Math 31 : Calculus II

California State University, Sacramento · Department of Mathematics & Statistics

This is the second course in a one year course covering one-dimesionla differential and integral calculus including infinite series. It is designed for students majoring in Physics, Chemistry, Engineering, Computer Science, and Mathematics. Students who have the prerequisites for Math 30 but who have taken a mathematics course within the past two years may need to take Math 29 before enrolling in Math 30.

The purpose of this course is to give students a firm foundation in the basic concepts of the calculus, e.g. limit, derivative, integral, and infinite series; but every opportunity should be taken to apply these newly acquired mathematical tools to a variety of interesting physical and geometrical problems. Althouogh a certain degree of proficiency with the techniques of differentiation and integration is expected of each student, teaching emphasis should also be placed on the fundamental concepts of the calculus and on its applications to nontrivial problems. With this pedagogical emphasis in mind, students will be given periodic writing assignments which encourage them to think through concepts of the course. It is recommended that each new concept be introduced geometrically, algebraically, and numerically.

Catalog Description

MATH 30 continuation. Methods of integration; improper integrals; analytic geometry; infinite sequences and series. **Graded**: Graded Student. **Units**: 4.0.

Prerequisites

MATH 30 or appropriate high school based AP credit.

Learning Objectives

- Understand the indefinite integral as the inverse of differentiation, know the basic rules and techniques of integration (including the method of substitution, integration by parts, and trigonometric substitutions), and use these rules to evaluate antiderivatives.
- Extend the Riemann integral to improper integrals with unbounded functions and domains of integration.
- Know the definition, graphs, derivatives and antiderivatives of the inverse trigonometric functions, hyperbolic functions and the inverse hyperbolic functions.
- Know the definition for convergence and divergence of infinite sequences and series and apply these definitions to elementary sequences and to geometric and harmonic series.
- Know the integral test, comparison test, ratio test, and alternating series test for convergence of infinite series and apply these test to standard series.
- Find the power series of a function, determine the radius of convergence and the interval of convergence (including end point convergence) of a power series, and determine the error term for a function and its power series.

Text

Calculus - Early Transcedental , 8/e, by James Stewart

Coverage

Chapters 6-8 and 10-11

Writing Component

This is an area B4 GE course and has a writing component. To satisfy the writing requirement graded assignments involving writing and understanding of complex technical prose, interpretation of theoretical ideas, and the use of mathematical ideas will be part of the course.

Assignments

A variety of reading and problem solving assignments will be part of the course.

Examinations

There will be regular midterm examinations and a comprehensive final examination for this course.

Course Outline

I. Applications of integration (2 Weeks)
   A. Areas between curves
   B. Volumes by slicing

II. Techniques of integration (3 Weeks)
   A. Integration by parts
   B. Other techniques such as trigonometric substitutions algebraic substitutions, and partial fractions
   C. Approximate integration

III. Selected applications of integration (2 1/2 Weeks)
   A. Arc length
   B. Area of a surface of revolution
   C. Moments and centers of mass
   D. Work

IV. Infinite sequences and series (4 1/2 Weeks)
   A. Sequences: definition, convergence-divergence
   B. Series: definition, convergence-divergence
   C. Special series: geometric, harmonic
   D. Convergence test for series
   E. Taylor's series: radius of convergence, differentiation, integration, remainder term
   F. Binomial series
   G. Polynomial approximation

V. Parametric equations and polar coordinates (2 Weeks)
   A. Parametric equations: graphs, tangents, areas
   B. Polar coordinates: graphs, areas, arc length
   C. Equations of conic sections in polar coordinates [1]

[1] Optional