

Wallenpaupack Area School District

COURSE: Advanced Placement Calculus AB

GRADE LEVEL: 12

LENGTH OF COURSE: 90 days semester one and 45 days semester two

TEXT: Calculus of a Single Variable

PUBLISHER: Houghton Mifflin Company

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COURSE DESCRIPTION:

This is a rigorous course which parallels a college level calculus course. The course is designed to provide students with a strong foundation in the concepts of calculus and to prepare them for the AP Calculus AB exam. The course covers all of the topics listed in the Calculus AB topic outline and some additional topics. Technology is used throughout the course to help solve problems, experiment, interpret results, and verify conclusions.

CURRICULUM WRITING TEAM:

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DATE OF REVISION:

2007

Wallenpaupack Area School District

Course: AP Calculus AB

Grade Level: 12

Unit: Preparation for Calculus

PA Standards: 2.1.11.A
2.2.11.A
2.2.11.C
2.2.11.F
2.5.11.A
2.5.11.B
2.5.11.C
2.5.11.D
2.6.11.C
2.8.11.D
2.8.11.E
2.8.11.J
2.8.11.K
2.8.11.L
2.8.11.M
2.8.11.N
2.8.11.O
2.8.11.Q
2.8.11.R
2.8.11.S
2.8.11.T
2.9.11.J

Topics:	Skills:
<ul style="list-style-type: none">-Graphs and Models-Linear Models and Rates of Change-Functions and Their Graphs	<ul style="list-style-type: none">-Sketch the graph of an equation-Find the intercepts of a graph-Test a graph for symmetry-Find the points of intersection of two graphs-Interpret mathematical models for real-life data-Find the slope of a line passing through two points-Write the equation of a line with a given point and slope-Interpret slope as a ratio or as a rate in a real-life application-Sketch the graph of a linear equation in slope-intercept form-Write equations of lines that are parallel or perpendicular to a given line-Use function notation to represent and evaluate a function-Find the domain and range of a function

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	Skills: (continued) <ul style="list-style-type: none">-Sketch the graph of a function-Identify different types of transformations of functions-Classify functions and recognize combinations of functions
Activities: <ul style="list-style-type: none">Textbook problem solvingIndividual, partner, & small group workBoard workUtilizing the scientific and graphing calculators	Performance Assessments: <ul style="list-style-type: none">Teacher produced tests and quizzesClass assignmentsHomeworkClass participationBoard workTeacher observation

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Course: AP Calculus AB

Grade Level: 12

Unit: Limits and Their Properties

PA Standards: 2.1.11.A
 2.2.11.A
 2.2.11.B
 2.2.11.D
 2.2.11.E
 2.2.11.F
 2.4.11.A
 2.5.11.A
 2.5.11.B
 2.5.11.C
 2.5.11.D
 2.8.11.A
 2.8.11.C
 2.8.11.E
 2.8.11.J
 2.8.11.O
 2.8.11.Q
 2.8.11.R
 2.8.11.S
 2.8.11.T
 2.10.11.A

Topics:	Skills:
<ul style="list-style-type: none"> -A Preview of Calculus -Finding Limits Graphically and Numerically -Evaluating Limits Analytically -Continuity and One-Sided Limits -Infinite Limits 	<ul style="list-style-type: none"> -Understand what calculus is and how it compares with precalculus -Understand that the tangent line problem is basic to calculus -Understand that the area problem is also basic to calculus -Estimate a limit using a numerical or graphical approach -Learn different ways that a limit can fail to exist -Study and use a formal definition of limit -Evaluate a limit using properties of limits -Develop and use a strategy for finding limits -Evaluate a limit using dividing out and rationalizing techniques -Evaluate a limit using the Squeeze Theorem -Determine continuity at a point and continuity on an open interval

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	Skills: (continued) <ul style="list-style-type: none">-Determine one-sided limits and continuity on a closed interval-Use properties of continuity-Understand and use the Intermediate Value Theorem-Determine limits from the left and from the right-Find and sketch the vertical asymptotes of the graph of a function
Activities: <ul style="list-style-type: none">Textbook problem solvingIndividual, partner, & small group workBoard workUtilizing the scientific and graphing calculators	Performance Assessments: <ul style="list-style-type: none">Teacher produced tests and quizzesClass assignmentsHomeworkClass participationBoard workTeacher observation

