

# Final Exam Outline

## I. Exam 1 Material: Vectors

- A. Basics of Vectors (including Dot and Cross Products)
- B. Equations of Lines and Planes

## II. Exam 2 Material: Plane and Space Curves

- A. Parametric Curves
- B. Arc Length
- C. Unit Tangents, Unit Normals, and Curvature

## III. Exam 3 Material: Functions of Several Variables

- A. Limits and Continuity of Functions of Two or More Variables
- B. Partial Derivatives
- C. The Gradient and Directional Derivatives
- D. The Chain Rule
- E. Optimization in Several Variables
- F. Lagrange Multipliers

## IV. Exam 4 Material: Multiple Integrals

- A. Double Integrals
- B. Triple Integrals
- C. Polar, Cylindrical, and Spherical Coordinates
- D. Change of Variables and Jacobians

## V. Exam 5 Material: Vector Calculus I

- A. Line Integrals of Scalar and Vector-Valued Functions
- B. Path Independence, Conservative Vector Fields, and Potential Functions
- C. Parametric Surfaces
- D. Surface Integrals of Scalar and Vector-Valued Functions

## VI. New Material: Vector Calculus II

- A. Green's Theorem
- B. Stokes' Theorem
- C. The Divergence Theorem