MATH G180: CALCULUS 1

Item	Value
Curriculum Committee Approval Date	12/07/2021
Top Code	170100 - Mathematics, General
Units	4 Total Units
Hours	72 Total Hours (Lecture Hours 72)
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)
Local General Education (GE)	• Area 2 Mathematics (GB2)
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 course is the first course in a three-course sequence designed for mathematics, science, and engineering majors. Topics include differential and integral calculus of a single variable: functions; limits and continuity; techniques and applications of differentiation and integration; Fundamental Theorem of Calculus. (The student should plan to complete the first three semesters of calculus at Golden West College to maintain continuity.) PREREQUISITE: MATH G170, or MATH G115 and MATH G120, or appropriate Math Placement. Transfer Credit: CSU; UC: Credit Limitation: MATH G140 and MATH G180 combined: maximum credit, 1 course. C-ID: MATH 210, MATH 211, MATH 900S. **C-ID:** MATH 210, MATH 211, MATH 900S.

Course Level Student Learning Outcome(s)

1. Course Outcomes
2. Calculate limits when they exist, and explain why when they do not exist.
3. Compute derivatives of polynomial, rational, algebraic, exponential, logarithmic, or trigonometric functions.
4. Evaluate definite and indefinite integrals.

Course Objectives

- 1. Find the limit of a function at a real number.
- 2. Determine the continuity of a function at a real number.
- 3. Find the derivative of a function as a limit.
- 4. Find the equation of a tangent line to a function.
- 5. Compute derivatives using differentiation formulas.
- 6. Use differentiation to solve applications such as related rate problems and optimization problems.
- 7. Differentiate expressions and equations implicitly.
- 8. Graph functions using methods of calculus.
- 9. Evaluate a definite integral as a limit.
- 10. Evaluate integrals using the Fundamental Theorem of Calculus.
- 11. Apply integration to find area.

Lecture Content

Functions and Models Functions, domains, and ranges Limits and Rates of Change Definition and computation of limits using numerical, graphical, and algebraic approaches, including 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 Definition of continuity, a survey of continuous functions, and the Intermediate Value Theorem The definition of limit as it approaches positive and negative infinity 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 constant, monomial, trigonometric, exponential, logarithmic, and hyperbolic functions Computing derivatives using the power rule, sum rule, product rule, and quotient rule Computing derivatives using the chain rule Computing derivatives using implicit differentiation and applications of implicit differentiation Computing higher-order derivatives explicitly and implicitly Related rates applications Differentiation of inverse functions Applications of the Derivative Identifying critical numbers, local extrema, and absolute extrema Rolle's Theorem, the Mean Value Theorem, and applications of these theorems Identifying intervals where f(x) is increasing or decreasing Using the First Derivative Test for identifying local extrema (maximum and minimum values) Concavity and points of inflection Using the Second Derivative Test for identifying inflectio n points L'Hopital Rule and indeterminant forms Curve sketching, identifying local and absolute extrema, intervals where the graph is increasing or decreasing, concavity, inflection points, and asymptotes Optimization applications 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 integrals The Fundamental Theorem of Calculus Computation of definite integrals using the Fundamental Theorem of Calculus Antiderivatives and indefinite integrals Using u-substitution in definite and indefinite integrals Applications of Integration Apply integration to find area

Method(s) of Instruction

- Lecture (02)
- DE Live Online Lecture (02S)
- DE Online Lecture (02X)

Instructional Techniques

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

Reading Assignments

Course textbook which provides explanations, worked examples, and problems to be solved.

Writing Assignments

Homework, quizzes, and examinations covering topics presented in the course.

Out-of-class Assignments

Homework assignments as given by instructor.

Demonstration of Critical Thinking

Students will demonstrate critical thinking and problem-solving skills by using logic, in conjunction with past mathematical solving techniques, to solve and interpret a variety of applications not previously seen. Demonstrations will be shown by completing assignments, participating in discussions, and completing required exams and quizzes.

Required Writing, Problem Solving, Skills Demonstration

Tests, examinations, homework or projects where students demonstrate their mastery of the learning objectives and their ability to devise, organize and present complete solutions to problems.

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 James Stewart. Calculus, 9 ed. Cengage, 2020 2. Required Strang, Gilbert Herman, Edwin. Calculus Volume 1, ed. OpenStax (OER) (latest), 2016 Rationale: Text published March 30th, 2016 with most recent web version update January 7th, 2021 and pdf version update June 25th, 2020.