplace - 101, 107
  - theorem 60 \text{ff}, 82 \text{ff}
               60ff, 101f, 105ff,
                                            transport equation 309f, 320
spectral bound
      130, 163, 168, 204ff, 225, 292ff,
                                            type of a semigroup -2
      316, 334ff, 361, 379, 400ff
  essential -- 73f, 214ff, 318
spectral inclusion theorem
spectral mapping theorem
     60ff, 67, 82ff, 106
                                            ultrapower 315, 377, 394, 420
 weak --- 65f, 83f, 89ff
                                            unimodular function 313
  --- for the resolvent 67f
                                            unitary
                                                     390
spectral radius \delta\theta
  essential -- 73f, 177, 214ff, 318
spectral value
                177ff
  dominant --
  strictly dominant - 177ff, 210, 217
                                            vector
spectrum \delta \thetaff
                                              - lattice
  approximate point -
                       64f, 394

    sublattice

  boundary - 169ff, 296ff, 302ff,
 305, 379ff, 387
cyclic - 169, 172ff, 302ff,
305, 379ff, 388ff
  essential - 73f
                                            W*-algebra
                                                         369
  point - 64f, 394
                                            W*-dynamical system 414ff
                                              irreducible -- 414ff
  residual - 64f
                                            weakly sequentially compact 242, 322
stability
  98ff, 227, 337ff, 361, 402ff
exponential - 99ff, 227
                                            well-posedness
                                                            26f f
  uniform - 99f, 339, 402ff
 uniform exponential - \theta\thetaf,
     205, 402ff
 weak - 111f, 205f, 402ff
                                            Zero-Two law (0-2 law)
 weak uniform - 111f
state space 369, 400
stationary point -156
stochastic continuity 213f
```