

Quick summary of concepts

Chapter 1: The real numbers

- Ordered sets
- Supremum/Infimum
- Least upper bound property
- Archimedean property

Chapter 2: Topology

- Functions
- Injective, surjective, bijective
- Countable and uncountable sets
- Metric spaces
- Interior points, open sets
- Limit points, closed sets
- Bounded sets
- Closure of a set
- Relatively open and closed sets
- Compact sets
- Heine-Borel theorem

Chapter 3: Sequences and series

- Convergent sequences
- Properties of convergent sequences
- Subsequences
- Cauchy sequences
- Monotonic sequences
- \limsup and \liminf

- Partial sums and series
- Comparison test
- p -series
- Definition of e and \log
- Tests for series
- The harmonic series

Chapter 4: Continuity

- Limit of a function
- Continuous functions
- Characterization of continuity in terms of open sets
- Uniformly continuous functions
- Continuity and compactness (Extreme value theorem)
- Connectedness
- Continuity and connectedness (Intermediate value theorem)
- Left-hand and right-hand limits

Chapter 5: Differentiation

- Derivative of a function
- Error function characterization of differentiability
- Differentiation rules
- Mean value theorem and generalized version
- Monotonic functions
- L'Hospital's rule
- Taylor's theorem

Chapter 6: Integration

- Partition, Riemann sum, upper/lower Riemann integral, Riemann integral
- Properties of the integral

- Fundamental theorem of calculus
- Change of variables
- Integration by parts
- Arc length of curves

Chapter 7: Sequences of functions

- Pointwise convergence
- Uniform convergence
- Weierstrass M -test
- Uniform convergence and continuity/integrability/differentiation
- Supremum norm and the space $C(X)$
- Equicontinuous and uniformly bounded
- Arzela-Ascoli
- Stone-Weierstrass theorem