Syllabus for the Multivariable Calculus Portion of the Comprehensive Exam
Department of Mathematics and Statistics, Amherst College

Elementary vector analysis

- Dot or scalar product
- Cross or vector product
- Lines and planes
- Tangent vectors and tangent lines to parametrized curves

Definitions and computations involving functions of several variables

- Partial derivative
- Directional derivative
- Gradient
- Tangent plane to a surface

Maxima and minima of functions of several variables

- Finding critical points
- The second derivative test for local maxima/minima and saddle points
- The method of Lagrange multipliers

Double integrals

- Cartesian and polar coordinates
- Finding area and volume

Triple integrals

- Cartesian, cylindrical and spherical coordinates
- Finding volume

Line integrals of vector fields

- Fundamental Theorem of Calculus for Line Integrals
- Green's Theorem