

Course Outline for MATH 1265, Calculus for Data Science II

MATH 1265 Calculus for Data Science II (4 units)

Prerequisite: DATA/MATH 1264 with a grade of C- or better.

Vectors and vector functions. Partial derivatives. Multiple integrals. Lagrange Multipliers. Sequences and series.
4 lectures. Cross-listed as DATA/MATH 1265.

Course Learning Objectives	
1	Compute the dot product and cross product of vectors and use these products to solve elementary problems in geometry.
2	Graph cylinders and quadric surfaces in 3-dimensional Euclidean space.
3	Compute derivatives and integrals of vector functions.
4	Draw level sets and level surfaces of functions of several variables.
5	Find unit tangent and normal vectors to parametric curves and compute the arc length and curvature of space curves.
6	Compute directional derivatives of functions of several variables and describe the meaning of the gradient vector, including steepest ascent and descent.
7	Compute 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.
8	Solve problems involving maxima, minima, and constrained optimization using differentiation.
9	Evaluate double and triple integrals using rectangular, polar, and cylindrical coordinates, and the Change of Variables Theorem.
10	Determine whether a sequence or an infinite series converges or diverges.
11	Determine Taylor series of functions and use them to compute limits, derivatives, and antiderivatives, and to approximate functions with a bound on error.
12	Use Taylor polynomials to approximate functions with a bound on error.

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 12.1, 12.2, 12.3 of Stewart	Three-dimensional coordinate systems, vectors, the dot product
2	Sections 12.4, 12.5, 12.6 of Stewart	The cross product, equations of lines and planes, cylinders and quadric surfaces
3	Sections 13.1, 13.2, 13.3 of Stewart	Vector functions and space curves, derivatives and integrals of vector functions, arc length and curvature
4	Sections 14.1, 14.2 of Stewart	Functions of several variables, limits and continuity
5	Sections 14.3, 14.4 of Stewart	Partial derivatives, tangent planes and linear approximation
6	Sections 14.5, 14.6 of Stewart	The chain rule, directional derivatives and the gradient vector
7	Sections 14.7, 14.8 of Stewart	Maximum and minimum values, Lagrange multipliers
8	Sections 15.1, 15.2 of Stewart	Double integrals over rectangles and general regions
9	Sections 15.3, 15.6 of Stewart	Double integrals in polar coordinates, triple integrals
10	Sections 15.7, 15.9 of Stewart	Triple integrals in cylindrical coordinates, change of variables in multiple integrals
11	Sections 11.1, 11.2, 11.3 of Stewart	Sequences, series, the integral test
12	Sections 11.4, 11.5 of Stewart	The comparison test, alternating series and absolute convergence

Week	Readings	Topics of Discussion
13	Sections 11.6, 11.7 of Stewart	The ratio test, strategy for testing series
14	Sections 11.8, 11.9 of Stewart	Power series, representations of functions as power series
15	Sections 11.10, 11.11 of Stewart	Taylor and Maclaurin series, applications of Taylor polynomials

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.

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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.