

STANDARD REFERENCES TEXTS

For references to standard facts from real and complex analysis, point set topology and functional analysis the following four books are used.

- [C] Conway, J.B., *Functions of One Complex Variable*, Graduate Texts in Mathematics, Springer-Verlag, New York, 1973.
- [GG] Gohberg, I., Goldberg, S., *Basic Operator Theory*, Birkhäuser Verlag, Boston, 1981.
- [R] Rudin, W., *Real and Complex Analysis*, McGraw-Hill, New York, 1966.
- [W] Willard, S., *General Topology*, Addison Wesley, Reading, 1970.

BIBLIOGRAPHY

Apostol, C.

- [1] On a spectral equivalence of operators, in: *Topics in Operator Theory (Constantin Apostol Memorial Issue)*, Operator Theory: Advances and Applications, Vol. 32, Birkhäuser Verlag, Basel, 1988, pp. 15–35.

Bart, H., Gohberg, I., Kaashoek, M.A.

- [1] *Minimal Factorization of Matrix and Operator Functions*, Operator Theory: Advances and Applications, Vol. 1, Birkhäuser Verlag, Basel, 1979.
- [2] Wiener-Hopf integral equations, Toeplitz matrices and linear systems, in: *Toeplitz Centennial*, Operator Theory: Advances and Applications, Vol. 4, Birkhäuser Verlag, Basel, 1982, pp. 85–135.
- [3] Convolution equations and linear systems, *Integral Equations and Operator Theory* 5 (1982), 283–340.
- [4] The coupling method for solving integral equations, in: *Topics in Operator Theory and Networks, the Rehovot Workshop*, Operator Theory: Advances and Applications, Vol. 12, Birkhäuser Verlag, Basel, 1984, pp. 39–73.
- [5] Explicit Wiener-Hopf factorization and realization, in: *Constructive Methods for Wiener-Hopf Factorization*, Operator Theory: Advances and Applications, Vol. 21, Birkhäuser Verlag, Basel, 1986, pp. 235–316.
- [6] Fredholm theory of Wiener-Hopf equations in terms of realization of their symbols, *Integral Equations and Operator Theory* 8 (1985), 590–613.
- [7] Wiener-Hopf factorization, inverse Fourier transforms and exponentially dichotomous operators, *J. Functional Analysis* 68 (1986), 1–42.
- [8] Wiener-Hopf equations with symbols analytic in a strip, in: *Constructive Methods of Wiener-Hopf Factorization* (Gohberg, I. and Kaashoek, M.A., eds.), Operator Theory: Advances and Applications, Vol. 21, Birkhäuser Verlag, Basel, 1986, pp. 39–74.

Bart, H., Kaashoek, M.A., Lay, D.C.

- [1] The integral formula for the reduced algebraic multiplicity of meromorphic operator functions, *Proc. Edinburgh Math. Soc.* 21 (1978), 65–72.

Beauzamy, B.

- [1] Un opérateur sans sous-espace invariant: simplification de l'exemple de P. Enflo, *Integral Equations and Operator Theory* 8 (1985), 314–384.
- [2] *Introduction to Operator Theory and Invariant Subspaces*, North-Holland Math. Library 42, Elsevier Science Publ., Amsterdam, 1988.

Calderon, A.P.

- [1] The analytic calculation of the index of elliptic equations, *Proc. Nat. Acad. Sci. USA* **57** (1967), 1193–1194.

Carleman, T.

- [1] Zur Theorie der linearen Integralgleichungen, *Math. Zeitsch.* **9** (1921), 196–217.

Colojoara, L., Foias, C.

- [1] *The Theory of Generalized Spectral Operators*, Gordon and Breach, New York, 1968.

Daleckii, Ju.L., Kreĭn, M.G.

- [1] *Stability of Solutions of Differential Equations in Banach Space*, Transl. Math. Monographs, Vol. 43, Amer. Math. Soc., Providence, R.I., 1974.

Davies, E.B.

- [1] *One-Parameter Semigroups*, London Math. Soc. Monographs, No. 15, Academic Press, London, 1980.

Dunford, N., Schwartz, J.T.

- [1] *Linear Operators*, Part II: *Spectral Theory (Self Adjoint Operators in Hilbert Space)*, Wiley-Interscience, New York, 1963.
- [2] *Linear Operators*, Part III: *Spectral Operators*, Wiley-Interscience, New York, 1971.

