

MATH R106: BUSINESS CALCULUS

Originator

ptrujillo

College

Oxnard College

Discipline (CB01A)

MATH - Mathematics

Course Number (CB01B)

R106

Course Title (CB02)

Business Calculus

Banner/Short Title

Business Calculus

Credit Type

Credit

Start Term

Fall 2023

Catalog Course Description

This course presents a study of the calculus techniques with an emphasis on the application of concepts to business and management related problems. Further, the course addresses the application of derivatives and integrals of functions including polynomials, rational, exponential and logarithmic functions.

Taxonomy of Programs (TOP) Code (CB03)

1701.00 - Mathematics, General

Course Credit Status (CB04)

D (Credit - Degree Applicable)

Course Transfer Status (CB05) (select one only)

A (Transferable to both UC and CSU)

Course Basic Skills Status (CB08)

N - The Course is Not a Basic Skills Course

SAM Priority Code (CB09)

E - Non-Occupational

Course Cooperative Work Experience Education Status (CB10)

N - Is Not Part of a Cooperative Work Experience Education Program

Course Classification Status (CB11)

Y - Credit Course

Educational Assistance Class Instruction (Approved Special Class) (CB13)

N - The Course is Not an Approved Special Class

Course Prior to Transfer Level (CB21)

Y - Not Applicable

Course Noncredit Category (CB22)

Y - Credit Course

Funding Agency Category (CB23)

Y - Not Applicable (Funding Not Used)

Course Program Status (CB24)

1 - Program Applicable

General Education Status (CB25)

B - Satisfies Math/Quantitative Reasoning req (CSUGE-B B4, IGETC 2, or 4-yr)

Support Course Status (CB26)

N - Course is not a support course

Field trips

Will not be required

Grading method

(L) Letter Graded

Does this course require an instructional materials fee?

No

Repeatable for Credit

No

Is this course part of a family?

No

Units and Hours

Carnegie Unit Override

No

In-Class

Lecture

Minimum Contact/In-Class Lecture Hours

70

Maximum Contact/In-Class Lecture Hours

70

Activity

Laboratory

Total in-Class

Total in-Class

Total Minimum Contact/In-Class Hours

70

Total Maximum Contact/In-Class Hours

70

Outside-of-Class

Internship/Cooperative Work Experience

Paid**Unpaid****Total Outside-of-Class****Total Outside-of-Class****Minimum Outside-of-Class Hours**

140

Maximum Outside-of-Class Hours

140

Total Student Learning**Total Student Learning****Total Minimum Student Learning Hours**

210

Total Maximum Student Learning Hours

210

Minimum Units (CB07)

4

Maximum Units (CB06)

4

Prerequisites

Course taught at the level of intermediate algebra or placement as determined by the college's multiple measures assessment process.

Advisories on Recommended Preparation

MATH R115 or equivalent

Entrance Skills**Entrance Skills**

Algebraic fluency with expressions and equations. Understanding functions and graphs.

Requisite Justification**Requisite Type**

Prerequisite

Requisite

Course taught at the level of intermediate algebra or placement as determined by the college's multiple measures assessment process

Requisite Description

Course in a sequence

Level of Scrutiny/Justification

Content review

Student Learning Outcomes (CSLOs)

Upon satisfactory completion of the course, students will be able to:

- 1 Students will compute derivatives of polynomial, exponential, and logarithmic functions.
- 2 Students will determine the maxima and minima in optimization problems using derivatives.

Course Objectives

Upon satisfactory completion of the course, 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. |
| 9 | Use integration in business and economics applications. |

Course Content**Lecture/Course Content**

1. Basic analysis and graphing of functions and non-functions
 - a. Equations of functions or non-functions (such as polynomials, exponential and logarithmic, rational, radicals, piecewise defined, and absolute value)
 - b. Algebra of functions including the composition of functions
 - c. Concepts of intercepts (including the Zeros of a Function), left and right endpoint behaviors, and asymptotes to sketch the graph of a function or a non-function
 - d. Use of domain and range of a function both analytically and graphically
 - e. Average rate of change and slope of a secant line
2. Limits
 - a. Definition of a limit and continuity
 - b. Properties of limits (including Left Hand limit and Right-Hand limit)
 - c. Relationship of limits to functions, specifically vertical and horizontal asymptotes
 - d. Approximating the instantaneous rate of change
3. Derivatives
 - a. Definition of a derivative in relation to polynomials, rational, exponential and logarithmic functions
 - b. Properties of derivatives (including Constants, Power, Sum and Difference, Product, Quotient, and Chain Rule)
 - c. Relationship to tangent lines and rate of change
 - d. Implicit differentiation and related rates
4. Application of derivatives
 - a. First derivative and the graph of functions
 - b. Second derivative and the graph of functions
 - c. Second Derivative Test
 - d. Optimization of a function
 - e. Graphical analysis and Curve sketching (including asymptotes, intercepts, derivatives to determine intervals of increasing and decreasing, maximum and minimum values, concavity, and inflection)
 - f. Analysis of marginal functions
5. Integration
 - a. Definition of indefinite and definite integrals
 - b. Relationship between derivatives and integrals
 - c. Properties of integration
 - d. Using the general integral formula, integration by U-Substitution, and other integration techniques to evaluate an indefinite and definite integral
 - e. Integration of exponential and logarithmic functions
6. Application of integrations
 - a. Area between two curves on both an open and closed interval
 - b. Approximating the area under the curve
 - c. Business and economic applications of the integrals

