

## INDEX

- accretive 197  
 adjoint  
   ,distribution 57  
   ,Hilbert space 57, 201  
   diff. expression 120  
 adjoint relation 115  
 algebra, invariant 298f  
   of the Dirac equation  
     310f, 319f
- Baker-Campbell-Hausdorff  
   formula 48
- Beals composition formulas 64f
- Bessel function 24  
   equation 25  
   integrals 27
- bicharacteristic strip 42
- boundary condition  
   Dirichlet 150  
   Lopatinski-Shapiro 169f  
   Neumann 150
- boundary space  $Z_x$  186
- boundedness of  $\psi$ do's in  $\Lambda_2$  99f
- Bracket operation 47
- calculus of  $\psi$ do's 72f
- Cauchy problem, local 244f  
   nonrelativistic 227, 236  
   relativistic 227, 237
- characteristic equation 41  
   set 224  
   strip 38, 41  
   surface 41, 230  
     simple, multiple 42  
     complex 44  
   ,non- 89
- commutator equation 301
- commutativity, spectral  
   theoretical 340
- compactification 87
- compactness  
   of neg. order  $\psi$ do's
- comparison algebra 189
- comparison triple 127
- complete spaces  
   with cylindrical ends 138
- cone of time-like vectors 229
- conical 120
- coordinate  
   invariance 129f, 283, 293f  
   transform, S-admissible 124
- cut-off function,  
   S-admissible 126
- Dirac equation 313
- Dirichlet problem 145  
   exterior-interior 151
- dissipative operator 184, 197
- distribution 9  
   temperate 11, 118, 123f
- Egorov theorem 145
- elliptic 83  
   , md- 82  
   , formally (md-) hypo- 85  
   , local (md-) 87f  
   , md- with respect to 89
- end  
   , conical 127  
   , cylindrical 127
- evolution operator 175, 206f
- finite propagation speed 241
- flow 33

- flow,  
     characteristic 33, 196  
     particle 196, 215f, 220f,  
 Foldy-Wouthuysen  
     transform 319f, 323  
     theorem 343  
 Fourier integral 3f  
     inversion formula 5  
     -Laplace method 20f  
     series 14  
     transform 1, 3f  
     for temperate  
         distributions 12  
     for general distr. 14f  
 Fredholm inverse 113  
     special 113  
 fundamental solution 154  
     of heat operator 25  
  
 geometrical optics approach  
     of the Dirac algebra 324f  
 Green inverse 112, 113f, 139f,  
 Green's function 181  
  
 Hamilton flow 145  
     system 218  
 Hankel function 25  
     transform 22  
 Heisenberg group 249  
     representation 313  
 Helmholtz equation 24  
 hermitian operator 184  
 Hille-Yosida-Phillips  
     theorem 146, 176  
 hyperbolic 226f  
     normally 227  
     polynomial 227  
     semi-strictly 283  
     strictly 45, 196, 210, 228  
         of type  $f$  212  
     symmetric 196  
 hypergeometric function 28  
 hypo-elliptic  
     , boundary 145, 152, 158f  
     differential expression  
         91f, 174f  
     , formally md- 87f  
  
 infinitesimal generator 176, 197  
 initial conditions 36  
     value problem 42  
     for heat equ. 25  
 inverse, partial md- 98  
  
 Jacobi identity 284  
  
 K-parametrix 8f  
 Kirchhoff formula 27  
 Klein-Gordon equation 29  
  
 Laplace transform 19  
 Leibniz' formula  
     with integral remainder 70f  
 Lie algebra 45f  
 Lie group 45f  
 Lopatinski-Shapiro conditions  
     145, 151, 169, 180  
 L-S-cdn. see Lopatinski-Shapiro  
  
 maximal ideal  
     space 87  
     propagation of 223f  
 minimal operator 180, 198  
 multiplication operator 52  
  
 natural classes of  $\psi$ do's 247  
 Neumann problem 145  
 normally solvable 147, 161f, 189  
  
 observable 314f  
     , basic 341, 355, 366  
     , corrected 336  
     , spin 340  
     , standard dynamic 336  
 order classes 110, 139f  
 Paley-Wiener theorem 14

- parametrix 81
  - ,  $K$ - 82
  - , local 89
  - , with respect to 89
- Parseval's relation 5
- principal
  - symbol space 89
  - type 42, 231
- pseudodifferential operator 53
- $\psi$ do-theorem 251f, 257f
- realization, of a differential
  - expression 180
- region of dependence and
  - and influence 241f
- resolvent 262
  - compact 180
  - set 180
- Riemann Hilbert problem 145, 154
- $S$ -manifold 121
- $SG$ -structure 120
- Schmidt norm 254, 260, 339
- Schrodinger representation 312
- secondary symbol space 89
- self-adjoint operator 185, 186f
- semigroup 175, 179f
- singularities,
  - propagation of 223f
- smooth operator 247, 261f
  - , translation 261
  - , gauge 261
  - , rotation 264, 318
  - , dilation 264, 318
- Sobolev norm
  - , weighted 139
- Sobolev space 106f
  - , unweighted 107f
  - , weighted 106, 108f
- Sobolev estimate 107
  - imbedding 107
- Sonine-Gegenbauer formula 29
- Spectral theory 179f
- spectrum, essential 338
- strip 37
  - characteristic 38f
  - condition 37
  - initial 37
  - integral 37
- structure,  $S$ - 127
- symbol
  - , classical 78
  - , local 118
  - , of a  $\psi$ do 53, 249
  - , of a  $C^*$ -algebra 87, 189
  - classes  $ST$  53
    - $SS$  61
    - $ST_1$  60
    - $\psi_h$  61
    - $\psi_c$  78
    - $\psi_t$  69
    - $\psi_I$  269, 275
    - $\psi_S$  269, 275
    - $LS$  135
    - $LC$  135
  - Heroander type 62
- symbol space  $M$  87, 189
  - principal 89
  - secondary 89
- symmetrizer 210f, 212
- systems of  $\psi$ do's 97f
- wave front set 93f
  - space 88
- wave operator 230
- Weinstein-Zelditch class 273
- Weyl representation 61