Calculus 12

Outcomes

NOVA SCOTIA
NOUVELLE-ÉCOSSE

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Calculus Guide 12

Prepared by the Department of Education and Early Childhood Development

This is the most recent version of the current curriculum materials as used by teachers in Nova Scotia.

Calculus 12

General Curriculum Outcomes

A. Students will demonstrate number sense and apply number-theory concepts.
B. Students will demonstrate operation sense and apply operation principles and procedures in both numeric and algebraic situations.
C. Students will explore, recognize, represent, and apply patterns and relationships, both informally and formally.
D. Students will demonstrate an understanding of and apply concepts and skills associated with measurement.
E. Students will demonstrate spatial sense and apply geometric concepts, properties, and relationships.
F. Students will solve problems involving the collection, display, and analysis of data.
G. Students will represent and solve problems involving uncertainty.

Specific Curriculum Outcomes

Students will be expected to

Limits and Continuity

A1 apply, understand, and explain average and instantaneous rates of change and extend these concepts to secant line and tangent line slopes

B1 calculate and interpret average and instantaneous rate of change
B2 calculate limits for function values and apply the properties with and without technology
B3 remove removable discontinuities by extending or modifying a function
B4 apply the properties of algebraic combinations and composites of continuous functions

C1 identify the intervals upon with a given function is continuous and understand the meaning of a continuous function
C2 understand the development of the slope of a tangent line from the slope of a secant line
C3 find the equations of the tangent and normal lines at a given point

Derivatives

A2 demonstrate an understanding of the definition of the derivative
A3 demonstrate an understanding of implicit differentiation and identify situations that require implicit differentiation

B5 find where a function is not differentiable and distinguish between corners, cusps, discontinuities, and vertical tangents
B6 derive, apply, and explain power, sum, difference, product and quotient rules
B7 apply the chain rule to composite functions
B8 use derivatives to analyze and solve problems involving rates of change
B9 apply the rules for differentiating the six trigonometric functions

B10 (optional) apply the rules for differentiating the six inverse trigonometric functions
B11 calculate and apply derivatives of exponential and logarithmic functions
B12 (optional) apply Newton's method to approximate zeros of a function
B13 estimate the change in a function using differentials and apply them to real world situations
B14 solve and interpret related rate problems
C4 Demonstrate an understanding of the connection between the graphs of f, and f '

More Applications of Derivatives

B15 demonstrate an understanding of critical points and absolute extreme values of a function B16 find the intervals on which a function is increasing or decreasing
B17 solve application problems involving maximum or minimum values of a function

C5 apply the First and Second Derivative Tests to determine the local extreme values of a function
C6 determine the concavity of a function and locate the points of inflection by analyzing the second derivative
B18 apply rules for definite integrals
B19 apply the Fundamental Theorem of Calculus
B20 compute indefinite and definite integrals by the method of substitution
B21 (optional) apply integration by parts to evaluate indefinite and definite integrals
B22 solve problems in which a rate is integrated to find the net change over time
C7 Solve initial value problems of the form dy/dx = f(x), y0 = f(x0)
C8 understand the relationship between the derivative and the definite integral as expressed in both parts of the Fundamental Theorem of Calculus
C9 construct antiderivatives using the Fundamental Theorem of Calculus
C10 find antiderivatives of polynomials, e^{kx}, and selected trigonometric functions of kx

D1 apply and understand how Riemann's sum can be used to determine the area under a polynomial curve
D2 demonstrate an understanding of the meaning of area under the curve
D3 express the area under the curve as a definite integral
D4 compute the area under the curve using numerical integration procedures
D5 apply integration to calculate areas of regions in a plane

B23 (optional) solve a differential equation of the form $dy/dx = g(x)h(y)$, in which the variables are separable
B24 (optional) solve problems involving exponential growth and decay
B25 (optional) apply Euler's method to find approximate solutions to differential equations with initial values

C11 (optional) construct slope fields using technology and interpret them as visualizations of differential equations

D6 (optional) apply integration (by slices or shells) to calculate volumes of solids

The Definite Integral and its Applications

B18 apply rules for definite integrals
B19 apply the Fundamental Theorem of Calculus
B20 compute indefinite and definite integrals by the method of substitution
B21 (optional) apply integration by parts to evaluate indefinite and definite integrals
B22 solve problems in which a rate is integrated to find the net change over time

C8 understand the relationship between the derivative and the definite integral as expressed in both parts of the Fundamental Theorem of Calculus
C9 construct antiderivatives using the Fundamental Theorem of Calculus
C10 find antiderivatives of polynomials, e^{kx}, and selected trigonometric functions of kx

D1 apply and understand how Riemann's sum can be used to determine the area under a polynomial curve
D2 demonstrate an understanding of the meaning of area under the curve
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D6 (optional) apply integration (by slices or shells) to calculate volumes of solids

Techniques of Integration (optional)

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B25 (optional) apply Euler's method to find approximate solutions to differential equations with initial values

C11 (optional) construct slope fields using technology and interpret them as visualizations of differential equations

D6 (optional) apply integration (by slices or shells) to calculate volumes of solids