Laboratory or Activity Content

None

Methods of Evaluation

Which of these methods will students use to demonstrate proficiency in the subject matter of this course? (Check all that apply):

Problem solving exercises

Methods of Evaluation may include, but are not limited to, the following typical classroom assessment techniques/required assignments (check as many as are deemed appropriate):

Computational homework

Group projects

Individual projects

Mathematical proofs

Oral presentations

Problem-solving exams

Quizzes

Skills demonstrations

Skills tests or practical examinations

Problem-Solving Assignments

Instructional Methodology

Specify the methods of instruction that may be employed in this course

Audio-visual presentations

Class activities

Class discussions

Collaborative group work

Distance Education

Group discussions

Instructor-guided use of technology

Lecture

Describe specific examples of the methods the instructor will use:

Problem solving textbook exercises.

Example 1: Using the proper differentiation technique, find the derivative of the product of the square of x and the natural logarithm of x .

Example 2: Using the proper integration technique, evaluate the integral of the quotient of x and the exponential function e^x .

Example 3: The total profit function for a certain company in producing and selling x items is given by $P(x) = -0.02x^2 + 300x - 200,000$. Using the appropriate techniques of differentiation, determine the number of items that must be produced and sold in order for the company to maximize its total profits.

Representative Course Assignments**Writing Assignments**

Three or four sentence written response (for example, Can anything be said about the graph of a function $y = f(x)$ that has a continuous second derivative that is never zero? Give reasons for your answers.)

Critical Thinking Assignments

Explore mathematical modeling stages: formulation, analysis of the model, Interpretation, Testing and Adjustment. Develop a mathematical model for raw data using EXCEL or any other similar software.

Example: Modeling An Epidemic: Deaths Due to AIDS in the United States

During the past 20 years, many different mathematical models for the number of deaths from AIDS per year have been developed. In this essay, we will describe some of the simplest such models and discuss their accuracy.

Reading Assignments

Critical reading and thinking in application problems:

Example 1: National health expenditures are growing at the rate of $R(t) = 0.0058t + 0.159$ trillion dollars per year, where $t = 0$ corresponds to the beginning of 2002. The expenditure at the beginning of 2002 was \$1.6 trillion. Use this information together with the appropriate integration technique to predict the national health expenditure in the year 2015.

Example 2: A manufacturer can produce printer paper at a cost of \$2 per ream. The paper has been selling for \$5 per ream, and at that price consumers have been buying 4,000 reams per month. The manufacturer is planning to raise the price of the paper and estimates

that for each \$1 increase in price, 400 fewer reams will be sold each month. What price corresponds to the maximum profit, and what is the maximum profit?

Outside Assignments

Representative Outside Assignments

1. Reading assignments.

Example: Functions Used in Economics. We will study several functions associated with the marketing of a particular commodity. These functions includes Demand $D(x)$, Supply $S(x)$, Revenue $R(x)$, Cost $C(x)$, and Profit $P(x)$.

2. Practice problems - The purpose of homework is to practice and develop the concepts presented in class.

Example:

a. Find and simplify $f(-3)$ if $f(x)=x^2+4$.

b. Market research indicates that consumers will buy x thousand units of a particular kind of coffee maker when the unit price is $p(x)=-0.27x+51$ dollars. The cost of producing the x thousand units is $C(x)=2.23x^2+3.5x+85$ thousand dollars. What is the average cost of producing 4,000 coffee makers? How much revenue $R(x)$ and profit $P(x)$ are obtained from producing x thousand units (coffee makers)? For what values of x is production of the coffee makers profitable?

3. Group work activities.

Example: Read Section 2.1 The Derivative and the slope of a Graph (pages 80-88). Complete exercises #1-73, every other odd. In a group of 2, use the internet to locate the data for the Conejo Grade in Camarillo, CA. Record the length (miles) and elevation (feet). Use the data to find the average slope of the Conejo Grade in percentage.

