



ILLINOIS VALLEY COMMUNITY COLLEGE

COURSE OUTLINE

DIVISION: Natural Science and Business

COURSE: MTH 1007 Calculus for Business and Social Sciences

Date: Spring 2022

Credit Hours: 4

Complete all that apply or mark "None" where appropriate:

Prerequisite(s): MTH 1003 with a grade of "C" or better

Enrollment by assessment or other measure? Yes No

If yes, please describe: by appropriate assessment.

Corequisite(s): None

Pre- or CoRequisite(s): None

Consent of Instructor: Yes No

Delivery Method: **Lecture** **4 Contact Hours** (1 contact = 1 credit hour)
 Seminar **0 Contact Hours** (1 contact = 1 credit hour)
 Lab **0 Contact Hours** (2-3 contact = 1 credit hour)
 Clinical **0 Contact Hours** (3 contact = 1 credit hour)
 Online
 Blended
 Virtual Class Meeting (VCM)

Offered: **Fall** **Spring** **Summer**

CATALOG DESCRIPTION and IAI NUMBER (if applicable):

This course is for students who need a basic understanding of differential and integral calculus, but do not need the more rigorous traditional calculus sequence. Applications in the fields of business and social sciences are stressed. IAI equivalent: M1900B

ACCREDITATION STATEMENTS AND COURSE NOTES:

None

COURSE TOPICS AND CONTENT REQUIREMENTS:

- I. Preliminaries
 - A. Precalculus Review
 - B. The Cartesian Coordinate System
 - C. Straight Lines

- II. Functions, Limits, and the Derivative
 - A. Functions and Their Graphs
 - B. The Algebra of Functions
 - C. Functions and Mathematical Models
 - D. Limits
 - E. One-Sided Limits and Continuity
 - F. The Derivative

- III. Differentiation
 - A. Basic Rules of Differentiation
 - B. The Product and Quotient Rules
 - C. The Chain Rule
 - D. Marginal Functions in Economics
 - F. Higher-Order Derivatives
 - G. Implicit Differentiation and Related Rates
 - H. Differentials

- IV. Applications of the Derivative
 - A. Applications of the First Derivative
 - B. Applications of the Second Derivative
 - C. Curve Sketching
 - D. Optimization

- V. Exponential and Logarithmic Functions
 - A. Exponential Functions
 - B. Logarithmic Functions
 - C. Compound Interest
 - D. Differentiation of Exponential Functions
 - E. Differentiation of Logarithmic Functions
 - F. Exponential Functions as Mathematical Models

- VI. Integration
 - A. Antiderivatives and the Rules of Integration
 - B. Integration by Substitution
 - C. Area and the Definite Integral
 - D. The Fundamental Theorem of Calculus
 - E. Evaluating Definite Integrals
 - F. Area Between Two Curves
 - G. Applications of the Definite Integral to Business and Economics

- VII. Additional Topics in Integration
 - A. Integration by Parts
 - B. Integration Using Tables of Integrals
 - C. Numerical Integration
 - D. Improper Integrals

- VIII. Calculus of Several Variables
 - A. Functions of Several Variables
 - B. Partial Derivatives
 - C. Maxima and Minima of Functions of Several Variables

INSTRUCTIONAL METHODS:

- 1. Lecture
- 2. Class Participation and Discussions
- 3. Instructional quizzes, exams, and homework
- 4. Audio-Visual Aids – calculator, overheads, computer, etc.

EVALUATION OF STUDENT ACHIEVEMENT:

Unit tests
Comprehensive final exam
Projects
MyMathLab assignments
Quizzes

INSTRUCTIONAL MATERIALS:

Textbooks

Calculus for Business, Economics, Life Science, and Social Sciences, Barnett, Pearson

Resources

Test Generation Software
Printed Test Bank
Online Videos

LEARNING OUTCOMES AND GOALS:

Institutional Learning Outcomes

- 1) Communication – to communicate effectively;
- 2) Inquiry – to apply critical, logical, creative, aesthetic, or quantitative analytical reasoning to formulate a judgement or conclusion;
- 3) Social Consciousness – to understand what it means to be a socially conscious person, locally and globally;
- 4) Responsibility – to recognize how personal choices affect self and society.