Enflo, P.H.

- [1] On the invariant subspace problem in Banach spaces, *Acta Mathematica* **158** (1987), 213–313.

Fedosov, B.V.

- [1] Direct proof for the formula for the index of an elliptic system in Euclidean space, *Funct. Anal. Appl.* **4** (1970), 339–341.

Fredholm, I.

- [1] Sur une classe d'équations fonctionnelles, *Acta Math.* **27** (1903), 365–390.

Friedman, A.

- [1] *Partial Differential Equations*, Krieger Publ. Co., New York, 1976.

Gel'fand, I.M.

- [1] *Lectures on Linear Algebra*, Interscience Publ., New York, 1961.

Gilbarg, D., Trudinger, N.S.

- [1] *Elliptic Partial Differential Equations of the Second Order* (2nd edition), Springer-Verlag, New York, 1984.

Gohberg, I.C., Fel'dman, I.A.

- [1] *Convolution Equations and Projection Methods for Their Solution*, Transl. Math. Monographs, Vol. 41, Amer. Math. Soc., Providence, R.I., 1974.

Gohberg, I., Kaashoek, M.A.

- [1] Time varying linear systems with boundary conditions and integral operators, I. The transfer operator and its properties, *Integral Equations and Operator Theory* 7 (1984), 325–391.

Gohberg, I., Kaashoek, M.A., Lay, D.C.

- [1] Spectral classification of operators and operator functions, *Bull. Amer. Math. Soc.* 82 (1976), 587–589.
[2] Equivalence, linearization and decompositions of holomorphic operator functions, *J. Funct. Anal.* 28 (1978), 102–144.

Gohberg, I.C., Kreĭn, M.G.

- [1] The basic propositions on defect numbers, root numbers and indices of linear operators, *Uspekhi Math. Nauk* 12, 2(74) (1957), 43–118 (Russian); English Transl., *Amer. Math. Soc. Transl. (Series 2)* 13 (1960), 185–265.
[2] Systems of integral equations on a half line with kernels depending on the difference of arguments, *Uspekhi Math. Nauk* 13, 2(80) (1958), 3–72 (Russian); English Transl., *Amer. Math. Soc. Transl. (Series 2)* 14 (1960), 217–287.
[3] *Introduction to the Theory of Linear Nonselfadjoint Operators*, Transl. Math. Monographs, Vol. 18, Amer. Math. Soc., Providence, R.I., 1969.

Gohberg, I., Krupnik, N.Ya.

- [1] *Einführung in die Theorie der Eindimensionalen Singulären Integraloperatoren*, Mathematische Reihe, Band 63, Birkhäuser Verlag, Basel, 1979.

Gohberg, I., Lancaster, P., Rodman, L.

- [1] *Matrix Polynomials*, Academic Press, New York, 1982.

Gohberg, I.C., Sigal, E.I.

- [1] An operator generalization of the logarithmic residue theorem and the theorem of Rouché, *Mat Sbornik* 84(1260) (1971), 607–629 (Russian); English Transl., *Math. USSR Sbornik* 13 (1971), 603–625.

Goldberg, S.

- [1] *Unbounded Linear Operators, Theory and Applications*, McGraw-Hill, New York, 1966.

Greenberg, W., Mee, C.V.M. van der, Protopopescu, V.

- [1] *Boundary Value Problems in Abstract Kinetic Theory*, Operator Theory: Advances and Applications, Vol. 23, Birkhäuser Verlag, Basel, 1987.

Hilbert, D.

- [1] Grundzüge einer allgemeinen Theorie der Linearen Integralgleichungen (Erste Mitteilung), *Nachr. Wiss. Gesell. Göttingen, Math.-Phys. Kl.* (1904), 49–91.

Hille, E., Phillips, R.S.

- [1] *Functional Analysis and Semigroups*, Amer. Math. Soc. Colloquium Publ., Vol. XXXI, Amer. Math. Soc., Providence, R.I., 1957.

Horn, A.

- [1] On the eigenvalues of a matrix with prescribed singular values, *Proc. Math. Soc.* **5** (1954), 4–7.

Kaashoek, M.A.

