

MATH 230A : REAL ANALYSIS

California State University, Sacramento · Department of Mathematics & Statistics

Numbers and sets; metric topology; sequences and series of constants and functions; continuous functions; the theory of the derivative; the theory of the integral, including Riemann, Riemann-Stieltjes, and Lebesgue integrals; measure theory on the real line. Sequence begins every other Fall.

CATALOG DESCRIPTION

Metric topology; the theory of the derivative; measure theory. **Graded:** Graded Student. **Units:** 3.0.

PREREQUISITES

Math 130B.

COURSE OUTLINE

I. Number and sets

- A. Axioms for the real number system
- B. Algebra of sets
- C. Functions
- D. Finite, countable and uncountable sets
- E. Products of sets and the axiom of choice

II. Topology of Metric Spaces

- A. Open and closed sets
- B. Compact sets
- C. Bolzano-Weierstrass theorem
- D. Connected sets
- E. Perfect sets and the Cantor set

III. Sequences and Series

- A. Convergence and divergence
- B. Algebraic properties
- C. Bounded monotone sequences
- D. Subsequences
- E. Cauchy criterion
- F. Completeness and Baire category
- G. Lim sup and lim inf
- H. Root and ratio test
- I. Absolute and conditional convergence

IV. Limits and Continuity

- A. Algebraic properties
- B. Types of discontinuities and monotone functions
- C. Continuity and compactness
- D. Uniform continuity
- E. Absolute continuity

V. Differentiation

- A. Algebraic properties
- B. Continuity and derivatives
- C. Continuous, nowhere differentiable function
- D. Intermediate value theorem
- E. Local extrema
- F. Mean value theorems
- G. L'Hospital's rule
- H. One-side derivatives

The written exam in Real Analysis will cover the content of sections I-V of Math 230A and sections I-II of math 230B

REFERENCES

- *Principles of Mathematics*, by Rudin
- *The Elements of Real Analysis*, by Bartle
- *Methods of Real Analysis*, by Goldberg