MATH-1480: MODERN MATHEMATICS FOR BUSINESS AND SOCIAL SCIENCES II

Cuyahoga Community College

Viewing: MATH-1480 : Modern Mathematics for Business and Social Sciences II

Board of Trustees:
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Academic Term:
Fall 2022

Subject Code
MATH - Mathematics

Course Number:
1480

Title:
Modern Mathematics for Business and Social Sciences II

Catalog Description:
Second of a two-semester sequence. Topics include the fundamentals of differential and integral calculus, with applications in business and social sciences.

Credit Hour(s):
4

Lecture Hour(s):
4

Lab Hour(s):
0

Other Hour(s):
0

Requisites

Prerequisite and Corequisite
MATH-1470 Modern Mathematics for Business and Social Sciences I or MATH-1530 College Algebra or MATH-153H Honors College Algebra or MATH-1580 Precalculus or qualified Math placement or department approval for equivalent coursework.

Outcomes

Course Outcome(s):
Evaluate, interpret, and apply limits of various functions.

Essential Learning Outcome Mapping:
Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.
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. Define and utilize limits and their properties.
2. Evaluate limits algebraically and graphically.
3. Determine one-sided and two-sided limits.
4. Evaluate limits involving infinity.
5. Compute and apply average rate of change.
6. Compute and apply instantaneous rate of change.

7. Determine the slope and equation of a tangent line.
8. Find the derivative of a function using the limit definition of the derivative.

Course Outcome(s):

Utilize several techniques to compute derivatives of functions.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.
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 various notations for the derivative.
2. Utilize basic rules (constant, power, constant-multiple, sum/difference) for derivatives.
3. Utilize the Product Rule and Quotient Rule for derivatives.
4. Apply derivatives to marginal analysis.
5. Compute and interpret average cost and marginal average cost.
6. Evaluate and analyze a composition of functions.
7. Utilize the Chain Rule and the Generalized Power Rule for derivatives.
8. Compute derivatives of exponential and logarithmic functions.
9. Define and utilize the conditions of continuity.
10. Demonstrate the link between continuity and differentiability.

Course Outcome(s):

Analyze and apply derivatives to graph and optimize functions.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.
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. Define, compute, and utilize the critical numbers of a function.
2. Determine where a function is increasing and decreasing using derivatives.
3. Find and interpret local (relative) extrema for a function.
4. Perform and interpret the First Derivative Test for a function.
5. Find the second derivative and higher derivatives.
6. Identify various notations for the second derivative and higher derivatives.
7. Define and determine the concavity of a function and inflection points.
8. Perform and interpret the Second Derivative Test for a function.
9. Find and interpret absolute extrema.
10. Define and utilize the Extreme Value Theorem.
11. Define and utilize the Critical Point Theorem.
12. Apply derivatives to solve optimization problems.
13. Sketch the graph of a function, including information found with the first and second derivatives.

Course Outcome(s):

Utilize several techniques to compute and apply definite and indefinite integrals.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.
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. Define and find antiderivatives of functions.
2. Define, identify notation for, and determine indefinite integrals.
3. Utilize basic rules (power, constant-multiple, sum/difference) for integrals.
4. Compute integrals of exponential functions and 1/x.
5. Perform integration by substitution.
6. Perform integration by parts.
7. Compute the approximate area under a curve using rectangles.
8. Define, identify notation for, and determine definite integrals.
9. Compute the area under a curve using definite integrals.
10. Define and apply The Fundamental Theorem of Calculus.
11. Utilize properties of definite integrals.
12. Compute the area between two curves using definite integrals.
13. Apply definite integrals to compute future value and present value of an investment with interest compounded continuously.
14. Apply definite integrals to compute consumers' and producers' surplus.

Course Outcome(s):

Evaluate and compute the derivative of functions involving multiple variables.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.
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. Define, identify notations for, and evaluate functions of several variables.
2. Compute first-order and second-order partial derivatives.

Methods of Evaluation:

1. A minimum of three periodic exams.
2. Quizzes.
3. Homework.
4. In class collaborative work.
5. Graphing calculator or computer application problems.
6. Comprehensive final exam.

Course Content Outline:

1. Limits and the definition of the derivative
   a. Properties of limits
   b. Evaluating limits algebraically and graphically
   c. One-sided and two-sided limits
   d. Limits involving infinity
   e. Average rate of change
   f. Instantaneous rate of change
   g. Slope and equation of a tangent line
   h. Limit definition of the derivative
2. Techniques for finding derivatives
   a. Notations for the derivative
   b. Basic rules (constant, power, constant-multiple, sum/difference) for derivatives
   c. Product Rule and Quotient Rule
   d. Marginal analysis
   e. Average cost and marginal average cost
   f. Composition of functions
   g. The Chain Rule and the Generalized Power Rule
   h. Derivatives of exponential and logarithmic functions

   i. Conditions of continuity
   j. Continuity and differentiability
3. Applications of derivatives
   a. Critical numbers
   b. Increasing and decreasing functions
   c. Local extrema
   d. First Derivative Test
   e. The second derivative and higher derivatives
   f. Notations for the second derivative and higher derivatives
   g. Concavity and inflection points
   h. Second Derivative Test
   i. Absolute extrema
   j. Extreme Value Theorem
   k. Critical Point Theorem
   l. Optimization applications
   m. Curve sketching
4. Integration
   a. Antiderivatives
   b. The indefinite integral
   c. Basic rules (power, constant-multiple, sum/difference) for integrals
   d. Integration of exponential functions and 1/x
   e. Integration by substitution
   f. Integration by parts
   g. Approximate area under a curve using rectangles
   h. The definite integral
   i. Area under a curve
   j. The Fundamental Theorem of Calculus
   k. Properties of definite integrals
   l. Area between two curves
   m. Present value and future value with interest compounded continuously
   n. Consumers' and producers' surplus
5. Multivariate calculus
   a. Functions of several variables
   b. First-order and second-order partial derivatives

Resources

Lial, Margaret L., Thomas Hungerford, John P. Holcomb, and Bernadette Mullins. *Mathematics with Applications in the Management, Natural, and Social Sciences*. 12th ed. Boston, MA: Pearson, 2019.

Lial, Margaret L., Raymond Greenwell, and Nathan Ritchey. *Finite Mathematics and Calculus with Applications*. 10th ed. Boston, MA: Pearson/Addison Wesley, 2016.

Tan, Soo T. *Finite Mathematics for the Managerial, Life, and Social Sciences*. 12th ed. Boston, MA: Cengage Learning, 2018.

Barnett, Raymond A., Michael R. Ziegler, Karl E. Byleen, and Christopher J. Stocker. *College Mathematics for Business, Economics, Life Sciences, and Social Sciences*. 14th ed. New York, NY: Pearson, 2019.

Pearson. *MyMathLab*. Continuosly updated. New York, NY: Pearson, 2018.

Instructional Services

OAN Number:

Ohio Transfer 36 TMM013

Top of page

Key: 4539