- [1] Closed linear operators on Banach spaces, *Proc. Acad. Sci. Amsterdam A* **68** (1965), 405–414.

Kaashoek, M.A., Mee, C.V.M. van der, Rodman, L.

- [1] Analytic operator functions with compact spectrum, I. Spectral nodes, linearization and equivalence, *Integral Equations and Operator Theory* **4** (1981), 504–547.

Kailath, T.

- [1] *Linear Systems*, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1980.

Kalman, R.E., Falb, P.L., Arbib, M.A.

- [1] *Topics in Mathematical System Theory*, McGraw-Hill, New York, 1969.

Kato, T.

- [1] *Perturbation Theory for Linear Operators*, Grundlehren, Band 132, Springer-Verlag, Berlin, 1966.

Kaper, H.G., Lekkerkerker, C.G., Hejtmanek, J.

- [1] *Spectral Methods in Linear Transport Theory*, Operator Theory: Advances and Applications, Vol. 5, Birkhäuser Verlag, Basel, 1982.

Keldysh, V.M.

- [1] On the eigenvalues and eigenfunctions of certain classes of nonselfadjoint equations, *Dokl. Akad. Nauk SSSR* **77** (1951), 11–14 (Russian); English Transl. in Markus [1].

Knuth, D.E.

- [1] *The Art of Computer Programming*, Addison Wesley, Reading, M.A., 1980.

König, H.

- [1] *Eigenvalue Distribution of Compact Operators*, Operator Theory: Advances and Applications, Vol. 16, Birkhäuser Verlag, Basel, 1986.

Krupnik, N.Ya.

- [1] *Banach Algebras with Symbol and Singular Integral Operators*, Operator Theory: Advances and Applications, Vol. 26, Birkhäuser Verlag, Basel, 1987.

Leiterer, J.

- [1] Local and global equivalence of meromorphic operator functions, I, *Math. Nachr.* **83** (1978), 7–29.
[2] Local and global equivalence of meromorphic operator functions, II, *Math. Nachr.* **84** (1978), 145–170.

Lidskii, V.B.

- [1] Theorems on the completeness of the system of eigenelements and adjoined elements of operators having a discrete spectrum, *Dokl. Akad. Nauk SSSR* **119** (1958), 1088–1091 (Russian); English Transl., *Amer. Math. Soc. Transl. (Series 2)* **47** (1965), 37–41.
[2] Non-selfadjoint operators with a trace, *Dokl. Akad. Nauk SSSR* **125** (1959), 485–587 (Russian); English Transl., *Amer. Math. Soc. Transl. (Series 2)* **47** (1965), 43–46.

Lorch, E.R.

- [1] Return to the self-adjoint transformation, *Acta Sci. Math. Szeged* **12(B)** (1950), 137–144.
[2] *Spectral Theory*, University Texts in the Mathematical Sciences, Oxford University Press, New York, 1962.

Lumer, G., Rosenblum, M.

- [1] Linear operator equations, *Proc. Amer. Math. Soc.* **10** (1959), 32–41.

Lyubich, Ju., Macaev, V.I.

- [1] On operators with a separable spectrum, *Mat. Sb.* **56** (1962), 433–468 (Russian); English Transl., *Amer. Math. Soc. Transl. (Series 2)* **47** (1965), 89–129.

Macaev, V.I.

- [1] A class of completely continuous operators, *Dokl. Akad. Nauk SSSR* **139** (1961), 548–551 (Russian); English Transl., *Soviet Math. Dokl.* **1** (1961), 972–975.
[2] Several theorems on completeness of root subspaces of completely continuous operators, *Dokl. Akad. Nauk SSSR* **155** (1964), 273–276 (Russian), English Transl., *Soviet Math. Dokl.* **5** (1964), 396–399.

Markus, A.S.

- [1] *Introduction to Spectral Theory of Polynomial Operator Pencils*, Transl. Math. Monographs, Vol. 71, Amer. Math. Soc., Providence, R.I., 1988.

Markus, A.S., Fel'dman, I.A.

- [1] Index of an operator matrix, *Funct. Anal. Appl.* **11** (1977), 149–151.

Markus, A.S., Sigal, E.I.

- [1] On the multiplicity of a characteristic value of an analytic operator-function, *Mat. Issled* **5**, No. 3(17) (1970), 129–147 (Russian).

