Math 32 : Calculus III

California State University, Sacramento · Department of Mathematics & Statistics

This is the third semester of the three semester calculus sequence for students majoring in Mathematics, Physical Science, and Engineering. It provides an introduction to the calculus of functions of several variables and to elementary vector analysis.

Catalog Description

Continuation of Calculus II. Algebra and calculus of vectors; functions of several variables; partial differentiation; multiple integration; vector analysis. **Graded**: Graded Student. **Units**: 4.0.

Prerequisites

Math 31

Learning Objectives

- Understand and identify vectors in the plane and in three dimensional space.
- Understand the dot product of two vectors including the cross product of two vectors, surfaces, and cylindrical and spherical coordinates in space.
- Understand the concept of vector-valued function, differentiation and integration of vector-valued functions.
- Understand functions of several variables, limits, continuity, partial derivatives, differentials chain rules, directional derivatives gradients, tangent planes, normal lines and extrema of functions of two variables.
- Calculate and understand iterated integrals, double integrals, triple integrals, triple integrals in cylindrical and spherical coordinates, and change of variables in multiple integrals.
- Understand vector analysis, vector fields, line integrals, and Greens theorem. Conservative vector fields, and independence path. Surface integrals, divergence theorem and Stokess theorem.
- Solve application problems.

Text

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

Coverage

Chapters 12-16

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. Three-Dimensional Analytic Geometry and Vectors (3 1/2 Weeks)

   A. Three-dimensional coordinate system
   B. Vectors
   C. Dot and cross products
   D. Vector equations of lines and planes
   E. Vector functions of one variable and space curves
   F. Arc length and curvature
   G. Applications to motion in space
   H. Cylindrical and spherical coordinates

II. Differentiation of Functions of Several Variables (4 Weeks)

   A. Functions of several variables
   B. Limits and continuity
   C. Partial derivatives
   D. Differentiability and tangent plane
   E. Chain rule
   F. Directional derivative and gradient
   G. Extreme values
   H. Other techniques such as Lagrange multipliers

III. Multiple Integrals (3 1/2 Weeks)

   A. Double and triple integrals
   B. Iterated integrals
   C. Integrals in polar, cylindrical, and spherical coordinates
   D. Geometrical and physical applications

IV. Vector analysis (3 Weeks)

   A. Scalar and vector fields
   B. Divergence and curl
   C. Line integrals
   D. Conservative fields application to work and conservation of energy
   E. Green's theorem, Stokes' theorem and divergence theorem in the plane