

INDEX

- A_0 , see disc algebra.
 A-A-K results, see Adamjan-Arov-Krein results.
 absolutely convex set, 73, 82–83.
 Adamjan-Arov-Krein results, 55–65, 93.
 adjoint, 4, 9, 59, 67.
 algebra, 80–81.
 almost everywhere, 17, 83–84.
 approximation, 33, 53–65, 69, 80–81.
 approximation numbers, see singular values.
 Banach space, 1, 15–16, 77.
 Bergman space, 70–74, 95.
 Beurling’s theorem, 57–58.
 Blaschke product, 18–22, 33, 35, 55–63, 90.
BMOA, 91.
 Bonsall-Walsh theorem, 70–74.
 boundary value, 16–18, 22–23.
 bounded mean oscillation, 91.
 bounded operator, 78.
 B_p , see Bergman space.
 Carathéodory-Fejér problem, 34–35, 92.
 Cauchy-Schwarz inequality, 22, 25, 42, 71, 87.
 Cauchy sequence, 77.
 Cauchy’s integral formula, 16–17, 71, 89.
 characteristic function, 17, 84.
 CL_p , 76–77.
 Coifman-Rochberg theorem, 70–74.
 compact operator, 4–12, 37, 39–41, 46, 67, 78.
 compact set, 78.
 completeness, 16, 74, 77, 90.
 concave function, 88.
 continuous impulse response, 66, 74.
 continuous operator, 78.
 continuous-time system, 48–54.
 control theory, 48–54.
 convergence almost everywhere, 17, 84.
 convergence in measure, 17, 84.
 convex function, 87–88.
 convex set, 73, 82.
 countably additive, 83.
 $C_0(i\mathbf{R})$, 46.
 $C^*(i\mathbf{R})$, 46.

- C_p , 4, 9, 90.
- $C_{oo}(\mathbf{R})$, 14, 90.
- $C(\mathbf{T})$, 14, 38–41, 80–81.
- degree, 50.
- delay system, 50–53.
- disc algebra, 38, 40–41.
- discrete-time system, 31, 92–93.
- divides, 61.
- dominated convergence theorem, 85.
- dual space, 72–73, 81–83, 90–91.
- eigenvalues, 5–6, 59, 61–63, 78–80, 94.
- equivalence, 27–28, 44–47, 56, 74.
- Euclidean norm, 76.
- Fatou's lemma, 16–18, 36, 85–86.
- finite-rank operator, 37–39, 46, 55–56.
- Fourier series, 14, 81.
- Fubini's theorem, 21, 42, 67, 86–87.
- functional, 81–83.
- generalised eigenvalues, *see* singular values.
- Hahn-Banach theorem, 32, 73, 81–83.
- Hankel integral operator, 1, 42–45, 66–69, 93.
- Hankel matrix, 1, 29–31, 34–35, 37–38, 63, 93–94.
- Hardy spaces, basic properties of, 1, 13–28.
- harmonic function, 91.
- Hartman's theorem, 41, 46.
- heat equation, 50.
- Hermitian operator, 79–80, 90.
- Hilbert-Schmidt operator, 2, 9–12, 67–68, 93–95.
- Hilbert's inequality, 34.
- Hilbert's matrix, 34.
- Hilbert space, 1, 77.
- H_∞ , *see* Hardy spaces.
- H_∞^\perp , 33–34, 38–41, 56.
- H_∞ -system, 50.
- Hölder's inequality, 16, 87.
- H_p , *see* Hardy spaces.
- hyperplane, 73, 82–83.
- ideal, 9.
- impulse response, 50.
- indicator function, *see* characteristic function.
- inner function, 19, 35, 56–58, 60–62.
- inner product, 10, 15, 77.

- input, 48.
- integrable, 83–87.
- interpolation, 34–35, 92.
- Jensen's inequality, 19, 87–88.
- kernel,
 - integral, 1, 45, 68, 94–95.
 - null space, 57–59.
- Kronecker's theorem, 37, 46, 55.
- Laguerre polynomials, 27.
- Laplace transform, 25–28, 43–45, 48–52, 67, 69, 91, 94.
- lattice, 81.
- Laurent series, 88.
- Lebesgue integral, 83–87.
- Lebesgue measure, 83–84.
- lim inf, 85–86.
- linear functional, 81–83.
- linear operator, 78.
- linear system, see system.
- L_p space, 13–14, 77, 84, 90.
- M , a Möbius map, 23–25, 44–46, 95.
- measurable, 83.
- measure, 83–87.
- Möbius map, see M .
- mode, 50.
- model-matching problem, 54.
- model reduction, 48, 53, 69.
- modulus of an operator, 8.
- monotone convergence theorem, 22, 85–86.
- Nehari extension problem, 32, 34–37.
- Nehari's theorem, 29, 31–32, 40, 46, 56, 91.
- Nevanlinna-Pick problem, 34–35, 92.
- norm, 76–78, 81.
- normed space, 76.
- nuclear operator, 2, 9, 11–12, 68–75, 93–95.
- null space, 57–59.
- operator, 78.
- orthonormal, 5–6, 9–12, 14–15, 24–27, 67–69, 77–78.
- output, 48.
- partial isometry, 8, 12, 90.
- Peller's theorem, 70–74.
- Poisson kernel, 20–21, 40–41.
- polar decomposition, 8.

102

polarization identity, 10.
pole, 88.
positive operator, 5, 93.
principal ideal domain, 57.
rank, *see* finite-rank operator.
residue, 88.
residue theorem, 21, 71, 73, 88–89.
Riemann-Lebesgue lemma, 67.
Riemann mapping theorem, 92.
Riesz factorization theorem, 22, 90.
Riesz-Fischer theorem, 10, 78.
Riesz theorems, 21, 78–80.
robust stabilization problem, 54.
Sarason theorems, 37, 41.
scalar product, *see* inner product.
Schmidt expansion, 6.
Schmidt pairs, 59–61, 64.
self-adjoint, *see* Hermitian.
separating hyperplane, 73, 82–83.
separating points, 80.
sequentially compact, 78.
shift, 39–40, 57–58, 93.
shower bath, 51–53.
simple pole, 88.
singular values 2, 6–12, 56, 59–65, 67–69, 90, 94–95.
SISO, 48.
spectral radius, 78.
spectral theorem, 5, 78–80.
spectrum, 78.
square root of an operator, 5.
stability, 50.
state, 48.
step function, 14, 67, 91.
Stirling's formula, 71.
Stone-Wierstrass theorem, 14, 39, 80–81.
symbol, 29, 32–34, 37, 45–46, 64, 74.
system, 31, 48–54, 92–93.
Tonelli's theorem, 86–87.
trace, 11–12, 90.
trace-class operator, *see* nuclear operator.
tracking problem, 54.
transfer function, 50, 92–93.

- transmission line, 50.
- triangle inequality, 12, 16, 76.
- U , an isometric map, 31, 33–34, 37, 39, 46, 56, 63.
- V , an isometric map, 25, 44.
- vector space, 76.
- W , an isometric map, 45, 56, 64.
- Weierstrass approximation theorem, 80.
- z -transform, 92.