Wallenpaupack Area School District

Course: AP Calculus AB

Grade Level: 12

Unit: Differentiation

PA Standards: 2.1.11.A
 2.2.11.A
 2.2.11.F
 2.4.11.A
 2.5.11.A
 2.5.11.B
 2.5.11.C
 2.5.11.D
 2.6.11.C
 2.8.11.A
 2.8.11.E
 2.8.11.J
 2.8.11.K
 2.8.11.L
 2.8.11.M
 2.8.11.N
 2.8.11.O
 2.8.11.Q
 2.8.11.R
 2.8.11.S
 2.9.11.G
 2.9.11.I
 2.10.11.A
 2.10.11.B

Topics:	Skills:
<ul style="list-style-type: none"> -The Derivative and the Tangent Line Problem -Basic Differentiation Rules and Rates of Change -Product and Quotient Rules and Higher-Order Derivatives -The Chain Rule -Implicit Differentiation -Related Rates 	<ul style="list-style-type: none"> -Find the slope of the tangent line to a curve at a point -Use the limit definition to find the derivative of a function -Understand the relationship between differentiability and continuity -Use the position function to find velocity -Find the derivative of a function using the Constant Rule -Find the derivative of a function using the Power Rule -Find the derivative of a function using the Constant Multiple Rule -Find the derivative of a function using the Sum and Difference Rules -Find the derivatives of the sine function and of the cosine function

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	<p>Skills: (continued)</p> <ul style="list-style-type: none"> -Use derivatives to find rates of change -Find the derivative of a function using the Product Rule -Find the derivative of a function using the Quotient Rule -Find the derivative of a trigonometric function -Find the derivative of a composite function using the Chain Rule --Find the derivative of a function using the General Power Rule -Simplify the derivative of a function using algebra -Find the derivative of a trigonometric function using the Chain Rule -Distinguish between functions written in implicit form and explicit form -Use implicit differentiation to find the derivative of a function -Find a related rate -Use related rates to solve real-life problems
<p>Activities:</p>	<p>Performance Assessments:</p>
<ul style="list-style-type: none"> Textbook problem solving Individual, partner, & small group work Board work Utilizing the scientific and graphing calculators 	<ul style="list-style-type: none"> Teacher produced tests and quizzes Class assignments Homework Class participation Board work Teacher observation

Wallenpaupack Area School District

Course: AP Calculus AB

Grade Level: 12

Unit: Applications of Differentiation

PA Standards: 2.1.11.A
 2.2.11.A
 2.2.11.B
 2.2.11.C
 2.2.11.D
 2.2.11.E
 2.2.11.F
 2.4.11.A
 2.4.11.B
 2.5.11.A
 2.5.11.B
 2.5.11.C
 2.5.11.D
 2.8.11.E
 2.8.11.J
 2.8.11.K
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 2.8.11.N
 2.8.11.O
 2.8.11.Q
 2.8.11.R
 2.8.11.S
 2.8.11.T
 2.9.11.G
 2.10.11.A
 2.11.11.A
 2.11.11.B

Topics:	Skills:
<ul style="list-style-type: none"> -Extrema on the Interval -Rolle's Theorem and the Mean Value Theorem -Increasing and Decreasing Functions and the First Derivative Test -Concavity and the Second Derivative Test -Limits at Infinity -A Summary of Curve Sketching -Optimization Problems -Differentials 	<ul style="list-style-type: none"> -Understand the definition of extrema of a function on an interval -Understand the definition of relative extrema of a function on an open interval -Find extrema on a closed interval -Understand and use Rolle's Theorem -Understand and use the Mean Value Theorem -Determine intervals on which a function is increasing or decreasing -Apply the First Derivative Test to find relative extrema of a function -Determine intervals on which a function is concave upward or concave downward

