

Mathematics

Course: Calculus

12th Grade

MATH 602 Calculus

1/2 credit
5 days per week (2nd Semester)
Taught in English

This is a required class for 12th grade students in the Mexican and/or U.S. diploma program. This is a first course in the calculus of functions of one independent variable. The content of this introductory course includes a review of algebra, limits and continuity of functions. Students will be introduced to the concept of the rate of change of a function through both differential and integral calculus, problem solving and applications.

Textbook: Larson, Ron and Edwards, Bruce H. Brief Calculus: An Applied Approach. Houghton/Mifflin Company. Boston, MA. (2003 Edition)

Prerequisite: MATH 601

Benchmark Code – Subject: Calculus = C

- Strand 1 = Fundamental Skills and Concepts Review
- Strand 2 = Differentiation
- Strand 3 = Graphing Functions using Derivatives
- Strand 4 = Derivatives of Exponential and Logarithmic Functions
- Strand 5 = Integration

Code: Subject.Grade.Strand#.Standard#.Benchmark#.

Example: C.12.1.4.3 – Calculus, Twelfth Grade, Strand 1, Standard 4, Benchmark 3

Strand 1: Fundamental Skills and Concepts Review

Standard 1: The student simplifies and solves equations with different algebraic techniques.

Benchmark Code	Benchmark
C.12.1.1.1	The student will simplify expressions using exponent and radical laws and properties.
C.12.1.1.2	The student will simplify expressions with radicals using rationalization and conjugates.
C.12.1.1.3	The student will write the equation of a line in y-intercept form and slope-intercept form.
C.12.1.1.4	The student will find domain and range from the equation and the graph.
C.12.1.1.5	The student will multiply of polynomials. (special product formulas)
C.12.1.1.6	The student will divide polynomials. (long and synthetic division)
C.12.1.1.7	The student will factor expressions completely. (greatest common factor, difference of squares, perfect square trinomial, sum and difference of cubes, trinomials with leading coefficient of 1, trinomials with leading coefficient different that 1, grouping, rational zero theorem).
C.12.1.1.8	The student will add, subtract, multiply and divide rational expressions of two or more terms.

C.12.1.1.9	The student will simplify rational expressions and compound fractions, of two or more terms, using factorization.
C.12.1.1.10	The student will solve rational equations of two or more terms.
Standard 2: The student defines and finds limits of functions.	
Benchmark Code	Benchmark
C.12.1.2.1	The student will define limits.
C.12.1.2.2	The student will find limits of functions graphically and numerically.
C.12.1.2.3	The student will use the properties of limits to evaluate limits of functions.
C.12.1.2.4	The student will use different analytical techniques to evaluate limits of functions.
C.12.1.2.5	The student will evaluate one-sided limits.
C.12.1.2.6	The student will recognize unbounded behavior of functions.
C.12.1.2.7	The student will evaluate limits to infinity and infinity limits.
Standard 3: The student will find discontinuities of a function.	
Benchmark Code	Benchmark
C.12.1.3.1	The student will define the continuity of a function.
C.12.1.3.2	The student will find determine the types of discontinuity of functions, as removable and non-removable discontinuity.
C.12.1.3.3	The student will determine the continuity intervals of a function.
Strand 2: Differentiation	
Standard 1: The student will find the derivative and the slope of a graph	
Benchmark Code	Benchmark
C.12.2.1.1	The student will identify tangent lines to a graph at a point.
C.12.2.1.2	The student will find approximated the slopes of tangent lines to graphs at points.
C.12.2.1.3	The student will define and use the limit definition to find the slopes of } graphs at points.
C.12.2.1.4	The student will use the limit definition to find the derivatives of functions.
C.12.2.1.5	The student will describe the relationship between differentiability and continuity.
Standard 2: Rules of Differentiation	
Benchmark Code	Benchmark
C.12.2.2.1	The student will find the derivative of a function using the Constant Rule.
C.12.2.2.2	The student will find the derivative of a function using the Power Rule.
C.12.2.2.3	The student will find the derivative of a function using the Constant Multiple Rule.
C.12.2.2.4	The student will find the derivative of a function using the Sum and Difference Rules.
Standard 3: Rates of Change: Velocity and Marginals	
Benchmark Code	Benchmark
C.12.2.3.1	The student will find the average rates of change of functions over intervals.

