Servicepart

References – 379

Index – 381

© Springer International Publishing AG 2017
B. Said-Houari, *Linear Algebra*, Compact Textbooks in Mathematics,
DOI 10.1007/978-3-319-63793-8

References

1. H. Anton, C. Rorres, *Elementary Linear Algebra: with Supplemental Applications*, 11th edn. (Wiley, Hoboken, 2011)
2. M. Artin, *Algebra*, 2nd edn. (Pearson, Boston, 2011)
3. S. Axler, *Linear Algebra Done Right*. Undergraduate Texts in Mathematics, 2nd edn. (Springer, New York, 1997)
4. E.F. Beckenbach, R. Bellman, *Inequalities*, vol. 30 (Springer, New York, 1965)
5. F. Boschet, B. Calvo, A. Calvo, J. Doyen, *Exercices d'algèbre, 1er cycle scientifique, 1er année* (Librairie Armand Colin, Paris, 1971)
6. L. Brand, Eigenvalues of a matrix of rank *k*. Am. Math. Mon. **77**(1), 62 (1970)
7. G.T. Gilbert, Positive definite matrices and Sylvester's criterion. Am. Math. Mon. **98**(1), 44–46 (1991)
8. R. Godement, *Algebra* (Houghton Mifflin Co., Boston, MA, 1968)
9. J. Grifone, *Algèbre linéaire*, 4th edn. (Cépaduès–éditions, Toulouse, 2011)
10. G.N. Hile, Entire solutions of linear elliptic equations with Laplacian principal part. Pac. J. Math **62**, 127–140 (1976)
11. R.A. Horn, C.R. Johnson, *Matrix Analysis*, 2nd edn. (Cambridge University Press, Cambridge, 2013)
12. D. Kalman, J.E. White, Polynomial equations and circulant matrices. Am. Math. Mon. **108**(9), 821–840 (2001)
13. P. Lancaster, M. Tismenetsky, *The Theory of Matrices*, 2nd edn. (Academic Press, Orlando, FL, 1985)
14. S. Lang, *Linear Algebra*. Undergraduate Texts in Mathematics, 3rd edn. (Springer, New York, 1987)
15. L. Lesieur, R. Temam, J. Lefebvre, *Compléments d'algèbre linéaire* (Librairie Armand Colin, Paris, 1978)
16. H. Liebeck, A proof of the equality of column and row rank of a matrix. Am. Math. Mon. **73**(10), 1114 (1966)
17. C.D. Meyer, *Matrix Analysis and Applied Linear Algebra* (SIAM, Philadelphia, PA, 2000)
18. D.S. Mitrinović, J.E. Pečarić, A.M. Fink, *Classical and New Inequalities in Analysis*. Mathematics and Its Applications (East European Series), vol. 61 (Kluwer Academic, Dordrecht, 1993)
19. C. Moler, C. Van Loan, Nineteen dubious ways to compute the exponential of a matrix, twenty-five years later. SIAM Rev. **45**(1), 3–49 (2003)
20. J.M. Monier, *Algèbre et géométrie, PC-PST-PT*, 5th edn. (Dunod, Paris, 2007)
21. P.J. Olver, Lecture notes on numerical analysis, http://www.math.umn.edu/~olver/num.html. Accessed Sept 2016
22. F. Pécastaings, *Chemins vers l'algèbre, Tome 2* (Vuibert, Paris, 1986)
23. M. Queysanne, *Algebre*, 13th edn. (Librairie Armand Colin, Paris, 1964)
24. J. Rivaud, *Algèbre linéaire, Tome 1*, 2nd edn. (Vuibert, Paris, 1982)
25. S. Roman, *Advanced Linear Algebra*. Graduate Texts in Mathematics, vol. 135 (Springer, New York, 2008)
26. H. Roudier, *Algèbre linéaire: cours et exercices*, 3rd edn. (Vuibert, Paris, 2008)
27. B. Said-Houari, *Differential Equations: Methods and Applications*. Compact Textbook in Mathematics (Springer, Cham, 2015)

© Springer International Publishing AG 2017
B. Said-Houari, *Linear Algebra*, Compact Textbooks in Mathematics,
DOI 10.1007/978-3-319-63793-8

28. D. Serre, *Matrices. Theory and Applications*. Graduate Texts in Mathematics, vol. 216, 2nd edn. (Springer, New York, 2010)
29. G. Strang, *Linear Algebra and Its Applications*, 3rd edn. (Harcourt Brace Jovanovich, San Diego, 1988)
30. V. Sundarapandian, *Numerical Linear Algebra* (PHI Learning Pvt. Ltd., New Delhi, 2008)
31. H. Valiaho, An elementary approach to the Jordan form of a matrix. Am. Math. Mon. **93**(9), 711–714 (1986)

Index

Block matrix, 118
Cofactor
– matrix, 92
Fibonacci
– sequence, 116
Matrix
– skew–symmetric, 111

Abelian
– group, 11
Abelian group, 160
Addition
– of matrices, 8
Adjoint
– of a matrix, 92
Apollonius' identity, 149
Automorphism, 200
– of vector spaces, 211

Basis
– of a vector space, 176
bijective
– tarnsformation, 215
Binomial formula, 20

cardinality
– of a set, 178
Cauchy–Schwarz
– inequality, 136, 372
Cayley–Hamilton
– theorem, 305
Characteristic
– polynomial, 57
Characteristic polynomial, 284
Cholesky
– decomposition, 348
Cofactor
– expansion, 74
– of a matrix, 73
Column space, 241
Commutative
– group, 12
Complement
– of a subspace, 194
Components
– of a vector, 124
Congruent
– matrices, 355
Consistent
– system of linear equations, 263
Convex
– function, 365
Cramer's rule, 100
Cyclic property
– of the trace, 373

