

Course Outline for MATH 2263, Calculus III

MATH 2263 Calculus III (3 units)

Prerequisite: MATH 143, [MATH 1262](#), or [MATH 1263](#).

Partial derivatives. Multiple integrals. Lagrange Multipliers. Line and surface integrals of vector fields. Green's Theorem and the Divergence Theorem. 3 lectures. Cross-listed as HNRS/[MATH 2263](#). Formerly HNRS/MATH 241.

Course Learning Objectives	
1	Graph cylinders and quadric surfaces in 3-dimensional Euclidean space.
2	Draw level sets and level surfaces of functions of several variables.
3	Compute directional derivatives of functions of several variables and describe the meaning of the gradient vector, including steepest ascent and decent.
4	Find the linearization of a function of several variables at a given point and use it to approximate the function at a value near that point.
5	Solve problems involving maxima, minima, and constrained optimization using differentiation.
6	Evaluate double and triple integrals using rectangular, polar, cylindrical and spherical coordinates.
7	Use multiple integrals to compute areas, volumes, total mass, and centers of mass of two or three-dimensional regions.
8	Evaluate line integrals of functions and vector fields using the definitions.
9	Apply the Fundamental Theorem of Line Integrals and Green's Theorem to evaluate line integrals of vector fields.
10	Solve problems in physics including the work done by a force field, and the flow, circulation and flux of a velocity field along a given curve.
11	Parametrize a surface, and integrate a function over a parametrized surface.
12	Use the definition of the Divergence Theorem to compute the flux of a continuous vector field across a surface.

Expanded Course Content

Textbooks, materials, and/or other resources

Calculus: Early Transcendentals, 9th Edition, by James Stewart, Daniel K. Clegg, Saleem Watson

Week	Readings	Topics of Discussion
1	Sections 12.6, 14.1	Cylinders and quadric surfaces, functions of several variables
2	Sections 14.2, 14.3	Limits and continuity, partial derivatives
3	Sections 14.4, 14.5	Tangent planes and linear approximations, the chain rule
4	Sections 14.6, 14.7	Directional derivatives and the gradient vector, maximum and minimum values
5	Sections 14.7 (continued), 14.8	Maximum and minimum values (continued), Lagrange multipliers
6	Sections 15.1, 15.2	Double integrals over rectangles and general regions
7	Sections 15.3, 15.4	Double integrals in polar coordinates, applications of double integration
8	Sections 15.6, 15.7	Triple integrals, triple integrals in cylindrical coordinates
9	Sections 15.7 (continued), 15.8	Triple integrals in cylindrical coordinates (continued), triple integrals in spherical coordinates
10	Sections 16.1, 16.2	Vector fields, line integrals of functions
11	Sections 16.2 (continued), 16.3	Line integrals of vector fields, the Fundamental Theorem for Line Integrals
12	Sections 16.4, 16.5	Green's Theorem, curl and divergence

Week	Readings	Topics of Discussion
13	Sections 16.6, 16.7	Parametric surfaces and their areas, surface integrals
14	Sections 16.7 (continued), 16.8	Surface integrals (continued), Stokes' Theorem (optional topic)
15	Section 16.9	The Divergence Theorem

Method of Assessment

The possible methods of assessment are written individual examinations, quizzes, in-class worksheets or presentations, projects, and homework. All exams are to be proctored in-person, and one or more midterms and a cumulative final exam are required.

Instructional Mode

The instructional mode for this class is face-to-face. This designation means that the essential academic standards of the course require in-class student engagement, and thus remote instruction is not appropriate.