Topology and metric spaces
  • Basic definitions and structures (11.1, 9.1, 9.2, 11.2)
  • Sequences, separability, completeness (11.3, 9.3, 9.4, 9.6)
  • Continuity (11.4, 9.3)
  • Compactness (11.5, 9.5)
  • Arzelà-Ascoli (10.1)
  • Baire Category Theorem (10.2)
  • Contraction Mapping Principle (10.3)
  • Urysohn’s Lemma and Tietze Extension Theorem (12.1)

Normed linear spaces
  • Definitions, including Banach space (13.1)
  • Examples, including $L^p$ spaces (7.1-7.4)
  • Linear operators (13.2)
  • Compactness and infinite dimensions (13.3)
  • Open Mapping and Closed Graph theorems (13.4)
  • Uniform Boundedness Principle (13.5)

Linear functionals
  • Definitions (14.1)
  • Riesz Representation Theorem for $L^p$ spaces (8.1)
  • Hahn-Banach Theorem (14.2)
  • Weak topologies (14.3)

Hilbert spaces and continuous linear operators
  • Definitions and first properties (16.1)
  • Dual space (16.2)
  • Bessel’s inequality and orthonormal bases (16.3)
  • Adjoints and symmetry for linear operators (16.4)
  • Compact operators (16.5)
  • Hilbert-Schmidt Theorem (16.6)