MATH 12: CALCULUS FOR BUSINESS & ECONOMICS

Foothill College Course Outline of Record

Heading	Value
Units:	5
Hours:	5 lecture per week (60 total per quarter)
Prerequisite:	MATH 48A or equivalent.
Advisory:	Demonstrated proficiency in English by placement via multiple measures OR through an equivalent placement process OR completion of ESLL 125 & ESLL 249.
Degree & Credit Status:	Degree-Applicable Credit Course
Foothill GE:	Area V: Communication & Analytical Thinking
Transferable:	CSU/UC
Grade Type:	Letter Grade (Request for Pass/No Pass)
Repeatability:	Not Repeatable

Student Learning Outcomes

- Students will solve problems involving rates of change and integration drawn from business, economics, and the natural sciences.
- Students will develop conceptual understanding of limits, rates of change, and integrals. They will demonstrate and communicate this understanding in a variety of ways, such as: reasoning with definitions and theorems, connecting concepts, and connecting multiple representations, as appropriate.
- Students will demonstrate the ability to compute limits, rates of change, and integrals.

Description

A study of the techniques of differential and integral calculus, with an emphasis on the application of these techniques to problems in business and economics.

Course Objectives

The student will be able to:
A. demonstrate an understanding of elementary functions, including finding the derivatives of polynomial, rational, exponential, logarithmic functions, functions involving constants, sums, differences, products, quotients, and the chain rule
B. demonstrate understanding of elementary ideas of limits, rates of change, and the derivative
C. apply techniques of differentiation, graphically, numerically and symbolically, including sketching graphs of functions using horizontal/vertical asymptotes, intercepts, and the first and second derivatives to determine intervals where the function is increasing/decreasing, is concave up/down, and has local extrema and points of inflection
D. use the derivative to solve application problems, including cost/marginal cost, profit/marginal profit, revenue/marginal revenue, optimization problems (max/min), rates of change and tangent lines
E. demonstrate understanding of integration, including definite and indefinite integrals by using general integral formulas, integration by substitution and other integration techniques
F. solve applications problems using definite integrals, including problems drawn from business and economics
G. demonstrate an understanding of antidifferentiation techniques and be able to analyze antiderivatives graphically and numerically
H. use technology, such as graphing calculators and/or computer software to assist in solving problems involving any of the topics in (A) through (G) above
I. discuss mathematical problems and write solutions in accurate mathematical language and notation
J. interpret mathematical solutions

Course Content

A. Demonstrate an understanding of elementary functions
1. Linear functions
2. Average rate of change
3. Exponential functions
4. Logarithmic functions
5. Exponential growth and decay
6. Proportionality and power functions
B. Demonstrate understanding of elementary ideas of limits, rates of change, and the derivative
1. Limits
a. Approximation of limits numerically and visually from graphs of functions
b. Limits and continuity
c. Computation of limits algebraically
d. Limit definition of the derivative
2. Instantaneous rate of change and tangent lines
3. The derivative function
4. Interpretations of the derivative
5. The second derivative
6. Marginal cost, profit, and revenue
C. Apply techniques of differentiation, graphically numerically and symbolically
1. Derivative formulas for powers and polynomials
2. Exponential and logarithmic functions
3. The chain rule
4. The sum, product, and quotient rules
5. Implicit differentiation
6. Sketching graphs of functions using horizontal/vertical asymptotes, intercepts, and the first and second derivatives to determine intervals where the function is increasing/decreasing, is concave up/down, and has local extrema and points of inflection
D. Use the derivative to solve problems in optimization, with particular emphasis on problems from business and economics
1. Local maxima and minima
2. Inflection points
3. Global maxima and minima
4. Profit cost and revenue
5. Average cost
6. Elasticity of demand
7. Logistic growth
E. Demonstrate understanding of elementary ideas of accumulated change and the definite integral
1. The definite integral
2. The definite integral as area
3. Interpretations of the definite integral
4. The fundamental theorem of calculus

5. Approximate definite integrals using Riemann sums
F. Solve applications problems using definite integrals
1. Average value
2. Consumer and producer surplus
3. Present and future value
4. Areas between curves: computation of with definite integrals and in applications (e.g., total profit)
G. Demonstrate an understanding of antidifferentiation techniques and be able to analyze antiderivatives graphically and numerically
1. Constructing antiderivatives analytically
2. Integration by substitution
3. Using the fundamental theorem to find definite integrals
4. Integration by parts
5. Analyze antiderivatives graphically and numerically
H. Use technology, such as graphing calculators and/or computer software to assist in solving problems involving any of the topics in (A) through (G) above
1. Calculator/computer utilities for approximating graphs of derivative functions
2. Calculator/computer utilities for evaluating definite integrals
3. Calculator/computer utilities for approximating graphs of antiderivative functions
I. Discuss mathematical problems and write solutions in accurate mathematical language and notation
1. Use of proper notation
J. Interpret mathematical solutions
1. Explain significance of solutions to application problems

Lab Content

Not applicable.

Special Facilities and/or Equipment

A. Graphing calculator
B. When taught hybrid:
1. Internet access
2. Course management system
3. Specific software related to the course

Method(s) of Evaluation

A. Homework
B. Quizzes
C. Exams
D. Proctored comprehensive final examination

Method(s) of Instruction

A. Lecture
B. Discussion
C. Cooperative learning exercises

Representative Text(s) and Other Materials

Waner, Stefan, and Steven Costenoble. Applied Calculus. 7th ed. Boston: Cengage Learning, 2018.

Types and/or Examples of Required Reading, Writing, and Outside of Class Assignments

A. Homework Problems: Homework problems covering subject matter from text and related material ranging from 30-60 problems per week. Students will need to employ critical thinking in order to complete assignments.

B. Reading and study of the textbook, related materials and notes.

C. Projects: Student projects covering subject matter from textbook and related materials. Projects will require students to discuss mathematical problems, write solutions in accurate mathematical language and notation and interpret mathematical solutions. Projects may require the use of a computer algebra system, such as Mathematica or MATLAB.

D. Worksheets: Problems and activities covering the subject matter. Such problems and activities will require students to think critically. Such worksheets may be completed inside and/or outside of class.

Discipline(s)

Mathematics