Multivariable Calculus Learning Objectives[1]

1. Perform basic vector operations such as the dot product and cross product and utilize these operations in applications.

2. Find equations of lines and planes in 3-space, sketch level curves and contour diagrams from a given 3-variable equation, and recognize simple surfaces like paraboloids and ellipsoids from their level curves and contour diagrams.

3. Evaluate derivatives and integrals of vector-valued functions of one variable.

4. Compute limits, partial derivatives, directional derivatives, and gradients for functions of several variables, and use differentiation to determine tangent planes, relative extrema, and absolute extrema of continuous functions on closed and bounded regions for functions of several variables.

5. Use Lagrange multipliers to find extrema of a function subject to one constraint.

6. Set up and evaluate multiple integrals in 2 and 3 dimensions, in rectangular, polar, cylindrical, and spherical coordinates, and apply these integrals to solve physical problems.

7. Evaluate line integrals directly. Identify conservative vector fields and find potential functions for conservative vector fields, and be able to apply the Fundamental Theorem of Calculus for Line Integrals and Green's theorem appropriately.

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[1]This list was approved by the department on 4/10/19