Determinant, 74
– of Vandermonde, 108
Determinant , 57
Diagonalizable
– matrix, 240, 290
Diagonally
– dominant matrix, 264
Dimension
– of a direct sum , 186
– of a subspace, 182
– of a vector space, 178
Direct sum
– of vector spaces, 170
Distance, 131
Dot product, 6, 132
Dunford
– decomposition, 302
Dunkl–Williams inequality, 151

Eigenspace, 270
Eigenvalue
– complete, 275
– defective, 275
– of a matrix, 278
– of a projection, 272
– of an endomorphism, 269
Eigenvector
– generalized, 305
– matrix, 295
– of a matrix, 278
– of an endomorphism, 269

© Springer International Publishing AG 2017
B. Said-Houari, *Linear Algebra*, Compact Textbooks in Mathematics,
DOI 10.1007/978-3-319-63793-8

Elementary
– matrix, 82
Elementary row operation, 246
Endomorphism, 200
Equation
– linear, 4
Equivalent
– matrices, 240
Euclidean
– norm, 129
– vector space, 126
Euler
– formula, 283
Exponential
– of a matrix, 32

Factorization
– LU, 336
– QR, 330
Fibonacci
– matrix, 116
Frobenius inequality, 257
– for rank, 223

Gauss elimination, 336
Gauss–Jordan
– elimination method, 41
Global minimum
– of a function, 365
Gram's
– matrix, 363
Gram–Schmidt process, 328
Group, 11, 126
– $GL(n, \mathbb{K})$, 28
– Abelian, 126
– of invertible matrices, 65
– of matrices, 12
– orthogonal, 327

Hölder's
– inequality, 152
Hankel
– matrix, 110
Hessian
– matrix, 368
Homogeneous
– system, 5

Idempotent
– matrix, 258, 266
Identity
– operator, 200
Image
– of a linear transformation, 207
Inconsistent
– system of linear equations, 263
inconsistent, 264
Index
– of a matrix, 358
Inertia
– of a matrix, 354, 359
Injective
– linear transformation, 205
Inverse
– of an isomorphism, 212
Isomorphic
– vector spaces, 212
Isomorphism, 200
– of vector spaces, 211

Jordan
– block, 304
– canonical form, 303

Kernel
– of a linear transformation, 204

Lagrange form
– of the reminder, 369
Lagrange's identity, 157
Linear
– combination, 127, 165
– dependence, 172
– independence, 172
– operator, 200
– transformation, 200
Linear transformation
– associated to a matrix, 233

Matrix
– associated to a linear transformation, 227
– augmented, 40
– circulant, 319
– companion, 112, 317
– diagonal, 30, 166
– idempotent, 58, 60
– identity, 21
– inverse, 22
– involutory , 60
– nilpotent, 55, 302

– non derogatory, 317
– of full rank, 242
– of Vandermonde, 108, 110
– orthogonally diagonalizable, 334
– positive definite, 341
– positive semi-definite, 347
– skew-symmetric, 189
– square, 7, 19
– symmetric, 52, 189, 297
– transpose, 50
– triangular, 35, 166
– tridiagonal, 116
Matrix inverse
– determinant of, 90
Maximal
– linearly independent set, 179
Method
– of elimination, 2
– of substitution , 2
Minimal
– polynomial, 312
Minkowski
– inequality, 153
Minor
– of a matrix, 251
– leading principal , 337
– of a matrix, 72
– principal, 337
Multiplication
– of matrices, 13
Multiplicity
– algebraic, 275
– geometric, 275

Nilpotent
– matrix, 308
– linear transform, 222
– matrix, 310
Norm
– of a matrix, 371
– of a vector, 128
– of Frobenius, 371
– submultiplicative, 371
Null space, 167
Nullity
– of a linear transform, 209

Orthogonal
– complement, 196
– matrix, 145, 323
– projection, 142, 143
– subspace, 165
– vectors, 141
Orthonormal
– basis, 329
– vectors, 328

Parallelogram identity, 140
Polarization identity, 140
Positive definite
– quadratic form, 354
Principal axes
– theorem, 353
Product
– of two vector space, 192
Projection
– transformation, 215
Pythagoras theorem in $\mathbb{R}^n$, 144

Quadratic
– form, 352
– function, 365

Rank
– of a linear transformation, 209
– of a matrix, 242
– of a symmetric matrix, 346
Rank-nullity theorem, 209
Rayleigh–Ritz
– theorem, 344
Reflection matrix, 326
Ring, 20
– of matrices, 22
Rotation matrix, 59, 326
Row operation, 39
Row reduction method, 79
Row space
– of a matrix, 244

Schur's
– formula, 118
– lemma, 335
Semi-definite
– matrix, 347
– quadratic form, 354
Signature
– of a matrix, 358

Similar
– matrices, 240, 288
Singular
– matrix, 279
Spectral
– radius, 375
– theorem, 334
Spectrum, 278, 296
Square root
– of a matrix, 361
Submatrix
– leading principal, 337
– principal, 337
Subspace, 163
Surjective
– linear transformation, 208
Sylvester's law
– of nullity, 257
Sylvester's law of inertia, 359

Taylor's
– theorem, 369
Trace, 57
– of a matrix, 37
Transition matrix, 235, 252
Triangle inequality, 139
– for rank, 223
Triangularization
– of a matrix, 298
– of an endomorphism, 298

Unit
– vector, 130

Vector space, 127, 159

Young's inequality, 138, 153