MATH 0030 - ANALYTICAL GEOMETRY AND CALCULUS I

Catalog Description

Prerequisite: Completion of MATH 12 and MATH 27, or MATH 29 with grades of "C" or better, or placement by matriculation assessment process
Hours: 72 lecture
Description: Introduction to differential and integral calculus. Content includes limits, continuity, differentiation and integration of algebraic, trigonometric, exponential, logarithmic, hyperbolic and other transcendental functions; as well as application problems. (C-ID MATH 210) (combined with MATH 31, C-ID MATH 900S) (CSU, UC-with unit limitation)

Course Student Learning Outcomes

- CSLO #1: Evaluate limits of functions using limit laws, the definition of a limit, or L'Hospital's Rule; and utilize limits to determine continuity.
- CSLO #2: Calculate derivatives and integrals of algebraic and transcendental functions.
- CSLO #3: Translate, model, and solve applied problems utilizing derivatives and integrals.
- CSLO #4: Construct graphs of algebraic and transcendental 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

1. Compute the limit of a function.
2. Find the derivative of a function using the limit definition of a derivative.
3. Find the equation of a tangent line to a function.
4. Compute derivatives using differentiation formulas.
5. Use differentiation to solve applications such as related rate problems and optimization problems.
6. Apply implicit differentiation.
7. Graph functions using first derivatives, second derivatives, and limits.
8. Evaluate a definite integral as the limit of a Riemann Sum.
9. Evaluate integrals using the Fundamental Theorem of Calculus.
10. Apply integration to find area.

General Education Information

- Approved College Associate Degree GE Applicability
  - AA/AS - Comm & Analyt Thinking
  - AA/AS - Mathematical Skills
  - AA/AS - Physical Sciences
- 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. A particle moves on a vertical line so that its coordinate at time t is y = t^3 - 12t + 3, for t > 0. Find the velocity and acceleration functions. When is the particle moving upwards and when is it moving downwards? Find the distance the particle moves in the time interval t = 1 to t = 3. This problem is graded for correct method and accuracy. 2. Find an equation of the line through the point (3, 5) that cuts off the least area from the first quadrant. This problem is graded for correct method and accuracy.

Repeatable

No

Methods of Instruction

- Lecture/Discussion
- Distance Learning

Lecture:

1. Interactive lecture format to develop the concept of what a derivative represents, given a variety of functions (e.g., rational, polynomial, trigonometric, exponential, logarithmic). To help students see the commonalities and differences between the derivatives of each type of function, the instructor will incorporate algebraic analysis through equations and visual analysis through graphing. Students will participate verbally and will work several examples. (Objectives 2 & 4)
2. In class, small group collaborative learning activities will focus on applied physics problems involving derivatives. These will include analysis of velocity, acceleration, and other instantaneous rates of change. After an instructor lecture on derivatives, students will practice reading problems, interpreting problems, and developing solutions with peers. (Objective 7)

Distance Learning

1. Video lectures develop the concept of what a derivative represents, given a variety of functions (e.g., rational, polynomial, trigonometric,

exponential, logarithmic). To help students see the commonalities and differences between the derivatives of each type of function, the instructor will incorporate algebraic analysis through equations and visual analysis through graphing. Students will participate in a discussion board to post work from several examples for peer review. (Objectives 2 & 4)

2. In small virtual groups students will be create a wiki-page showing an applied physics problems involving derivatives. These will include analysis of velocity, acceleration, and other instantaneous rates of change. After a video lecture on derivatives, students will practice reading problems, interpreting problems, and developing solutions to post for peer review. (Objective 7)

Typical Out of Class Assignments

Reading Assignments

1. Read in your textbook how the first and second derivative of a function influence the graph of the function and be prepared to discuss in class.
2. Research online the history of the development of calculus, including Newton and Leibniz and be prepared to discuss in class.

Writing, Problem Solving or Performance

1. Write a report on the historical and mathematical origins of l'Hospital's rule. 2. After reading about Newton's and Leibniz's development of calculus, write a 3 - 5 paragraph essay comparing and contrasting each approach.

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

Required Materials

- Calculus: Early Transcendentals
  - Author: Gillett, Schulz
  - Publisher: Pearson
  - Publication Date: 2019
  - Text Edition: 3rd
  - Classic Textbook?: No
  - OER Link:
  - OER:
- Calculus: Early Transcendentals
  - Author: James Stewart
  - Publisher: Cengage Learning
  - Publication Date: 2016
  - Text Edition: 8th
  - Classic Textbook?: No
  - OER Link:
  - OER:

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