Mee, C.V.M. van der

- [1] *Semigroup and Factorization Methods in Transport Theory*, Thesis Vrije Universiteit, Amsterdam, 1981 = Mathematical Centre Tracts **146**, Mathematisch Centrum, Amsterdam, 1981.

Mirsky, L.

- [1] Matrices with prescribed characteristic roots and diagonal elements, *J. London Math. Soc.* **33** (1958), 14–21.

Pazy, A.

- [1] *Semigroups of Linear Operators and Applications to Partial Differential Equations*, Applied Mathematical Sciences, Vol. 44, Springer-Verlag, New York, 1983.

Pietsch, A.

- [1] *Eigenvalues and s -numbers*, Cambridge Studies in Advanced Mathematics, Vol. 13, Cambridge University Press, Cambridge, 1987.

Pólya, G., Szegő, G.

- [1] *Aufgaben und Lehrsätze aus der Analysis*, Band I. Grundlehren, Band 19, Springer-Verlag, Berlin, 1964.

Ran, A.C.M., Rodman, L.

- [1] A matricial boundary value problem which appears in the transport theory, *J. Math. Anal. Appl.* **130** (1988), 200–222.

Read, C.

- [1] Solution to the invariant subspace problem, *Bull. London Math. Soc.* **16** (1984), 337–401.
- [2] Solution to the invariant subspace problem on the space ℓ_1 , *Bull. London Math. Soc.* **17** (1985), 305–317.

Rickart, C.E.

[1] *Banach Algebras*, R.E. Krieger Publ. Co., New York, 1974.

Riesz, F., Sz.-Nagy, B.

[1] *Leçons d'Analyse Fonctionnelle*, Académie des Sciences de Hongrie, 1955.

Showalter, R.E.

[1] *Hilbert Space Methods for Partial Differential Equations*, Pitman, London, 1977.

Sigal, E.I.

[1] Factor-multiplicity of eigenvalues of meromorphic operator functions, *Mat. Issled* **5**, No. 4(18) (1970), 136–152 (Russian).

Stampfli, J.G.

[1] A local spectral theory for operators, IV. Invariant subspaces, *Indiana Univ. Math.* **22** (1972), 159–176.

Stummel, F.

[1] Diskreter konvergenz linearer operatoren, II, *Math. Zeitschr.* **120** (1971), 231–264.

Sz.-Nagy, B.

[1] Perturbations des transformations autoadjointes dans l'espace de Hilbert, *Comment. Math. Helv.* **19** (1947), 347–366.

[2] Perturbations des transformations linéaires fermées, *Acta Sci. Math. Szeged* **14** (1951), 125–137.

[3] *Introduction to Real Functions and Orthogonal Expansions*, Oxford Univ. Press, New York, 1965.

Wolf, F.

[1] Operators in Banach space which admit a generalized spectral decomposition, *Ned-erl. Akad. Wetensch. Indig. Math.* **19** (1957), 302–311.

