MATH-1620: CALCULUS II

Cuyahoga Community College

Viewing: MATH-1620 : Calculus II

Board of Trustees:
November 2020

Academic Term:
Fall 2021

Subject Code
MATH - Mathematics

Course Number:
1620

Title:
Calculus II

Catalog Description:
Second of three-semester sequence. Includes the study of applications of the definite integral, techniques of integration, indeterminate forms, improper integrals, sequences, series, conic sections, parametric equations and polar coordinates.

Credit Hour(s):
5

Lecture Hour(s):
5

Lab Hour(s):
0

Other Hour(s):
0

Requisites

Prerequisite and Corequisite
MATH-1610 Calculus I, or departmental approval: equivalent coursework.

Outcomes

Course Outcome(s):
Apply definite integrals to solve geometric and STEM application problems.

Essential Learning Outcome Mapping:
Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

Objective(s):
1. Describe how Riemann sums are used to approximate solutions of geometric problems and lead to definite integrals.
2. Set up and evaluate definite integrals that represent the area between two curves.
3. Set up and evaluate definite integrals that represent the volume of solids of revolution.
4. Utilize definite integrals to calculate the arc length of curves.
5. Utilize definite integrals to calculate areas of surfaces of revolution.
6. Describe work as the limit of a Riemann sum and utilize definite integrals to solve work problems.

Course Outcome(s):
Utilize a variety of techniques to evaluate integrals.

Essential Learning Outcome Mapping:

Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

Objective(s):

1. Perform integration by parts.
2. Evaluate trigonometric integrals using substitutions and identities.
3. Utilize trigonometric substitutions to evaluate integrals involving radicals and other functions.
4. Utilize the method of partial fractions to evaluate integrals involving rational functions.
5. Perform numerical integration using the Trapezoidal Rule and Simpson's Rule.
6. Recognize the appropriate rule or technique for evaluating a particular integral.
7. Utilize technology to evaluate integrals.

Course Outcome(s):

Evaluate limits of functions and improper integrals.

Essential Learning Outcome Mapping:

Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

Objective(s):

1. Identify indeterminate forms resulting from limits.
2. Apply L'Hôpital's Rule to evaluate limits.
3. Identify improper integrals.
4. Utilize limits to evaluate improper integrals.

Course Outcome(s):

Apply convergence tests to sequences and series, and solve application problems.

Essential Learning Outcome Mapping:

Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

Objective(s):

1. Distinguish between sequences and series.
2. Identify the *n*th-term of a sequence or series.
3. Utilize limits and graphs of sequences to determine convergence.
4. Find the *n*th partial sum of a series.
5. Identify special types of series including geometric series, telescoping series, alternating series, *p*-series and power series.
6. Determine the convergence of a series using various tests, including the *n*th term, geometric series, integral, *p*-series, comparison, alternating series, ratio, and root tests.
7. Create Taylor and Maclaurin polynomials to approximate functions.
8. Find the radius and interval of convergence of power series.
9. Perform mathematical operations on power series, such as addition, multiplication, integration and differentiation, to create power series for other functions.
10. Create Taylor and Maclaurin series for functions using the definition and by using power series for elementary functions.

Course Outcome(s):

Analyze functions and curves defined by parametric and polar equations.

Essential Learning Outcome Mapping:

Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

Objective(s):

1. Convert between parametric and rectangular equations.
2. Sketch curves defined by parametric equations, and indicate the orientation.
3. Plot points and curves in the polar coordinate system.

4. Convert rectangular coordinates and equations to polar form and vice versa.
5. Solve calculus problems involving parametric and polar equations.
6. Utilize technology to solve problems with functions expressed in parametric and polar form.

Methods of Evaluation:

1. Exams
2. Quizzes
3. Homework
4. Projects
5. Collaborative Work

Course Content Outline:

1. Applications of Definite Integrals
    a. Area between two curves
    b. Volume of solids of revolution
    c. Arc length
    d. Area of surfaces of revolution
    e. Work
2. Integration Techniques
    a. Integration by inspection
    b. Integration by parts
    c. Trigonometric integrals
    d. Trigonometric substitution
    e. Partial fractions
    f. Numerical integration
3. Limits and Improper Integrals
    a. Indeterminate forms
    b. L'Hôpital's Rule
    c. Improper integrals
4. Sequences and series
    a. Graphs of sequences
    b. Limits of sequences and convergence
    c. The *n*th partial sum of a series
    d. Convergence tests for series
        i. The *n*th-term test
        ii. Geometric series test
        iii. Integral test
        iv. The *p*-series test
        v. Comparison tests
        vi. Alternating series test
        vii. Ratio and root tests
    e. Taylor and Maclaurin polynomials
        i. Local linear and quadratic approximations
    f. Power series
        i. Radius of convergence
        ii. Interval of convergence
        iii. Operations on power series
        iv. Representation of functions with Taylor and Macluarin series
5. Conic sections
    a. Parabolas
    b. Ellipses
    c. Hyperbolas
6. Parametric equations
    a. Parameters
    b. Graphs
    c. Orientation

   d. Parametric equations of a curve
   e. Parametric form of the derivative
7. Polar Coordinates
   a. Polar coordinate system
   b. Conversion between polar and rectangular form
   c. Graphs of polar equations
   d. Slope in polar form
   e. Area of polar curves

Resources

Larson, Ron; Edwards, Bruce. *Calculus - Early Transcendental Functions*. 9th Edition. Cengage , 2019.

Stewart, James; Clegg, Daniel; Watson, Saleem. *Calculus - Early Transcendentals*. 9th Edition. Cengage, 2021.

Briggs, William; Cochran, Lyle; Gillett, Bernard; Schulz, Eric. *Calculus - Early Transcendentals*. 3rd Edition. Pearson, 2019.

Resources Other

1. Textbook Software
2. Computer Algebra Systems: Maple, Mathematica, Derive and Converge

Instructional Services

OAN Number:

Ohio Transfer 36 TMM006 and TMM017 (2 of 2 courses, both must be taken)

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