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General Syllabus

MATH 25004 Calculus II

Credit Hours: 4 Lecture Hours: 3 Laboratory Hours: 2

Prerequisite(s): MATH 24004 Calculus I

Effective Catalog: 2026-2027

I. Course Information

A. Catalog Description

Physical applications of integration, techniques of integration, sequences and series, conic sections, parametric equations in two and three dimensions, and polar coordinates. Appropriate technology is used to discover relationships and work problems, not usually possible to work by hand. (ACTS: MATH 2505)

II. Student Learning Outcomes

A. Subject Matter

Upon successful completion of this course, the student will be able to:

1. Define, interpret, and approximate a definite integral.
2. Find antiderivatives and use them to compute definite integrals using the following techniques: substitution, integration by parts, trigonometric identities, trigonometric substitution, and decomposition into partial fractions.
3. Recognize and evaluate improper integrals.
4. Approximate integrals using technology.
5. Apply integrals to solve applications in a variety of areas in the natural and social sciences including: areas between curves, average value of a function, probability, mean and standard deviation of a probability distribution, volumes of solids with known cross sections, volumes of solids of revolution, arclength, surface area of revolution, centroids of planar lamina, work, fluid force, and economics.
6. Find limits of infinite sequences.
7. Utilize the following tests appropriately to determine the convergence or divergence of infinite series: integral test, p -series, geometric series, telescoping series, direct comparison, limit comparison, alternating series, ratio, root, and alternating series tests.
8. Approximate functions with Taylor polynomials.
9. Expand transcendental functions as Taylor series representations and determine the relevant intervals of convergence.
10. Create tables and graphs of curves in 2D given parametrically and use these parametric representations to determine arc length.
11. Convert two dimensional points and equations between rectangular and polar coordinates.

12. Create tables and graphs of 2D curves given in polar coordinates, and use them to calculate areas between curves and arclengths.

B. University Learning Outcomes

This course enhances student abilities in the following general education areas.

Analytical Skills

Quantitative Reasoning

Students will learn advanced techniques for the solution of problems and derivation of formulas relating to

- cumulative effects of variable quantities,
- numerical approximation, and
- multiple quantities dependent on a single variable.

III. Major Course Topics

- A. Advanced techniques of integration
- B. Applications of integration
- C. Infinite sequences and series, tests for convergence of a series, Taylor polynomials, Taylor series
- E. 2D parametric functions
- F. Polar coordinates and functions
- G. Conic sections