

# MATH 0042 - BUSINESS CALCULUS

## Catalog Description

Prerequisite: Completion of MATH D or MATH G with grade of "C" or better, or placement by matriculation assessment process

Advisory: Completion of MATH 12 strongly recommended, especially for students who have not recently taken MATH D or MATH G

Hours: 72 lecture

Description: Introduction to differential and integral calculus with particular emphasis on applications in the fields of business, economics, and social sciences. Includes: concepts of a function, limits, derivatives, integrals of polynomial, exponential and logarithmic functions, optimization problems, and calculus of functions of more than one variable. Recommended for Business Majors transferring to CSU, Sacramento. Not recommended for students with credit for MATH 30. (C-ID MATH 140) (CSU, UC-with unit limitation)

## Course Student Learning Outcomes

- CSLO #1: Evaluate limits of functions using limit laws and graphical methods.
- CSLO #2: Calculate derivatives, partial derivatives, and integrals.
- CSLO #3: Translate, model, and solve applied business problems utilizing derivatives and integrals.
- CSLO #4: Present clear, complete, accurate, and sufficiently detailed solutions to communicate reasoning and demonstrate the method of solving business problems.

## Effective Term

Fall 2022

## Course Type

Credit - Degree-applicable

## Contact Hours

72

## Outside of Class Hours

144

## Total Student Learning Hours

216

## Course Objectives

1. Construct and graph functions of various types (linear, quadratic, rational, exponential, logarithmic, and logistic) from real world information.
2. Evaluate limits at a point, at infinity, and compute derivatives using the limit definition.
3. Calculate derivatives of polynomial, rational, radical, exponential, and logarithmic functions using basic derivative rules including sum, difference, product, quotient, and chain rules. Use of the chain rule includes implicit differentiation.

4. Solve business application problems involving demand, cost, revenue, profit, and marginality.
5. Investigate real world functions using derivatives to find such information as optimal points, rates of change, and shape of graph.
6. Solve exponential equations, logarithmic equations and application problems related to exponential growth and decay, as well as logistic and learning curves.
7. Definite integrals - apply integration techniques to determine the area under a curve, determine consumer and producer's surplus, and solve basic differential equations.
8. Indefinite integrals - investigate antiderivatives to develop formulas for integration.
9. Find both definite and indefinite integrals by using the general integral formulas, integration by substitution, and other integration techniques;
10. Calculate partial derivatives of two variables and use to solve optimization problems in three dimensions.
11. Analyze the meaning of the derivative and the integral in the context of real world situations for both business and economics applications.

## General Education Information

- Approved College Associate Degree GE Applicability
  - AA/AS - Comm & Analyt Thinking
  - AA/AS - Mathematical Skills
- CSU GE Applicability (Recommended-requires CSU approval)
  - CSUGE - B4 Math/Quantitative Reasoning
- Cal-GETC Applicability (Recommended - Requires External Approval)
- IGETC Applicability (Recommended-requires CSU/UC approval)
  - IGETC - 2A Math/Quan Reasoning

## Articulation Information

- CSU Transferable
- UC Transferable

## Methods of Evaluation

- Problem Solving Examinations
  - Example: 1. Calculate the derivative of a rational function using the quotient rule. This problem is graded based on the completeness and correctness of the quotient rule, the algebra used in simplifying, and of the derivative found. 2. Analyze the meaning of the derivative of a profit function. The grade is based on the correctness of the derivative found, and a clear, concise and correct analysis. 3. Assume that  $R(x)$  and  $C(x)$  are the revenue and cost, in dollars, when  $x$  units are produced. Find the maximum profit and the number of units,  $x$ , of leather brief case that must be produced and sold in order to yield the maximum profit. Apply calculus to maximize the profit function. Also, compare the answer by graphing and finding the maximum from the graph. Explain the procedure and interpret the findings. This problem is graded based on the completeness and correctness of the quotient rule, the algebra used in simplifying, and of the derivative found. 4. Assume  $D(x)=6.50-0.25x$  represents the demand function and  $S(x)=2.10+0.15x$  represent the supply function. Find the equilibrium point Find the consumer surplus and the producer surplus at the equilibrium point. Assume a price ceiling of \$3 per gallon of propane is imposed. Find the point  $(x_C, p_C)$  Find the new producer surplus and new consumer surplus at  $(x_C, p_C)$  Find the dead weight loss (the loss in surplus). This problem is graded based on the completeness and

correctness of the quotient rule, the algebra used in simplifying, and of the derivative found.

## Repeatable

No

## Methods of Instruction

- Lecture/Discussion
- Distance Learning

Lecture:

1. In-class collaborative learning activity. Instructor will divide students into small groups and introduce the activity. Students will choose appropriate exponential and logarithmic functions to model data from business, science, and nature while instructor supports the learning. In a whole-class activity, instructor will review the small group models and lead a discussion on predictions based on the chosen models. (Objectives 5 & 6)
2. Instructor will introduce and assign reading in a prior class meeting. In class, students will be divided into small groups to compare and review the reading and associated mathematical models. Instructor will then lead a discussion on student findings. For example, students will read data about the interaction of an experimental drug in the bloodstream, develop a mathematical formula to model the situation and make predictions about when the patient will be cured. (Objectives 1 & 5)

Distance Learning

1. Instructor will divide students into small virtual groups and present a discussion prompt asking each group to choose appropriate exponential and logarithmic functions to model data from business, science, and nature while instructor supports the learning. Each group will post their models for peer review. Then the instructor will lead a discussion on predictions based on the chosen models. (Objectives 5 & 6)
2. Instructor will post videos and assign reading. In a discussion board, students will be divided into small virtual groups to compare and review the reading and associated mathematical models. Instructor will then lead a discussion on student findings. For example, students will read data about the interaction of an experimental drug in the bloodstream, develop a mathematical formula to model the situation and make predictions about when the patient will be cured. (Objectives 1 & 5)

## Typical Out of Class Assignments

### Reading Assignments

1. Students will read selected topics throughout the course from the textbook. For example, students will read how to construct a revenue function from real world data and be prepared to discuss in class. 2. A typical homework assignment includes many application problems that the students will read. Example as follows. A rumor about a county official's willingness to accept bribes is circulating. So far, 25,000 of the 300,000 citizens of the county have heard the rumor. Suppose the rumor spreads logistically through the county, and during the next 8 days, 10,000 more citizens will hear the rumor. How many of the county's citizens will have heard the rumor 15 days from now.

## Writing, Problem Solving or Performance

1. Students will complete homework problems from the textbook on topics throughout the course. Such problems may involve computation, sketching graphs and diagrams, solving equations, applying mathematical concepts, or explaining mathematical ideas. Example: Cost, Revenue and Profit Graphs. 2. Students will solve application problems in class. For example, students will use the derivative to compute the marginal cost for a real world situation and write an explanation on what information the marginal cost conveys to the business owner.

## Other (Term projects, research papers, portfolios, etc.)

### Required Materials

- Calculus and its Application
  - Author: Bittinger
  - Publisher: Pearson
  - Publication Date: 2019
  - Text Edition: 12th
  - Classic Textbook?: No
  - OER Link:
  - OER:
- Applied Mathematics for the Managerial, Life, and Social Sciences
  - Author: Tan
  - Publisher: Cengage
  - Publication Date: 2017
  - Text Edition: 10th
  - Classic Textbook?: No
  - OER Link:
  - OER:

## Other materials and-or supplies required of students that contribute to the cost of the course.