LIST OF SYMBOLS

A_{\Im}	imaginary part of the operator A , 135, 146
A_{\Re}	real part of the operator A , 146
A^*	(Hilbert space) adjoint of the operator A , 291
A'	conjugate of the operator A , 292
\overline{A}	minimal closed linear extension of the operator A , 289
$A _N$	restriction of A to the subspace of N , 8, 326
$A \geq 0$	non-negative operator A , 82
$AC_n(J)$	a space of functions on the interval J , 295
$A(X \rightarrow Y)$	operator A with domain in X and range in Y , 288
\mathbb{C}	field of complex numbers, 5
\mathbb{C}^n	complex Euclidean n -space
\mathbb{C}_{∞}	the extended complex plane, 49
$C([a, b])$	the space of complex-valued continuous functions on $[a, b]$, 288
$C^k(\Omega)$	a set of differentiable functions on Ω , 310
$C^{\infty}(\Omega)$	the set of C^{∞} -functions on Ω , 310
$C_0^{\infty}(\Omega)$	the set of C^{∞} -functions with compact support in Ω , 310
$C^k(\overline{\Omega})$	a set of differentiable functions on $\overline{\Omega}$, 310
\mathbb{D}	open unit disk in the complex plane
$\mathcal{D}(A)$	domain of the operator A , 288
D^{α}	elementary differential operator, 310
$d(A)$	codimension of the range of A , 184
$\partial\Omega$	boundary of the open set Ω , 315
$\det A$	determinant of an operator matrix A , 194
$\det(I + A)$	determinant of $I + A$ with A a trace class operator, 117
$\dim M$	dimension of the linear space M
E_A	a space spanned by eigenvectors and generalized eigenvectors, 31
$E(t)$	orthogonal projection in a resolution of the identity, 72
$\mathcal{F}(A)$	a family of analytic functions associated with a bounded operator A , 13
$\mathcal{F}_{\infty}(A)$	a family of analytic functions associated with an unbounded operator A , 323
$G(A)$	graph of the operator A , 289
$H_m(\Omega)$	Sobolev space of order m , 313
$H_m^0(\Omega)$	closure of $C_0^{\infty}(\Omega)$ in $H_m(\Omega)$, 313
I	identity operator, 5
I_X	identity operator on X , 5
$\Im\lambda$	the imaginary part of the complex number λ
$\text{Im } A$	range (image) of the operator A
$\text{ind}(A)$	index of the operator A , 184
$\mathcal{K}(X)$	the set of compact operators on the Banach space X , 191
$\kappa(\Gamma; 0)$	winding number, 226

$\text{Ker } A$	null space of A
$L_2^m([a, b])$	Lebesgue space of \mathbf{C}^m -valued functions, 148
$\mathcal{L}(X)$	Banach space of all bounded linear operators on X , 5
$\mathcal{L}(X, Y)$	Banach space of all bounded linear operators from X into Y , 5
$\lambda_j(A)$	j -th eigenvalue of the compact operator A , 30
$m(\lambda_0, A)$	algebraic multiplicity, 26
$m(\lambda_0, W(\cdot))$	algebraic multiplicity of an operator function, 205
$m(\Gamma, W(\cdot))$	algebraic multiplicity relative to a contour Γ , 205
$n(A)$	dimension of the null space of A , 184
$\nu(A)$	number of non-zero singular values of A , 96
$P_\sigma(A)$	Riesz projection, 9
$\Re \lambda$	real part of the complex number λ
\mathbf{R}^n	real Euclidean n -space
$\mathcal{R}_\infty^{m \times m}(\mathbf{R})$	a set of rational $m \times m$ matrix functions, 232
rank A	rank of the operator A
$\rho(A)$	resolvent set of the operator A , 5
$\rho(G, A)$	resolvent set of the pencil $\lambda G - A$, 49
S_1	the trace class operators, 105
S_2	the Hilbert-Schmidt operators, 143
$s_j(A)$	j -th singular value of the operator A , 96, 212
$\sigma(A)$	spectrum of the operator A , 5
$\sigma(G, A)$	spectrum of the operator pencil $\lambda G - A$, 49
$\sigma_{\text{ess}}(A)$	essential spectrum of the operator A , 191, 373
\mathbf{T}	unit circle in the complex plane
$T_{\max, \tau, J}$	maximal operator, 295
$T_{\min, \tau, J}$	minimal operator, 300
$T_{R, J}$	a differential operator, 300
tr A	trace of the operator A , 110
W_A	numerical range of A , 167
\perp_N	inverse annihilator of N , 292
S^\perp	orthogonal complement of S ; and also at times, annihilator of S , 292
$(x_1, \dots, x_n)^T$	transpose of the row vector (x_1, \dots, x_n)
$\langle \cdot, \cdot \rangle$	inner product
$\ A\ _1$	trace class norm of A , 106
$\ A\ _2$	Hilbert-Schmidt norm of A , 143
\emptyset	empty set

SUBJECT INDEX

A

- abstract Cauchy problem, 408
- adjoint
 - of an unbounded operator, 290
 - of differential operators, 301, 321, 383
 - Lagrange adjoint, 301, 309, 318
- adjoint boundary conditions, 306
- A -invariant, 326
- algebraic multiplicity of an eigenvalue
 - for operators, 26
 - for operator functions, 205
 - relative to a contour, 205
- analytically matricially coupled, 46
- analytic
 - at a point, 6
 - on a set, 6
- associated operator, 54
- asymptotically stable
 - solution, 20
 - differential equation, 20
 - difference equation, 58

