

CUYAMACA COLLEGE
COURSE OUTLINE OF RECORD

MATHEMATICS 178 – CALCULUS FOR BUSINESS, SOCIAL AND BEHAVIORAL SCIENCES

4 hours lecture, 4 units

Catalog Description

Presents a study of the techniques of calculus with emphasis placed on the application of these concepts to business and management related problems. The applications of derivatives and integrals of functions including polynomials, rational, exponential and logarithmic functions are studied. *Not open to students with credit in MATH 180.*

Prerequisite

“C” grade or higher or “Pass” in MATH 110 or equivalent

Entrance Skills

Without the following skills, competencies and/or knowledge, students entering this course will be highly unlikely to succeed:

- 1) Operations, Simplification and Manipulation
 - a. Functions and function composition
 - b. Polynomials
 - c. Factoring
 - d. Rational expressions
 - e. Logarithms
 - f. Variables with rational exponents
 - g. Algebraic expressions involving radicals
 - h. Matrices
 - i. Determinants
- 2) Solving Mathematical Statements
 - a. Linear, quadratic, polynomial (factorable), rational, logarithmic, exponential and radical equations
 - b. Linear and non-linear systems of equations
- 3) Linear and Quadratic Inequalities
- 4) Absolute Value Inequalities
- 5) Graphing
 - a. Functions and their inverses
 - b. Absolute value functions
- 6) Modeling and Applications
 - a. Functions
 - b. Problem-solving strategies and techniques
 - c. Translating verbiage into a mathematical model

Course Content

- 1) Functions and their graphs, including exponential and logarithmic functions;
- 2) Limits and intuitive limit definition of derivative;
- 3) Increments, tangent lines, and rate of change;
- 4) Rules of differentiation including sum, product, quotient, and the chain rule;
- 5) Implicit differentiation;
- 6) Applications of differentiation such as marginal analysis, optimization, and curve sketching;
- 7) Antiderivatives, indefinite and definite integrals;

- 8) Multiple techniques of integration including substitution;
- 9) Area between curves;
- 10) Approximating definite integral as a sum; and
- 11) Applications of integration in business and economics.

Course Objectives

Students will be able to:

- 1) Find the derivatives of polynomial, rational, exponential, and logarithmic functions;
- 2) Find the derivatives of functions involving constants, sums, differences, products, quotients, and the chain rule;
- 3) Sketch the graph of functions using horizontal and vertical asymptotes, intercepts, and first and second derivatives to determine intervals where the function is increasing and decreasing, maximum and minimum values, intervals of concavity and points of inflection;
- 4) Analyze the marginal cost, profit and revenue when given the appropriate function;
- 5) Determine maxima and minima in optimization problems using the derivative;
- 6) Use derivatives to find rates of change and tangent lines;
- 7) Use calculus to analyze revenue, cost, and profit;
- 8) Find definite and indefinite integrals by using the general integral formulas, integration by substitution, and other integration techniques; and
- 9) Use integration in business and economics applications.

Method of Evaluation

A grading system will be established by the instructor and implemented uniformly. Grades will be based on demonstrated proficiency in subject matter determined by multiple measurements for evaluation, one of which must be essay exams, skills demonstration or, where appropriate, the symbol system.

- 1) Independent and group-oriented exploration activities which measure students' ability to analyze the connections between the numeric, algebraic, graphic, or verbal representations of various types of calculus problems and applications.
- 2) Quizzes and exams (including a comprehensive in-class final exam) which measure students' ability to work independently to choose appropriate mathematical models to solve problems, accurately calculate derivatives and antiderivatives, and apply the use of appropriate technology to solve problems.
- 3) Homework assignments in which students apply the principles of calculus discussed in class to a series of practice problems to help students reinforce these principles, formulate questions about topics where they are experiencing difficulty, and receive feedback and guidance from the instructor, classmates and tutors.
- 4) Computer and/or calculator-based activities which demonstrate students' ability to apply the principles of calculus discussed in class to application problems.

Special Materials Required of Student

Graphing utility

Minimum Instructional Facilities

Smart classroom with writing boards covering three walls, overhead projector, graphing utility overhead viewing panels

Method of Instruction

- 1) Lecture and discussion
- 2) Teamwork
- 3) Computer-facilitated instruction

Out-of-Class Assignments

- 1) Problem sets

- 2) Reading and/or writing assignments

Texts and References

- 1) Required (representative example): Hughes-Hallett. *Applied Calculus*. 5th edition. Wiley, 2014.
- 2) Supplemental: None

Exit Skills

Students having successfully completed this course exit with the following skills, competencies and/or knowledge:

- 1) Essential Vocabulary and Concepts and Calculations
 - a. Limits
 - b. Continuity
 - c. Fundamental Theorem of Calculus
 - d. Differentiation
 - e. Integration
- 2) Evaluating Derivatives
 - a. Polynomial and Logarithmic
 - b. Product/Quotient rule
 - c. Chain rule
 - d. Implicit
 - e. Differentials
- 3) Evaluating Integrals
 - a. Definite
 - b. Indefinite
 - c. Area applications
- 4) Graphing: interpreting function behavior from derivatives
- 5) Modeling and Applications
 - a. Maximum/minimum problems
 - b. Business related
 - c. Social science related
 - d. Behavioral science related

Student Learning Outcomes

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

- 1) Use graphical, numerical, and analytical methods to solve multidisciplinary problems at the Calculus for business, social, and behavioral sciences level (especially from business or the natural/social sciences).
- 2) Use integration in business and economics applications.