MATH 251 Multivariate and Vector Calculus

Course Description from Bulletin: Analytic geometry in three-dimensional space. Partial derivatives. Multiple integrals. Vector analysis. Applications. (4-0-4)

Enrollment: Required for AM majors and some engineering majors

Textbook(s): James Stewart, *Calculus* (9th Ed.), Cengage (2021), ISBN:9781337624183 (Recommended if the entire Calculus sequence will be taken. For MATH 251 only, Stewartôs *Multivariable Calculus* suffices.)

Other required material: WebAssign access (comes bundled with Stewart Calculus)

Prerequisites: Math 152

Objectives:

1. Students will learn to solve problems in three-dimensional space by utilizing vectors and vector-

c. Arc length and the unit tangent vector

3. Partial Derivatives 12
    a. Functions of several variables
    b. Limits and continuity, partial derivatives, differentiability
    c. Linearization and differentials
    d. Chain rule
    e. Gradient vector, tangent planes, directional derivatives
    f. Extreme values and saddle points,
    g. Lagrange multipliers
    h. Taylor's formula
4. Multiple Integrals 13
    a. Double integrals
    b. Areas, moments, and centers of mass
    c. Double integrals in polar form
    d. Triple integrals in rectangular coordinates
    e. Masses and moments in 3-D
    f. Triple integrals in cylindrical and spherical coordinates
    g. Substitutions in multiple integrals
5. Vector Calculus 13
    a. Integration in vector fields
    b. Line integrals
    c. Vector fields
    d. Work, circulation, and flux
    e. Path independence, potential functions, and conservative fields
    f. Green's theorem in the plane
    g. Surface area and surface integrals
    h. Parameterized surfaces
    i. Stokes' theorem
    j. Divergence theorem and a unified theory

Assessment:

	Homework/Quizzes	35%
	3 Tests	30%
	Common Final Exam	35%

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