

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 or MATH C2210.*

Prerequisite

Appropriate Placement or Intermediate Algebra

Entrance Skills

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

- 1) Performing operations, simplifying and manipulating mathematical expressions and structures, including: functions and function composition, polynomials, factoring, rational expressions, logarithms, variables with rational exponents, algebraic expressions involving radicals, matrices, and determinants.
- 2) Solving linear, quadratic, polynomial (factorable), rational, logarithmic, exponential and radical equations as well as linear and non-linear systems of equations.
- 3) Solving linear, quadratic and absolute value inequalities
- 4) Graphing functions and their inverses, including absolute value functions.
- 5) Modeling using functions and applying problem-solving strategies and techniques.

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) **Reading:** Lecture notes; assigned textbook sections explaining mathematical concepts and procedures; instructional materials provided by the instructor; worked example sets; reference materials for mathematical symbols and notation; supplemental explanations from approved online resources; and documentation for graphing calculators or mathematical software.
- 2) **Writing / Problem Solving:** Problem sets requiring clear, step-by-step demonstration of reasoning using correct mathematical notation; written explanations supporting solutions and justifying methods; error analysis and revision of incorrect or incomplete work; solution summaries explaining conceptual understanding; problem-based learning tasks requiring application of multiple skills; written responses to mathematical prompts or inquiry problems; and organized documentation of problem-solving strategies used in individual or group assignments.
- 3) **Other:** Online homework assignments or quizzes using learning platforms; collaborative problem solving using shared documents or discussion boards; graph construction by hand and with technology; review and annotation of instructor feedback to revise and resubmit work; preparation for exams through practice tests and concept reviews; mathematical modeling activities using real-

world data; use of graphing calculators or math software to explore and verify solutions; and completion of study logs, learning reflections, or structured practice plans to build mastery.

Texts and References

- 1) Required (representative example): Hughes-Hallett. *Applied Calculus*. 7th edition. Wiley, 2021.
- 2) Supplemental: None

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.