Real Analysis II: MATH 8144
August 2019 Exam

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)