

Perry Local School Guaranteed and Viable Curriculum

AP Calculus AB

Power Objectives

Data Analysis and Probability

MAAPCALAB.OT
H.1

Integrate a function by applying the process of integration-by-parts.

MAAPCALAB.OT
H.1.a

Demonstrate the first step of the process by identifying which part of the function is the u and which part is the dv .

MAAPCALAB.OT
H.1.b

Demonstrate the second step of the process by calculating the du and the v .

MAAPCALAB.OT
H.1.c

Demonstrate the complete process of integration-by-parts for a given function.

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Power Objectives

Geometry and Spatial Sense

MAAPCALAB.3.1 Perform a numerical evaluation of an integral.

MAAPCALAB.3.1
.a *Approximate the area under a curve by using rectangles whose heights are based on a right-corner, left-corner, or midpoint evaluation.*

MAAPCALAB.3.1
.b *Approximate the area under a curve by applying the Trapezoidal Rule.*

MAAPCALAB.3.1
.c *Approximate the area under a curve by applying the Simpson's Rule.*

MAAPCALAB.3.1
.d *Identify weaknesses with the process of numerical evaluation of integrals and possible solutions.*

MAAPCALAB.3.2 Apply the Fundamental Theorem of Calculus to problems depicting area under a curve.

MAAPCALAB.3.2
.a *State the Fundamental Theorem of Calculus.*

MAAPCALAB.3.2
.b *Compare and contrast net area under a curve and true area under a curve.*

MAAPCALAB.3.2
.c *Identify differentiation and integration as inverse operations.*

MAAPCALAB.3.2
.d *Demonstrate the application of the Fundamental Theorem of Calculus to a given function using correct notation.*

MAAPCALAB.3.2
.e *Describe the area under a curve as representative of an Accumulation Function, not just a numerical value.*

MAAPCALAB.3.2
.f *Verify the hypothesis for the Mean-Value Theorem is satisfied.*

MAAPCALAB.3.2
.g *Calculate the average value of a function over a closed interval.*

MAAPCALAB.3.2
.h *Sketch the rectangle associated with the average value of the function whose area is equal to the area under*

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Geometry and Spatial Sense

the curve over the closed interval.

MAAPCALAB.3.3 Calculate the area between two curves on a coordinate plane.

MAAPCALAB.3.3 *Graph the curves and identify intersection points.*

.a

MAAPCALAB.3.3 *Produce an appropriate definite integral that represents the area between the two curves.*

.b

MAAPCALAB.3.3 *Evaluate the integral by applying the Fundamental Theorem of Calculus and by using a graphics calculator/computer program.*

.c

MAAPCALAB.3.4 Calculate the volume of a solid of revolution.

MAAPCALAB.3.4 *Make a sketch of the basic area to be revolved and identify the axis of revolution.*

.a

MAAPCALAB.3.4 *Represent the solid of revolution, identify it as a disk or a washer problem, and state the independent variable of the problem.*

.b

MAAPCALAB.3.4 *Produce an appropriate definite integral that represents the volume.*

.c

MAAPCALAB.3.4 *Evaluate the integral by applying the Fundamental Theorem of Calculus or by graphics calculator/computer program.*

.d

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Patterns, Functions and Algebra

MAAPCALAB.4.1

Calculate the rate of change of a function.

MAAPCALAB.4.1

Calculate the average rate of change of a function over an interval.

.a

MAAPCALAB.4.1

Calculate the instantaneous rate of change of a function at a given point.

.b

MAAPCALAB.4.1

Verify the hypothesis of the Mean-Value Theorem is satisfied.

.c

MAAPCALAB.4.1

Calculate the slope of a secant line over an interval and find where there is a tangent line with the same slope on that interval.

.d

MAAPCALAB.4.1

Apply the Mean Value Theorem for Derivatives to real-world problems.

.e

MAAPCALAB.4.2

Calculate the limit of a function at a specific point.

MAAPCALAB.4.2

Calculate the limit of a trig function.

.a

MAAPCALAB.4.2

Calculate the limit of a piece-wise function.

.b

MAAPCALAB.4.2

Calculate the limits of polynomial, rational, or root functions.

.c

MAAPCALAB.4.2

Apply L'Hopital's Rule if an indeterminate form develops.

.d

MAAPCALAB.4.3

Calculate the limit of a function at infinity.

MAAPCALAB.4.3

Describe the limit at infinity as the end-behavior or the function.

.a

MAAPCALAB.4.3

Calculate the limit of a piece-wise function.

.b

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Patterns, Functions and Algebra

MAAPCALAB.4.3
.c

Calculate the limits of polynomial, rational, or root functions.

MAAPCALAB.4.3
.d

Apply L'Hopital's Rule if an indeterminate form develops.

MAAPCALAB.4.4

Verify continuity or discontinuity of a function.

MAAPCALAB.4.4
.a

Verify continuity or discontinuity of a function by applying continuity theorems.