C.12.2.3.2	The student will find the instantaneous rates of change of functions at points.
C.12.2.3.3	The student will find the marginal revenue, marginal cost, and the marginal profit for products.
Standard 4: The Product and Quotient Rules	
Benchmark Code	Benchmark
C.12.2.4.1	The student will find the derivative of a function using the Product Rule.
C.12.2.4.2	The student will find the derivative of a function using the Quotient Rule.
Standard 5: The Chain Rule	
Benchmark Code	Benchmark
C.12.2.5.1	The student will find the derivative of a function using the Chain Rule.
Standard 6: Higher-Order Derivatives	
Benchmark Code	Benchmark
C.12.2.6.1	The student will find higher-order derivatives.
C.12.2.6.2	The student will evaluate higher-order derivatives.
C.12.2.6.3	The student will find and use the position functions to determine the velocity and acceleration of moving objects.
Standard 7: Implicit Differentiation	
Benchmark Code	Benchmark
C.12.2.7.1	The student will find derivatives implicitly.
Strand 3: Graphing Functions using Derivatives	
Standard 1: Increasing and Decreasing Functions	
Benchmark Code	Benchmark
C.12.3.1.1	The student will find the critical numbers of functions using derivatives.
C.12.3.1.2	The student will use the first derivative test to test and find increasing and decreasing intervals of function.
C.12.3.1.3	The student will find local extrema.
Standard 2: Concavity and the Second-Derivative Test	
Benchmark Code	Benchmark
C.12.3.2.1	The student will find the points of inflection of the graphs of functions using the second derivative.
C.12.3.2.2	The student will determine the intervals on which the graphs of functions are concave upward or concave downward.
C.12.3.2.3	The student will use the Second-Derivative Test to find the relative extrema of functions.
Standard 3 : Graphing Functions	
Benchmark Code	Benchmark
C.12.3.3.1	The student will use first and second derivatives to find critical and inflection point to graph the function.
Strand 4: Derivatives of Exponential and Logarithmic Functions	
Standard 1: Derivatives of Exponential and Logarithmic Functions	
Benchmark Code	Benchmark
C.12.4.1.1	The student will find the derivative of exponential functions.

C.12.4.1.2	The student will find derivatives of natural exponential functions.
C.12.4.1.3	The student will find the derivative of logarithmic functions.
C.12.4.1.4	The student will find derivatives of natural logarithmic functions.
Strand 5: Integration	
Standard 1: Anti-derivatives and Indefinite Integral.	
Benchmark Code	Benchmark
C.12.5.1.1	The student will define integrals (anti-derivatives).
C.12.5.1.2	The student will use basic integration rule to find integrals.
C.12.5.1.3	The student will use indefinite integration notation for integrals.
C.12.5.1.4	The student will use initial conditions to find particular solutions of indefinite integrals.
Standard 2: The General Power Rule.	
Benchmark Code	Benchmark
C.12.5.2.1	The student will use the general power rule to find indefinite integrals.
C.12.5.2.2	The student will use substitution method to find indefinite integrals.
Standard 3: Exponential and Logarithmic Integrals.	
Benchmark Code	Benchmark
C.12.5.3.1	The student will use the exponential rule to find indefinite integrals.
C.12.5.3.2	The student will use the log rule to find indefinite integrals.
Standard 4: Area and the Fundamental Theorem of Calculus.	
Benchmark Code	Benchmark
C.12.5.4.1	The student will evaluate definite integrals.
C.12.5.4.2	The student will evaluate definite integrals using the fundamental theorem of calculus.
C.12.5.4.3	The student will find the average value of a function.
Standard 5: The Area of a Region Bounded by Two Graphs.	
Benchmark Code	Benchmark
C.12.5.5.1	The student will use definite integrals to find the area under the curve.
C.12.5.5.2	The student will find the area of regions bounded by two graphs.
C.12.5.5.3	The student will use the area of regions bounded by two graphs to solve real/life problems.
Standard 6: Volumes of Solids of Revolution	
Benchmark Code	Benchmark
C.12.5.6.1	The student will use the disc method to find volumes of solids of revolution.
C.12.5.6.2	The student will use the washers method to find volumes of solids of revolution.
C.12.5.6.3	The student will use solids of revolution to solve real life problems.