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	<p>Skills: (continued)</p> <ul style="list-style-type: none"> -Find any points of inflection of the graph of a function -Apply the Second Derivative Test to find relative extrema of a function -Determine limits at infinity both finite and infinite -Determine the horizontal asymptotes, if any, of the graph of a function -Analyze and sketch the graph of a function -Solve applied minimum and maximum problems -Understand the concept of a tangent line approximation -Compare the value of the differential, dy, with the actual change in y, Δy -Estimate a propagated error using a differential -Find the differential of a function using differentiation formulas
<p>Activities:</p>	<p>Performance Assessments:</p>
<ul style="list-style-type: none"> Textbook problem solving Individual, partner, & small group work Board work Utilizing the scientific and graphing calculators 	<ul style="list-style-type: none"> Teacher produced tests and quizzes Class assignments Homework Class participation Board work Teacher observation

Wallenpaupack Area School District

Course: AP Calculus AB

Grade Level: 12

Unit: Integration

PA Standards: 2.1.11.A
 2.2.11.A
 2.2.11.B
 2.2.11.C
 2.2.11.D
 2.2.11.E
 2.2.11.F
 2.4.11.A
 2.4.11.B
 2.5.11.A
 2.5.11.B
 2.5.11.C
 2.5.11.D
 2.8.11.O
 2.8.11.Q
 2.8.11.R
 2.8.11.S
 2.8.11.T
 2.9.11.E
 2.9.11.I
 2.11.11.D
 2.11.11.E

Topics:	Skills:
<ul style="list-style-type: none"> -Antiderivatives and Indefinite Integral -Area -Riemann Sums and Definite Integrals -The Fundamental Theorem of Calculus -Integration by Substitution -Numerical Integration 	<ul style="list-style-type: none"> -Write the general solution of a differential equation -Use indefinite integral notation for antiderivatives -Use basic integration rules to find antiderivatives -Find a particular solution of a differential equation -Use sigma notation to write and evaluate a sum -Understand the concept of area -Approximate the area of a plane region -Find the area of a plane region using limits -Understand the definition of a Riemann sum -Evaluate a definite integral using properties of definite integrals -Evaluate a definite integral using the Fundamental Theorem of Calculus -Understand and use the Mean Value Theorem for Integrals

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	<p>Skills: (continued)</p> <ul style="list-style-type: none"> -Find the average value of a function over a closed interval -Understand and use the Second Fundamental Theorem of Calculus -Use pattern recognition to find an indefinite integral -Use a change of variables to find an indefinite integral -Use the General Power Rule for Integration to find an indefinite integral Use a change of variables to evaluate a definite integral -Evaluate a definite integral involving an even or odd function
<p>Activities:</p>	<p>Performance Assessments:</p>
<ul style="list-style-type: none"> Textbook problem solving Individual, partner, & small group work Board work Utilizing the scientific and graphing calculators 	<ul style="list-style-type: none"> Teacher produced tests and quizzes Class assignments Homework Class participation Board work Teacher observation

Wallenpaupack Area School District

Course: AP Calculus AB

Grade Level: 12

Unit: Logarithmic, Exponential, and
Other Transcendental Functions

PA Standards: 2.1.11.A
2.2.11.A
2.2.11.B
2.2.11.F
2.3.11.A
2.3.11.C
2.4.11.B
2.4.11.E
2.5.11.A
2.5.11.B
2.5.11.C
2.5.11.D
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2.8.11.C
2.8.11.D
2.8.11.E
2.8.11.N
2.8.11.O
2.8.11.Q
2.8.11.R
2.8.11.S
2.8.11.T
2.10.11.A
2.11.11.C
2.11.11.E

Topics:	Skills:
<ul style="list-style-type: none"> -The Natural Logarithmic Function: Differentiation -The Natural Logarithmic Function: Integration -Inverse Function -Exponential Functions: Differentiation and Integration -Bases Other than e and Applications -Inverse Trigonometric Functions: Differentiation -Inverse Trigonometric Functions: Integration 	<ul style="list-style-type: none"> -Develop and use properties of the natural logarithmic function -Understand the definition of the number e -Find the derivatives of functions involving the natural logarithmic function -Use the Log Rule for Integration to integrate a rational function -Integrate trigonometric functions -Verify that one function is the inverse function of another function -Determine whether a function has an inverse -Find the derivative of an inverse function -Develop properties of the natural exponential function -Differentiate natural exponential functions -Integrate natural exponential functions

