MATH 0016B - CALCULUS FOR SOCIAL AND LIFE SCIENCES

Catalog Description

Prerequisite: Completion of MATH 16A or 30 with grade of "C" or better
Advisory: Completion of MATH 27 with grade of "C" or better
Hours: 72 lecture
Description: Differentiation and integration of trigonometric functions, functions of several variables, partial derivatives, double integrals, introduction to differential equations, sequences and series, applications of calculus in the social and life sciences. (CSU, UC-with unit limitation)

Course Student Learning Outcomes

- CSLO #1: Calculate integrals of algebraic, trigonometric, inverse, and transcendental functions.
- CSLO #2: Sketch graphs of trigonometric functions using calculus techniques.
- CSLO #3: Translate, model, and solve optimization problems utilizing differentiation, partial differentiation, integration, and Lagrange multipliers.
- CSLO #4: Analyze points, surfaces, and graphs in three dimensions.
- 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

1. Apply the Fundamental Theorem of Calculus.
2. Use the disc method and washer method to find the volume of a solid of revolution. Use solids of revolution to solve real-life problems.
3. Use integration by substitution, integration by parts, partial fractions, and integration tables to find antiderivatives. Use techniques to solve real—life problems.
4. Evaluate improper integrals with infinite limits of integration and infinite integrands. Solve real-life problems.
5. Evaluate trigonometric functions (exactly and approximately), their limits and their derivatives. Calculate using degrees and radians.
6. Solve trigonometric equations (including real life applications) using identities and special angles.
7. Sketch the graphs of trigonometric functions using calculus when necessary.
8. Analyze points (distance between and midpoint) and surfaces (spheres, planes, traces, level curves) and graphs (quadric surfaces) in the three dimensional coordinate system.
9. Calculate partial derivatives and find extrema of functions of several variables including real life examples.
10. Use Lagrange multipliers to solve constrained optimization problems.
11. Evaluate double integrals and use them to find area and volume.
12. Find general solutions and particular solutions of differential equations. Solve differential equations using separation of variables and integrating factors. Use differential equations to model and solve real-life problems.
13. Find the limit of a sequence of numbers and use techniques to solve business and economic applications involving sequences.
14. Determine the convergence or divergence of an infinite series. Use the Ratio Test and Convergence Test to determine convergence or divergence for p-series.
15. Use Taylor's Theorem to determine the Taylor and Maclaurin series of simple functions.
16. Use Taylor polynomials for approximation.
17. Use the Power Rule, Exponential Rule and Log Rule to calculate antiderivatives.
18. Evaluate definite integrals to find the area bounded by two graphs.

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

- Objective Examinations
  - Example: 1. The line segment from (0, 0) to (4, 2) is revolved about the y axis to form a cone. Find the volume of the cone. This question is graded based on the clarity, completeness, and correctness of the method used and of the solutions found. 2. Find the area of the region bounded by the graphs of the equations y = xlnx, x = 3, x = 5 using integration by parts. This question is graded based on the clarity, completeness, and correctness of the method used and of the solutions found. 3. Classify the surface given by x^2 + y^2 – z^2 = 1. Describe the traces of the surface in the xy-plane, the yz-plane and the xz-plane. (from outcome 8). This question is graded based on the clarity, completeness, and correctness of the method used and of the solutions found.
- Problem Solving Examinations
  - Example: 1. The line segment from (0, 0) to (4, 2) is revolved about the y axis to form a cone. Find the volume of the cone. This question is graded based on the clarity, completeness, and correctness of the method used and of the solutions found.

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- Projects
  - Example: 1. Have the students construct a model of a saddle point using the media of their choice. This question is graded based on the clarity, completeness, and correctness of the method used and of the solutions found. 2. Have the students find an application of a topic in their field and make a poster presenting their information. 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. Interactive lecture format to develop the concept of finding a power series representation of a variety of functions. For each type of function, the instructor will incorporate algebraic derivation and visual analysis though graphing. Students will participate verbally and will work several examples on their own. (Objective 14)
2. In class, small group collaborative learning activities will focus on determining which methods of integration to use for a variety of problems. After an instructor lecture on solids of revolution, students will use solids of revolution to solve real-life problems. They will practice recognizing which method to try, testing their conjectures, and developing solutions with peers. (Objective 2)

Distance Learning

1. Instructor created video lectures develop the concept of finding a power series representation of a variety of functions. For each type of function, the instructor will incorporate algebraic derivation and visual analysis though graphing. Students will participate in a discussion with peer review to present their work from a chosen example. (Objective 14)
2. A small group discussion board topic will focus on determining which methods of integration to use for a variety of problems. After an instructor created video lecture on solids of revolution, students will use solids of revolution to solve real-life problems. They will practice recognizing which method to try, testing their conjectures, and posting solutions to be peer review. (Objective 2)

Typical Out of Class Assignments
Reading Assignments

1. Read in your textbook about 2 methods for calculating the volume of a solid of revolution and be prepared for a class discussion. 2. Research online the history of Newton's discovery of the Binomial Series and be prepared to discuss in class.

Writing, Problem Solving or Performance

1. Write a 3 - 5 page report on Newton's discovery of the Binomial Series. 2. A 20-foot ladder leaning against the side of a house makes a 75 degree angle with the ground. How far up the side of the house does the ladder reach? 3. Find the relative extrema of the function y = x - sinx over the interval (0, 2pi).

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.