B

- bijection
 - associated with an operator, 188
- bounded resolution of identity, 72
- boundary of class C^2 , 315

C

- Calkin algebra, 191
- canonical factorization, 235
- Cauchy contour, 6
- Cauchy domain, 6
- Cayley transform, 346
- closable operator, 289
- closed linear extension, 289
 - minimal, 289
- compact semigroup, 435
- completeness
 - problem of, 29
- complete system
 - of eigenvectors and generalized

- eigenvectors, 135, 378
- conjugate
 - of an unbounded operator, 292
- continuously differentiable solution, 408
- contraction semigroup, 427
- convolution operator
 - with symbol, 216
- coupling matrices, 45
- coupling relation, 45
- C_0 semigroup, 415
- C^1 -solution, 408

D

- derivative, 7
 - weak derivative, 312
- determinant, 114
 - analyticity of, 119
- differentiable, 7
- differential operator, 295, 316, 382, 399
 - adjoint of, 301, 321, 383
 - higher order, 399
 - on a half line, 382
 - selfadjoint, 341
 - uniformly elliptic, 316
- Dirichlet operator, 316
 - adjoint of, 321
- dissipative operator
 - on a Hilbert space, 428
 - on a Banach space, 429
- divergence form, 316
- domain
 - Cauchy domain, 6
 - inner domain, 49
 - outer domain, 49

E

- eigenvalue of an unbounded operator, 349
- eigenvalue of finite type
 - for a bounded operator, 25
 - for an operator function, 205
 - for an unbounded operator, 326
- eigenvector of an unbounded operator, 349
 - generalized, 378

elementary solutions, 29
 equivalent

- globally equivalent, 38
- locally equivalent, 42
- strictly equivalent, 237

 essential spectrum

- for a bounded operator, 191
- for an unbounded operator, 373

 exponential representation, 268
 exponential type zero, 122
 extension, 38
 extension of an unbounded operator, 290

F

factorization

- canonical, 235
- left Wiener-Hopf, 235
- right Wiener-Hopf, 235, 236
- Wiener-Hopf, 234

 factorization indices, 235
 final space of a partial isometry, 84
 finitely meromorphic, 206
 finite slab problem, 274
 first kind Wiener-Hopf operator, 398
 Fourier transform, 217
 Fourier transformation, 217
 Fredholm operator

- bounded, 184
- perturbation of, 189, 376
- unbounded, 372

 functional calculus, 13, 80, 323
 fundamental matrix, 154

G

generalized Dirichlet problem, 316
 generalized eigenspace, 30
 generalized eigenvectors, 28, 378
 generalized inverse, 192

- in the weak sense, 193

 generalized resolvent equation, 50
 generator of a semigroup, 419
 geometric multiplicity, 26
 globally equivalent, 38
 graph norm, 369
 Green's formula, 304
 Green's function, 386

H

half range problem, 258
 Hankel operator, 225
 Hardy space, 222
 Hilbert-Schmidt operator, 140
 Hilbert-Schmidt norm, 143
 Hille-Yoshida-Phillips theorem, 419

I

index of a

- bounded Fredholm operator, 184
- bounded semi-Fredholm operator, 283
- unbounded Fredholm operator, 372

 indicator, 151
 infinitesimal generator of a semigroup, 419
 initial space of a partial isometry, 84
 inner domain, 49
 integral operator, 148
 invariant

- projectionally, 181
- subspace, 8

 isolated part of the spectrum, 9
 isometric semigroup, 432

J

Jordan chain, 28

K

kernel function, 148, 215
 semi-separable, 149

L

Lagrange adjoint for

- an ordinary differential expression, 301, 309
- the Dirichlet problem, 318

 Laplace transform, 418
 Lax-Milgram lemma, 319
 left strictly equivalent, 237
 left Wiener-Hopf factorization, 235
 Lemma of Schur, 31
 linear operator pencil, 49
 locally equivalent, 42
 lower order, 149
 Lyapunov's theorem, 22

M

matrixially coupled, 44
 analytically, 46
 maximal operator, 295
 adjoint of, 301
 minimal closed linear extension, 289
 minimal operator, 300
 adjoint of, 301
 min-max theorem, 96
 multiplication
 operator of, 218
 multiplicity
 algebraic multiplicity, 26, 205
 geometric multiplicity, 26
 multiplying medium, 275
 mutually disjoint projections, 88