MAAPCALAB.4.4
.b

Verify continuity or discontinuity of a function from its graph.

MAAPCALAB.4.4
.c

Verify the hypothesis of the Intermediate-Value Theorem is satisfied.

MAAPCALAB.4.4
.d

Calculate the value of a missing constant in a piece-wise function which will guarantee the Intermediate-Value Theorem applies.

MAAPCALAB.4.4
.e

Apply the Intermediate-Value Theorem to verify a function has a root between two specific x values.

MAAPCALAB.4.5

Produce the derivative of a function by applying the Product or Quotient Rule.

MAAPCALAB.4.5
.a

Use the definition of the derivative of a function f at a number a .

MAAPCALAB.4.5
.b

Produce the derivatives of constant functions, power functions, polynomials, and exponential functions.

MAAPCALAB.4.5
.c

Produce the derivatives of functions formed from combinations of polynomial functions, exponential functions, logarithmic functions, trigonometric functions, and inverse trigonometric functions.

MAAPCALAB.4.5
.d

Calculate the value of a derivative of a function at a given point by substitution or graphics calculator.

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Patterns, Functions and Algebra

MAAPCALAB.4.6

Produce the derivative of a composite function by applying the Chain Rule.

MAAPCALAB.4.6
.a

Apply the power, constant, product, and quotient rules for differentiation.

MAAPCALAB.4.6
.b

Produce the derivatives of functions formed from combinations of polynomial functions, exponential functions, logarithmic functions, trigonometric functions, and inverse trigonometric functions.

MAAPCALAB.4.6
.c

Calculate the value of a derivative of a function at a given point by substitution or graphics calculator.

MAAPCALAB.4.7

Use maximization and minimization processes to solve word problems in a real-world context.

MAAPCALAB.4.7
.a

Verify the hypothesis of the Extreme Value Theorem is satisfied.

MAAPCALAB.4.7
.b

The student will calculate the first and second derivative of the function.

MAAPCALAB.4.7
.c

The student will use the second derivative to identify concavity and find inflection points.

MAAPCALAB.4.7
.d

The student will apply the Extreme Value Theorem to identify a maximum or minimum value.

MAAPCALAB.4.7
.e

The student will use the First Derivative Test and Second Derivative Test to verify a maximum or minimum.

MAAPCALAB.4.8

Solve related rate problems.

MAAPCALAB.4.8
.a

Produce a diagram with labels or a chart stating the known and unknown quantities.

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MAAPCALAB.4.8
.b

Create an equation that represents the physical data of the problem.

MAAPCALAB.4.8
.c

Solve an appropriate equation through implicit differentiation.

MAAPCALAB.4.8
.d

Substitute known quantities into the differential equation and solve for the unknown.

MAAPCALAB.4.8
.e

Answer the question posed by the problem in a sentence format with appropriate labels.

MAAPCALAB.4.9

Evaluate indefinite and indefinite integrals.

MAAPCALAB.4.9
.a

Demonstrate his knowledge that no product or quotient rule exists for integration by first simplifying functions.

MAAPCALAB.4.9
.b

Check for the correct du before beginning the process and make adjustments as needed.

MAAPCALAB.4.9
.c

Integrate functions formed from combinations of polynomial functions, exponential functions, logarithmic functions, trigonometric functions, and algebraic functions that yield inverse trigonometric functions.

MAAPCALAB.4.9
.d

Demonstrate the answer to an indefinite integral represents a family of functions by including a $+C$ with the final answer unless initial conditions are provided.

MAAPCALAB.4.9
.e

Evaluate functions expressed as definite integrals by applying the Fundamental Theorem of Calculus or by using a graphics calculator/computer program.

MAAPCALAB.4.1
0

Solve variable/separable differential equations.

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Patterns, Functions and Algebra

MAAPCALAB.4.1
0.a

Identify which functions qualify as differential equations.

MAAPCALAB.4.1
0.b

Use the correct nomenclature when preparing the equation for differentiation.

MAAPCALAB.4.1
0.c

Use initial conditions and other data, when available, to eliminate constants of integration.

MAAPCALAB.4.1
0.d

Solve real-world problems by solving differential equations.

MAAPCALAB.4.1
1

Solve position, velocity, and acceleration problems.

MAAPCALAB.4.1
1.a

Use derivatives and integrals to produce position, velocity, and acceleration functions for a particle.

MAAPCALAB.4.1
1.b

Calculate times when the particle is at rest, moving left, moving right, speeding up, slowing down, or cruising.

MAAPCALAB.4.1
1.c

Create a coordinative line and show the movement of the particle.

MAAPCALAB.4.1
1.d

Identify the area under the velocity curve for an interval as representing total distance traveled.

MAAPCALAB.4.1
1.e

Identify the slope of a tangent line to the position curve as representing instantaneous velocity and slope of a secant line as representing average velocity.