MATH-1590: BUSINESS CALCULUS

Cuyahoga Community College

Viewing: MATH-1590 : Business Calculus

Board of Trustees:
May 2025

Academic Term:
Fall 2026

Subject Code
MATH - Mathematics

Course Number:
1590

Title:
Business Calculus

Catalog Description:
Topics include the study of limits, continuity, and differential, integral, and multivariable calculus, with applications in the business environment. Intended for students majoring in business and related fields.

Credit Hour(s):
5

Lecture Hour(s):
5

Lab Hour(s):
0

Other Hour(s):
0

Requisites

Prerequisite and Corequisite
MATH-1530 College Algebra or MATH-153H Honors College Algebra or MATH-1580 Precalculus or qualified Math placement or department approval for equivalent coursework. Note: MATH-1470 taken prior to Fall 2026 will also be accepted to meet prerequisite requirements for this course.

Outcomes

Course Outcome(s):
Analyze, define, and apply functions of various types.

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. Find the domain of algebraic, exponential, and logarithmic functions.
2. Define, find, and apply profit, revenue, and cost functions.
3. Define and apply marginal profit, marginal revenue, and marginal cost.
4. Solve for break-even points using revenue and cost functions.
5. Determine the maximum or minimum profit, revenue, or cost, for quadratic functions.

Course Outcome(s):

Evaluate, interpret, and apply limits of various functions and analyze continuity.

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.
9. State the conditions of continuity at a point.
10. Analyze the limit behavior of a function at a point to determine continuity at that point.
11. Find intervals on which a function is continuous.
12. Classify continuities.

Course Outcome(s):

Utilize several techniques to compute and apply 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. Determine marginal cost, marginal revenue, and marginal profit functions using derivatives.
5. Compute and interpret average cost and marginal average cost.
6. Utilize the Chain Rule and the Generalized Power Rule for derivatives of composite functions.
7. Compute derivatives of exponential and logarithmic functions.
8. Recognize that differentiability at a point implies continuity at that point.

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. Compute the approximate area under a curve using rectangles.
7. Define, identify notation for, and determine definite integrals.
8. Compute the area under a curve using definite integrals.
9. Define and apply The Fundamental Theorem of Calculus.
10. Utilize properties of definite integrals.
11. Compute the area between two curves using definite integrals.
12. Apply definite integrals to compute future value and present value of an investment with interest compounded continuously.
13. Apply definite integrals to compute consumers' and producers' surplus.

Course Outcome(s):

Analyze multivariable functions and compute and apply partial derivatives.

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 multivariable functions.
2. Find the domain of multivariable functions.
3. Compute first-order and second-order partial derivatives.
4. Solve applications involving multivariable functions, including the Cobb-Douglas production formula.

Methods of Evaluation:

1. Periodic exams.
2. Quizzes.
3. Homework.
4. In-class collaborative work.

5. Projects employing technology.
6. Comprehensive final exam.

Course Content Outline:

1. Functions
   a. Domain of functions
   b. Profit, revenue, and cost functions
   c. Marginal profit, marginal revenue, and marginal cost
   d. Break-even points
   e. Maximum and minimum profit, revenue, and cost
2. Limits and continuity
   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
   i. Conditions of continuity
   j. Limit behavior and continuity at a point
   k. Intervals of continuity
   l. Continuity classification
3. 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. The Chain Rule and the Generalized Power Rule
   g. Derivatives of exponential and logarithmic functions
   h. Continuity and differentiability
4. 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
5. Integration
   a. Antiderivatives
   b. Indefinite integrals
   c. Basic rules (power, constant-multiple, sum/difference) for integrals
   d. Integration of exponential functions and 1/x
   e. Integration by substitution
   f. Approximate area under a curve using rectangles
   g. The definite integral
   h. Area under a curve
   i. The Fundamental Theorem of Calculus
   j. Properties of definite integrals

k. Area between two curves
l. Present value and future value with interest compounded continuously
m. Consumers' and producers' surplus

6. Multivariate calculus
   a. Multivariable functions
   b. Domain of multivariable functions
   c. First-order and second-order partial derivatives
   d. Cobb-Douglas production function

Religious Accommodation

Before reviewing the course schedule, students should carefully review the following religious accommodation policy and other required instructional policies:

Religious Accommodation:

Students seeking an accommodation for absences permitted under Ohio's Testing Your Faith Act must provide the instructor with written notice of the specific dates for which the student requires an accommodation and must do so not later than fourteen (14) days after the first day of instruction. Please submit requests for accommodations at this link: https://portal2.tri-c.edu/ReligiousAccommodation/ Religious Accommodation Form. Students with questions about their religious accommodations under Ohio's Testing Your Faith Act may contact the College's Office of General Counsel and Legal Services by phone at 216.987.4856 or via email at legal@tri-c.edu.

Other Required Instructional Policies:

https://www.tri-c.edu/student-resources/curriculum/documents/syllabus-part-b.pdf

Weekly Schedule

	Topics
Week 1	Functions Graphs of Functions and Transformations Applications of Linear Functions Quadratic Functions and Applications
Week 2	Exponential Functions Applications of Exponential Functions Logarithmic Functions Logarithmic and Exponential Equations
Week 3	Review for and take Test 1
Week 4	Limits One-Sided Limits and Limits Involving Infinity
Week 5	Rates of Change Tangent Lines and Derivatives Techniques for Finding Derivatives
Week 6	Derivatives of Products and Quotients The Chain Rule
Week 7	Derivatives of Exponential and Log Functions Continuity and Differentiability
Week 8	Local Extrema The Second Derivative
Week 9	Optimization Problems Curve Sketching
Week 10	Review for and take Test 2
Week 11	Antiderivatives Integration by Substitution
Week 12	Area of the Definite Integral
Week 13	The Fundamental Theorem of Calculus Application of Integrals
Week 14	Functions of Several Variables

Week 15	Partial Derivatives
Week 16	Review for and take Test 3

The Course Schedule is subject to change due to pedagogical needs, instructor discretion, parts of term, and unexpected events.

Required/Recommended Readings

Readings may be selected from one of the following textbooks:

Mathematics with Applications in the Management, Natural, and Social Sciences, by Lial, Hungerford, Holcomb, and Mullins.

Applied Calculus by Waner.

Resources for the Instructor

Lial, Margaret L., Raymond N. Greenwell, and Nathan P. Ritchey. *Calculus with Applications*. 12th ed. New York, NY: Pearson, 2022.

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

Lial, Margaret L., Thomas Hungerford, John P. Holcomb, and Bernadette Mullins. *Mathematics with Applications in the Management, Natural, and Social Sciences*. 13th ed. Boston, MA: Pearson, 2024.

Tan, Soo T. *Applied Calculus for the Managerial, Life, and Social Sciences*. 10th ed. Boston, MA: Cengage Learning, 2017.

Larson, Ron. *Calculus: An Applied Approach*. 10th ed. Boston, MA: Cengage Learning, 2017.

Additional Resources for the Instructor

1. Textbook Software (WebAssign, MyLab, Aleks)
2. Computer Algebra Systems: Maple, Mathematica, Desmos
3. Graphing Calculators

Instructional Services

OAN Number:

Ohio Transfer 36 TMM013

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