Course Outcomes and Competencies

- 1. Students will demonstrate knowledge of the cartesian coordinate system.
 - 1.1. Students will be able to solve inequalities
 - 1.2. Students will be able to evaluate expressions
 - 1.3. Students will be able to perform indicated operations
 - 1.4. Students will be able to factor the expressions

- 1.5. Students will be able to sketch a set of coordinate axes and plot points
- 1.6. Students will be able to find the distance between points
- 1.7. Students will be able to find the slope of the given line
- 1.8. Students will be able to write the equation in slope-intercept form
- 1.9. Students will be able to find the equation of the line given points

2. Students will demonstrate knowledge of functions, limits, and the derivative
 - 2.1. Students will be able to determine whether the point lies on the graph
 - 2.2. Students will be able to find the domain of the function
 - 2.3. Students will be able to sketch the graph of a piece-wise function
 - 2.4. Students will be able to determine if the graph is a function
 - 2.5. Students will be able to find the rules for $f-g$, $f+g$, fg , and f/g
 - 2.6. Students will be able to find the rules for composite functions
 - 2.7. Students will be able to determine the kind of function given
 - 2.8. Students will be able to find the equilibrium point
 - 2.9. Students will be able to find the indicated limit
 - 2.10. Students will be able to find the indicated one-sided limit
 - 2.11. Students will be able to determine functional values that are discontinuous
 - 2.12. Students will be able to show that a function is continuous
 - 2.13. Students will be able to prove that f must have a zero between a and b
 - 2.14. Students will be able to use the four-step process to find slope of tangent
 - 2.15. Students will be able to find average rate of change
 - 2.16. Students will be able to find the instantaneous rate of change

3. Students will demonstrate knowledge of differentiation
 - 3.1. Students will be able to find the derivative using the rules of differentiation
 - 3.2. Students will be able to find the given limit by evaluating the derivative
 - 3.3. Students will be able to find the marginal cost, revenue, and profit
 - 3.4. Students will be able to find the average marginal cost, revenue, and profit
 - 3.5. Students will be able to find the elasticity of demand
 - 3.6. Students will be able to find the second and third derivatives
 - 3.7. Students will be able to find derivatives using implicit differentiation
 - 3.8. Students will be able to find the differential of the given function

4. Students will demonstrate knowledge of applications of the derivative
 - 4.1. Students will be able to find increasing, decreasing, or constant functions
 - 4.2. Students will be able to determine the relative maxima and minima
 - 4.3. Students will be able to determine the concavity and inflection points
 - 4.4. Students will be able to find the vertical and horizontal asymptotes
 - 4.5. Students will be able to sketch the graphs using curve-sketching
 - 4.6. Students will be able to determine the absolute maxima and minima

5. Students will demonstrate knowledge of exponential and logarithmic functions
 - 5.1. Students will be able to evaluate and simplify expressions with \log and e
 - 5.2. Students will be able to use the laws of logs to solve equations
 - 5.3. Students will be able to find accumulated amounts and present values
 - 5.4. Students will be able to find the effective rates and annuities
 - 5.5. Students will be able to differentiate exponential functions
 - 5.6. Students will be able to differentiate logarithmic functions

- 5.7. Students will be able to solve exponential growth problems
- 5.8. Students will be able to solve exponential decay problems
- 5.9. Students will be able to solve population problems

6. Students will demonstrate knowledge of integration
 - 6.1. Students will be able to verify that F is an antiderivative of f
 - 6.2. Students will be able to find the indefinite integral
 - 6.3. Students will be able to solve an initial value problem
 - 6.4. Students will be able to find a function given slope at any point
 - 6.5. Students will be able to solve indefinite integrals using substitution
 - 6.6. Students will be able to find an approximation of the area under the curve
 - 6.7. Students will be able to compute the Riemann sum over the interval
 - 6.8. Students will be able to understand the fundamental theorem of calculus
 - 6.9. Students will be able to evaluate the definite integral
 - 6.10. Students will be able to find the area between two curves
 - 6.11. Students will be able to find the consumer surplus
 - 6.12. Students will be able to find the producer surplus
 - 6.13. Students will be able to find the accumulated future value
 - 6.14. Students will be able to find the present value of an income stream
 - 6.15. Students will be able to find the amount of an annuity
 - 6.16. Students will be able to find the present value of an annuity

7. Students will demonstrate knowledge of additional topics in integration
 - 7.1. Students will be able to evaluate an indefinite integral by integrate by parts
 - 7.2. Students will be able to use the table of integrals to evaluate integrals
 - 7.3. Students will be able to approximate integrals with numerical integration
 - 7.4. Students will be able to find the present value of a perpetuity
 - 7.5. Students will be able to evaluate improper integrals when convergent

8. Students will demonstrate knowledge of calculus of several variables
 - 8.1. Students will be able to find the domain of functions of several variables
 - 8.2. Students will be able to sketch level curves
 - 8.3. Students will be able to find the first partial derivatives of functions
 - 8.4. Students will be able to find the second order partial derivatives
 - 8.5. Students will be able to find critical points of several variable functions