CALCULUS III

MATH 1970

Course Description:

This course presents vector functions, parametric equations, solid analytic geometry, partial differentiation, multiple integration, and an introduction to vector calculus. A mathematical software package is introduced with required assignments. **4 credits**

Prerequisites:

MATH 1960 with a grade of C- or better, or MATH 1970 with a grade of F or better, or permission of instructor.

Overview of Content and Purpose of the Course:

This is the third and final course of the Calculus sequence. The course builds on the calculus of two-dimensions learned in MATH 1950 and MATH 1960 and applies calculus to three-dimensions. This application is important to solving many real-world problems in engineering, economics, and science, as well as higher mathematics.

Major Topics:

1) Vectors and the Geometry of Space
- a. Vectors in the Plane
- b. Space Coordinates and Vectors in Space
- c. The Dot Product of Two Vectors
- d. The Cross Product of Two Vectors in Space
- e. Lines and Planes in Space
- f. Surfaces in Space
- f. Cylindrical and Spherical Coordinates

2) Vector-Valued Functions
- a. Vector-Valued Functions
- b. Differentiation and Integration of Vector-Valued Functions
- c. Velocity and Acceleration
- d. Arc Length and Curvature

3) Functions of Several Variables
- a. Introduction to Functions of Several Variables
- b. Limits and Continuity
- c. Partial Derivatives
- d. Differentials
- e. Chain Rules for Functions of Several Variables
- f. Directional Derivatives and Gradients
- g. Tangent Planes and Normal Lines
- h. Extrema of Functions of Two Variables
- i. Applications of Extrema
- j. Lagrange Multipliers

4) Multiple Integration

a. Iterated Integrals and Area in the Plane
b. Double Integrals and Volume
c. Change of Variables: Polar Coordinates
d. Center of Mass and Moments of Inertia
e. Surface Area
f. Triple Integrals and Applications
g. Triple Integrals in Other Coordinates
h. Change of Variables: Jacobians

5) Vector Analysis

a. Vector Fields
b. Line Integrals
c. Conservative Vector Fields and Independence of Path
d. Green's Theorem
e. Parametric Surfaces
f. Surface Integrals
g. Divergence Theorem
h. Stokes' Theorem

Textbook:

Larson, Ron, and Bruce H. Edwards. *Calculus, Hybrid: Early Transcendental Functions, 6th ed*. Boston: Cengage Learning, 2014.

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