N

non-negative operator, 82
 normal with respect to a contour, 205
 numerical range, 167

O

open neighbourhood of a set, 13
 operator
 bounded selfadjoint, 61
 closable, 289
 convolution, 216
 differential, 295, 382, 399
 Dirichlet, 316
 dissipative, 428, 429
 Fredholm, 184, 372
 Hilbert-Schmidt, 140
 non-negative, 82
 of multiplication, 218
 semi-Fredholm, 283
 strictly negative, 22
 strictly positive, 22
 trace class, 105
 unbounded selfadjoint, 341
 unitary, 85
 Volterra, 32
 Wiener-Hopf, 221
 operator with compact resolvent, 328
 order of
 the differential expression D^α , 310
 a Sobolev space, 313

order of a semiseparable representation,
 149
 lower, 149
 upper, 149
 outer domain, 49

P

partial isometry, 84
 initial space of, 84
 final space of, 84
 polar decomposition, 84
 problem of completeness, 29
 projectionally invariant, 181

R

realization, 244
 realized form, 244, 395
 regular, 49
 Δ -regular, 49
 resolution of the identity, 72, 350, 362
 bounded, 72
 for a bounded selfadjoint operator, 74
 for an unbounded selfadjoint operator,
 362
 resolvent operator, 6, 288
 resolvent equation, 9, 288
 generalized, 50
 resolvent identity, 288
 resolvent set, 5, 49, 288
 restriction
 of an unbounded operator, 290
 to an invariant subspace, 8
 Riesz projection, 9, 326
 right canonical factorization, 235
 right equivalence operator, 54
 right factorization indices, 235
 right Wiener-Hopf factorization
 relative to the real line, 235
 relative to circle, 236
 row multiplicity, 238

S

scattering function, 258
 Schmidt-representation, 97
 Schur basis, 136
 Schur's lemma, 31
 selfadjoint operator, 61, 341

- semi-Fredholm operator, 283
 - semigroup
 - C_0 semigroup, 415
 - compact, 435
 - contraction, 427
 - isometric, 432
 - strongly continuous, 415
 - translation, 420
 - unitary, 432
 - semi-separable kernel function, 149
 - semi-separable representation, 149
 - order of, 149
 - lower order of, 149
 - upper order of, 149
 - separating projection, 54
 - sesquilinear form, 319
 - simple pole, 88
 - singular value, 96, 212
 - singular value decomposition, 98
 - s -number, 96, 212
 - Sobolev space, 313
 - solution
 - elementary solution, 29
 - of a half range problem, 441
 - solution of an abstract Cauchy problem, 408
 - continuously differentiable, 408
 - C^1 -solution, 408
 - spectral decomposition, 54
 - spectral mapping theorem, 16
 - spectral measure, 362
 - spectral radius, 90
 - spectral subspace, 59
 - corresponding to the left (right) half plane, 336
 - spectral theorem for a selfadjoint operator
 - bounded, 77
 - unbounded, 350
 - spectrum of
 - a bounded operator, 5
 - an operator pencil, 49
 - an unbounded operator, 288
 - square root of an operator, 83
 - strictly negative operator, 22
 - strictly positive operator, 22
 - strongly continuous semigroup, 415
 - subspace, 5
 - support of a function, 300, 310
 - symbol of
 - a convolution operator, 216
 - a differential operator, 399
 - a Wiener-Hopf operator, 221
 - symmetric operator, 347
- T
- T -bounded, 369
 - T -compact, 370
 - T -norm, 369
 - trace class operator, 105
 - trace class norm, 106
 - trace of an operator, 110
 - translation semigroup, 420
 - transport theory, 257, 274, 439
 - finite slab problem, 274
 - half range problem, 258
 - multiplying medium, 275
 - totally bounded, 314
- U
- uniformly elliptic, 316
 - unitary operator, 85, 432
 - upper order, 149
- V
- Volterra operator, 32
- W
- Weierstrass approximation theorem, 420
 - Wiener-Hopf factorization, 234, 235, 236
 - Wiener-Hopf operator, 221
 - winding number, 226
- Y
- Yoshida approximant, 414
- Z
- Z -extension, 38