

MATH 230B : 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 230A.

COURSE OUTLINE

I. Riemann-Stieltjes Integration

- A. Monotone functions and bounded variation
- B. The Riemann-Stieltjes integral as a generalization of the Riemann integral
- C. Mean value theorems
- D. Conditions for integrability
- E. Reduction to Riemann integral
- F. Fundamental Theorem of Calculus

II. Sequences and Series of Functions

- A. Pointwise, uniform and Cauchy convergence
- B. Continuity and uniform convergence
- C. Differentiation and uniform convergence
- D. Integration and uniform convergence
- E. Equicontinuity
- F. Stone-Weierstrass theorem
- G. Power series and Taylor series

III. Measure on the Real Line

- A. Inner and outer measure
- B. Measureable sets
- C. Set theoretic properties
- D. Translation invariance
- E. Example of a nonmeasurable set
- F. Vitali covering theorem

IV. Measureable functions

- A. Continuity and measurability
- B. Algebraic properties
- C. Pointwise limits
- D. Egorov's theorem
- E. Lusin's theorem
- F. Approximation by simple functions

V. Lebesgue Integration

- A. Algebraic properties
- B. Conditions for integrability
- C. Convergence theorems
- D. The fundamental theorem of Calculus
- E. Change of variable
- F. Mean value theorems

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