Articulation

C-ID Descriptor Number

MATH 140

Status

Approved

Comparable Courses within the VCCCD

MATH M16A - Applied Calculus I

MATH V46 - Business Calculus

District General Education**A. Natural Sciences****B. Social and Behavioral Sciences****C. Humanities****D. Language and Rationality****E. Health and Physical Education/Kinesiology****F. Ethnic Studies/Gender Studies****CSU GE-Breadth****Area A: English Language Communication and Critical Thinking****Area B: Scientific Inquiry and Quantitative Reasoning****Area C: Arts and Humanities****Area D: Social Sciences****Area E: Lifelong Learning and Self-Development****Area F: Ethnic Studies****CSU Graduation Requirement in U.S. History, Constitution and American Ideals:****IGETC****Area 1: English Communication****Area 2A: Mathematical Concepts & Quantitative Reasoning****Area 3: Arts and Humanities****Area 4: Social and Behavioral Sciences****Area 5: Physical and Biological Sciences****Area 6: Languages Other than English (LOTE)****Textbooks and Lab Manuals****Resource Type**

Textbook

Description

Armstrong, B., Davis, D. (2014). *Brief Calculus for the Business, Social, and Life Sciences* (3rd or most recent edition). Jones & Bartlett Learning.

Resource Type

Textbook

Description

Ron Larson, (2017 or more recent edition). *An Applied Approach Calculus with CalcChat and CalcView*, 10e.

Library Resources

Sufficient Library Resources exist

Yes

Distance Education Addendum

Definitions

Distance Education Modalities

Hybrid (1%–50% online)
Hybrid (51%–99% online)
100% online

Faculty Certifications

Faculty assigned to teach Hybrid or Fully Online sections of this course will receive training in how to satisfy the Federal and state regulations governing regular effective/substantive contact for distance education. The training will include common elements in the district-supported learning management system (LMS), online teaching methods, regular effective/substantive contact, and best practices.

Yes

Faculty assigned to teach Hybrid or Fully Online sections of this course will meet with the EAC Alternate Media Specialist to ensure that the course content meets the required Federal and state accessibility standards for access by students with disabilities. Common areas for discussion include accessibility of PDF files, images, captioning of videos, Power Point presentations, math and scientific notation, and ensuring the use of style mark-up in Word documents.

Yes

Regular Effective/Substantive Contact

Hybrid (1%–50% online) Modality:

Method of Instruction	Document typical activities or assignments for each method of instruction
Asynchronous Dialog (e.g., discussion board)	Students will post a discussion board topic on using the appropriate techniques of differentiation to determine the number of items that must be produced and sold in order for the company to maximize its total profits. Students will respond to other classmates with the intent of dialogue.
Video Conferencing	Video tools such as ConferZoom may be used to provide live synchronous or asynchronous sessions with students. ADA compliance will be upheld with Closed Captioning during the session or of the recorded session. Student-to-student group meetings will also be encouraged.
Other DE (e.g., recorded lectures)	Students will watch recorded, video lectures.
E-mail	Responses to specific email questions.

Hybrid (51%–99% online) Modality:

Method of Instruction	Document typical activities or assignments for each method of instruction
Asynchronous Dialog (e.g., discussion board)	Students will post a discussion board topic on using the appropriate techniques of differentiation to determine the number of items that must be produced and sold in order for the company to maximize its total profits. Students will respond to other classmates with the intent of dialogue.
Video Conferencing	Video tools such as ConferZoom may be used to provide live synchronous or asynchronous sessions with students. ADA compliance will be upheld with Closed Captioning during the session or of the recorded session. Student-to-student group meetings will also be encouraged.

Other DE (e.g., recorded lectures) E-mail	Students will watch recorded, video lectures. Responses to specific email questions.
100% online Modality: Method of Instruction	Document typical activities or assignments for each method of instruction
Asynchronous Dialog (e.g., discussion board)	Students will post a discussion board topic on using the appropriate techniques of differentiation to determine the number of items that must be produced and sold in order for the company to maximize its total profits. Students will respond to other classmates with the intent of dialogue.
Video Conferencing	Video tools such as ConferZoom may be used to provide live synchronous or asynchronous sessions with students. ADA compliance will be upheld with Closed Captioning during the session or of the recorded session. Student-to-student group meetings will also be encouraged.
Other DE (e.g., recorded lectures) E-mail	Students will watch recorded, video lectures. Responses to specific email questions.
Examinations	
Hybrid (1%–50% online) Modality	
On campus Online	
Hybrid (51%–99% online) Modality	
On campus Online	

Primary Minimum Qualification
MATHEMATICS

Review and Approval Dates

Department Chair
05/09/2023

Dean
05/09/2023

Technical Review
05/10/2023

Curriculum Committee
05/10/2023

DTRW-I
MM/DD/YYYY

Curriculum Committee
MM/DD/YYYY

Board
MM/DD/YYYY

CCCCO
MM/DD/YYYY

Control Number
CCC000561755

DOE/accreditation approval date

MM/DD/YYYY