

MATH 0016A - CALCULUS FOR SOCIAL AND LIFE SCIENCES

Catalog Description

Prerequisite: Completion of MATH 12 with grade of "C" or better or placement by matriculation assessment process

Advisory: Not recommended for students with grade of "C" or better in MATH 30

Hours: 72 lecture

Description: Review of functions, limits, differentiation and integration of algebraic functions, calculus for exponential and logarithmic functions, applications of calculus in social and life sciences. This course is not intended for students majoring in mathematics, engineering, physics, or chemistry. (CSU, UC-with unit limitation)

Course Student Learning Outcomes

- CSLO #1: Evaluate limits of functions using limit laws and graphical methods and utilize limits to determine continuity.
- CSLO #2: Calculate derivatives and integrals of algebraic, exponential, and logarithmic functions.
- CSLO #3: Translate, model, and solve applied problems in the social and life sciences utilizing derivatives and integrals.
- CSLO #4: Construct graphs of algebraic functions using their derivatives.
- CSLO #5: Logically present clear, complete, accurate, and sufficiently detailed solutions to communicate reasoning and demonstrate the method of solving 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

For all objectives the student will work with algebraic, exponential and logarithmic functions.

1. Analyze functions and be able to graph (with and without technology), interpret graphs, find inverses and solve application problems.
2. Calculate the limits of a function including the limit at a point and the limit at infinity. Determine when limit exists and how limits relate to continuity of a function over an interval.
3. Calculate the derivative of a function from the definition, using rules for differentiation, and implicit differentiation.

4. Interpret the meaning of the derivative as it relates to the slope of the tangent line to a graph, the instantaneous rate of change, intervals on which a function is increasing or decreasing, and marginal cost, revenue and profit.

5. Interpret the results of the first and second derivative tests and use to find relative extrema on open and closed intervals.

6. Identify relative extrema, points of inflection, concavity, critical points, horizontal and vertical asymptotes, points of non-differentiability and use to sketch graphs of functions.

7. Analyze the differentials of a function and how it relates to approximate rates of change and real life problems.

8. Solve "real life" situations using calculus. These should include (but not be limited to) the average and instantaneous rates of change; velocity and acceleration; related rates problems; optimization problems; and logistic growth problems.

9. Calculate the antiderivatives of basic algebraic functions.

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. The combined perimeter of an equilateral triangle and a square is 10. Find the dimensions of the triangle and square that produce a minimum total area. This question is graded based on the clarity, completeness, and correctness of the method used and of the solutions found. 2. Find the critical numbers and the open intervals on which the function $f(x) = 2x/(16-x)$ is increasing and decreasing. This question is graded based on the clarity, completeness, and correctness of the method used and of the solutions found. 3. Using differentials, approximate the possible error and the relative error in computing the volume of a sphere if the radius of a sphere is measured to be 6 inches with a possible error of 0.02 inch. This question is graded based on the clarity, completeness, and correctness of the method used and of the solutions found.

Repeatable

No

Methods of Instruction

- Lecture/Discussion
- Distance Learning

Lecture:

1. Instructor will create a worksheet to be completed during the class period that requires the students to collaborate to find the solutions to real-world optimization problems. (Objective 8)
2. After the instructor demonstrates a related rates problem involving water filling a cylindrical tank, students will calculate the rate at which water rises in a conical tank, and write a verbal description of the results of their mathematical computations. (Objective 8)

Distance Learning

1. Instructor will create a discussion topic presenting a real-world optimization problem that requires the students to post their solutions and peer review others work. (Objective 8)
2. After an students watch an instructor's video demonstrating a related rates problem involving water filling a cylindrical tank, students will calculate the rate at which water rises in a conical tank, and post a verbal description of the results of their mathematical computations. (Objective 8)

Typical Out of Class Assignments

Reading Assignments

1. Read the textbook section on the First Derivative Test and the Second Derivative Test. Solve problems based upon using both methods. State which method is preferable in each problem and why.
2. Read supplementary handouts on topics such as modeling population growth using exponential functions. Research a specific example to share with the class.

Writing, Problem Solving or Performance

1. Compute the slope of the tangent line to the circle $(x-2)^2+(y+3)^2=9$ at the point $(2,0)$. Interpret the meaning of your answer.
2. Determine all relative extrema of the function $f(x)=2x^3-4x^2+5x$ using the first derivative test.

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

Required Materials

- Applied Calculus
 - 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.