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	<p>Skills: (continued)</p> <ul style="list-style-type: none"> -Define exponential functions that have bases other than e -Differentiate and integrate exponential functions that have bases other than e -Use exponential functions model compound interest and exponential growth -Integrate functions whose antiderivatives involve inverse trigonometric functions -Use the method of completing the square to integrate a function -Review the basic integration rules involving elementary functions
<p>Activities:</p>	<p>Performance Assessments:</p>
<ul style="list-style-type: none"> Textbook problem solving Individual, partner, & small group work Board work Utilizing the scientific and graphing calculators 	<ul style="list-style-type: none"> Teacher produced tests and quizzes Class assignments Homework Class participation Board work Teacher observation

Wallenpaupack Area School District

Course: AP Calculus AB

Grade Level: 12

Unit: Differential Equations

PA Standards: 2.1.11.A
 2.2.11.A
 2.2.11.C
 2.2.11.D
 2.2.11.E
 2.2.11.F
 2.4.11.A
 2.4.11.B
 2.5.11.A
 2.5.11.B
 2.5.11.C
 2.5.11.D
 2.8.11.A
 2.8.11.B
 2.8.11.C
 2.8.11.E
 2.8.11.J
 2.8.11.N
 2.8.11.O
 2.8.11.Q
 2.8.11.R
 2.8.11.S
 2.8.11.T
 2.11.11.C

Topics:	Skills:
<ul style="list-style-type: none"> -Slope Fields and Euler's Method -Differential Equations: Growth and Decay -Separation of Variables and the Logistic Equation -First-Order Linear Differential Equations 	<ul style="list-style-type: none"> -Use initial conditions to find particular solutions of differential equations -Use slope fields to approximate solutions of differential equations -Use separation of variables to solve a simple differential equation -Use exponential functions to model growth and decay in applied problems -Recognize and solve differential equations that can be solved by separation of variables -Recognize and solve homogeneous differential equations -Use differential equations to model and solve applied problem -Solve and analyze logistic differential equations

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	Skills: (continued) -Solve a first order-linear differential equation -Solve a Bernoulli differential equation -Use linear differential equations to solve applied problems
Activities: Textbook problem solving Individual, partner, & small group work Board work Utilizing the scientific and graphing calculators	Performance Assessments: Teacher produced tests and quizzes Class assignments Homework Class participation Board work Teacher observation

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Course: AP Calculus AB

Grade Level: 12

Unit: Applications of Integration

PA Standards: 2.1.11.A
 2.2.11.A
 2.2.11.F
 2.3.11.A
 2.4.11.B
 2.5.11.A
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 2.5.11.C
 2.5.11.D
 2.8.11.C
 2.8.11.E
 2.8.11.G
 2.8.11.H
 2.8.11.J
 2.8.11.N
 2.8.11.O
 2.8.11.Q
 2.8.11.R
 2.8.11.S
 2.8.11.T
 2.9.11.G
 2.9.11.H
 2.9.11.I
 2.9.11.J
 2.10.11.A
 2.11.11.E

Topics:	Skills:
<ul style="list-style-type: none"> -Area of a Region Between Two Curves -Volume: The Disk Method -Volume: The Shell Method -Arc Length and Surfaces of Revolution 	<ul style="list-style-type: none"> -Find the area of a region between two curves using integration -Find the area of a region between intersecting curves using integration -Describe integration as an accumulation process -Find the volume of a solid of revolution using the disk method -Find the volume of a solid of revolution using the washer method -Find the volume of a solid with known cross sections -Find the volume of a solid revolution using the shell method

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	Skills: (continued) -Compare the uses of the disk method and the shell method -Find the arc length of a smooth curve -Find the area of a surface of revolution
Activities: Textbook problem solving Individual, partner, & small group work Board work Utilizing the scientific and graphing calculators	Performance Assessments: Teacher produced tests and quizzes Class assignments Homework Class participation Board work Teacher observation