MATH A180H: CALCULUS 1 HONORS

Item	Value
Curriculum Committee Approval Date	09/18/2024
Top Code	170100 - Mathematics, General
Units	5 Total Units
Hours	90 Total Hours (Lecture Hours 90)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	No
Basic Skills	Not Basic Skills (N)
Repeatable	No
Open Entry/Open Exit	No
Grading Policy	Standard Letter (S), • Pass/No Pass (B)
Associate Arts Local General Education (GE)	• Area 1B Communication and Analytical Thinking (OA2)
Associate Science Local General Education (GE)	• Area 1B Communication and Analytical Thinking (OAS2) • Area 2 Mathematical Concepts and Quantitative Reasoning (OMTH)
California General Education Transfer Curriculum (Cal-GETC)	• Cal-GETC 2A Math Concepts (2A)
Intersegmental General Education Transfer Curriculum (IGETC)	• IGETC 2A Math Concepts (2A)
California State University General Education Breadth (CSU GE-Breadth)	• CSU B4 Math/Quant.Reasoning (B4)

Course Description

This is the first course in the calculus sequence. It satisfies the sequence for majors in mathematics, science, or engineering. Topics include limits, derivatives of algebraic and transcendental functions, applications of derivatives, indefinite integrals, definite integrals, the Fundamental Theorem of Calculus, and applications of integration. Enrollment Limitation: MATH A180; students who complete MATH A180H may not enroll in or receive credit for MATH A180. PREREQUISITE: MATH A170 or appropriate placement. Transfer Credit: CSU; UC: Credit Limitation: MATH A140, MATH A180, MATH A180H and MATH A182H combined: maximum credit, 1 course; MATH A180/H, MATH A185/H combined are equivalent to MATH A182H. C-ID: MATH 210.**C-ID:** MATH 210.

Course Level Student Learning Outcome(s)

1. Calculate limits when they exist, and explain why when they do not.
2. Determine where a function is continuous and/or differentiable, and explain why.
3. Compute derivatives of polynomial, rational, algebraic, exponential, logarithmic, and trigonometric functions.
4. Use techniques of differentiation, including the product, quotient, and chain rules, and implicit differentiation.

Course Objectives

- 1. State and apply the definitions of limits, derivatives, definite integrals and indefinite integrals.
- 2. Calculate limits with and without using L?Hospital?s Rule.
- 3. Calculate derivatives of algebraic and transcendental functions using the definition, the sum rule, the product rule, the quotient rule, and the chain rule.
- 4. Calculate indefinite integrals using the definition, formulas, and simple substitutions.
- 5. Calculate definite integrals using the definition, formulas, Riemann Sums, and simple substitutions.
- 6. Solve certain types of derivative applications such as related rates problems, linear approximations to functions, and optimization problems.
- 7. Analyze functions and their graphs by applying information obtained from the first and second derivative.
- 8. Use definite integrals in terms of either x or y to computer areas and volumes.
- 9. Use definite integrals to compute work and the average value of a function.

Lecture Content

Functions and Models Functions, domains, and ranges Catalog of functions: polynomial, rational, algebraic, and transcendental Inverse functions and their properties Review of properties of exponential and logarithmic functions Development of the inverse trigonometric functions and their properties Limits and Rates of Change Two-sided limits and one-sided limits with graphical interpretations Computing limits using sum, difference, product, quotient, and other rules Computing limits indirectly using the "Squeeze" theorem and other methods Formal ?, ? definitions of limits Given a linear function and its limit, compute ? for given values of ? Given a linear function and its limit, compute ? in terms of an arbitrary ? Definition of continuity, a survey of continuous functions, and the Intermediate Value Theorem The definition of limits as x? ? and its graphical interpretation as horizontal asymptotes Slopes of tangent lines and velocities as applications of limits Derivatives The definition of the derivative of a function Computing derivatives using only the limit definition Derivative formulas for monomial, trigonometric, exponential, logarithmic, and hyperbolic functions Discussion of the power rule, sum rule, product rule, and quotient rule with examples Discussion of the chain rule with examples Computing derivatives using implicit differentiation Computing higher order derivatives explicitly and implicitly Related rates applications Differentials and their use as estimations in applications Newton's Method Applications of the Derivative Identifying cri tical numbers, local extrema, and absolute extrema Rolle's Theorem, the Mean Value Theorem, and applications of these theorems Identifying intervals where (x) is increasing or decreasing The First Derivative Test for identifying local extrema Concavity and points of inflection The Second Derivative Test for identifying local extrema L Hospital s Rule and indeterminate forms Curve sketching identifying local and absolute extrema, intervals where the graph is increasing or decreasing, concavity, inflection points, and asymptotes Optimization applications from the sciences and economics Antiderivatives as an example of a basic differential equation Integrals Summation notation and properties of finite sums Areas computed as Riemann sums Definition of the definite

integral as a limit of a Riemann sum Properties of definite integrals The Fundamental Theorem of Calculus Computation of definite integrals using the Fundamental Theorem of Calculus Using the u-substitution in definite and indefinite integrals Applications of Integration Computing area between curves by constructing definite integrals and integrating with respect to x or y Computing volumes of solids of revolution by constructing definite integrals using the methods of cross-sections or disks and integrating with respect to x or y Computing volumes of solids of revolution by constructing definite integrals using the methods of washers or shells and integrating with respect to x or y Computing work by constructing definite integrals and integrating with respect to x or y Computing the average value of a function over a closed interval by constructing definite integrals and integrating with respect to x or y

Method(s) of Instruction

- Lecture (02)

Instructional Techniques

The primary mode of instruction is the lecture/demonstration method. Some sections may utilize graphing calculators.

Reading Assignments

As assigned from text. 1 hour

Writing Assignments

Problem solving exercises commonly appear on exams or quizzes. These require written responses of the students. Critical thinking is an integral part of a calculus course. 1 hour

Out-of-class Assignments

Homework as assigned by instructor. 8 hour

Demonstration of Critical Thinking

Grades are determined by performance on quizzes and exams. Some instructors may also include grades on homework, cooperative assignments, or participation in cooperative learning sessions. A comprehensive final exam is part of this course.

Required Writing, Problem Solving, Skills Demonstration

Problem solving exercises commonly appear on exams or quizzes. These require written responses of the students. Critical thinking is an integral part of a calculus course and may include cooperative assignments, or participation in cooperative learning sessions.

Eligible Disciplines

Mathematics: Master's degree in mathematics or applied mathematics OR bachelor's degree in either of the above AND master's degree in statistics, physics, or mathematics education OR the equivalent. Master's degree required.

Textbooks Resources

1. Required Stewart, James. Calculus, Early Transcendentals , 9th ed. Cengage, 2019 Rationale: -

Other Resources

1. Other appropriate textbook as chosen by faculty.