COURSE: AP CALCULUS

GRADE LEVEL: Grade 12

LENGTH OF COURSE: Both Semester I and II

Semester I – 90 Days/84 Minutes Per Day

Semester II – 45 Days/84 Minutes Per Day

TEXT: Calculus and Analytic Geometry, 7th Edition, Part 1

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COURSE DESCRIPTION:

Advanced Placement Calculus is a rigorous course which parallels a college level calculus course. The student who enrolls is expected to prepare seriously to take an Advanced Placement examination in Calculus. Each student must assume responsibility for payment of the AP exam and be responsible for meeting the deadline.

CURRICULUM WRITING TEAM:

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DATE OF REVISION:

2002

Wallenpaupack Area School District

Course: AP Calculus

Unit: Rate of Change of a Function

Grade Level: Grade 12

PA Standards:

2.1.11.A	2.8.11.K
2.2.11.C	2.8.11.L
2.2.11.F	2.8.11.O
2.5.11.A	2.8.11.Q
2.5.11.B	2.8.11.S
2.5.11.C	2.8.11.T
2.8.11.A	2.9.11.G
2.8.11.E	2.10.11.A

Topics:	Skills:
Coordinates for the plane Slope of a line Equations for lines Functions and graphs Absolute values Tangent lines and slopes of quadratic and cubic curves Slope of a curve; y= f(x): derivatives Velocity and other rates of change Limits Infinity as a limit Continuity	Use slope to find additional points Find the angle of elevation Find the slope of a function Evaluate ΔX and ΔY Plot points and find slope between two points Determine if a quadrilateral is a parallelogram Write equations of lines using point-slope and slope y-intercept Determine equations of lines parallel or perpendicular to given a line and through given point Evaluate angle of inclination Identify and graph functions Determine the domain and range of algebraic and trigonometric functions Graph algebraic and trigonometric functions Evaluate composite functions Solve absolute value and inequality equations Define and find slopes of tangent and secant lines Write an equation of a line tangent to a curve at a given point Identify point(s) where a curve has a horizontal tangent Find the derivative of a function using the definition of derivative Compare and contrast function and its derivative Determine displacement, average velocity, and instantaneous velocity given a function (using definition of derivative)

	Skills: (continued)
	Evaluate limits of algebraic and trigonometric functions graphically and algebraically
	Use and understand the sandwich theorem for limits
	Use and understand the combination theorem for limits
	Determine continuity of a function
	Know three criteria for continuity
	Know and use max-min theorem for continuous functions
	Know and use limit combination theorem for continuous functions
Activities:	**Performance Assessments:**
Textbook problem solving Partner work Board work Utilizing the graphics calculator	Teacher produced tests and quizzes Class assignments Homework Class participation Board work Teacher observation

Course: AP Calculus

Unit: Derivatives

Grade Level: Grade 12

PA Standards:

2.1.11.A	2.8.11.A
2.2.11.B	2.8.11.E
2.2.11.C	2.8.11.J
2.2.11.D	2.8.11.K
2.2.11.E	2.8.11.L
2.2.11.F	2.8.11.N
2.3.11.C	2.8.11.Q
2.4.11.A	2.8.11.S
2.5.11.B	2.8.11.T
2.5.11.C	2.10.11.A

Topics:	Skills:
Polynomial functions and their derivatives Products, powers, and quotients Implicit differentiation and fractional powers Linear approximation and differentials The chain rule A brief review of trigonometry Derivatives of trigonometric functions Parametric equations Newton's method for approximating solutions of equations Derivative formulas in differential notation	Find the derivatives of algebraic functions and trigonometric functions by implicit and explicit methods Determine velocity and acceleration Write equations of tangent lines and normal lines to a curve at a given point Find the linearization of a function at a given point Estimate a given function using linearization Compare absolute change and relative change of a function Determine percent of error when using linearization Find the percentage of change of a function Apply linearization methods to real life problems Determine the derivatives of parametric equations using the chain rule Review graphing and evaluating trigonometric functions Find limits of trigonometric functions Graph parametric equations Use Newton's Method for approximating zeros to calculate the solution(s) of a function Use a graphics calculator to determine solution of a function Understand the relationship between derivatives and differential notation

Activities:	Performance Assessments:
Textbook problem solving Partner work Board work Utilizing the graphics calculator	Teacher produced tests and quizzes Class assignments Homework Class participation Board work Teacher observation

Course: AP Calculus

Unit: Applications of Derivatives

Grade Level: Grade 12

PA Standards:

2.1.11.A	2.8.11.D
2.2.11.A	2.8.11.E
2.2.11.B	2.8.11.J
2.2.11.C	2.8.11.N
2.2.11.D	2.8.11.0
2.2.11.E	2.8.11.Q
2.2.11.F	2.8.11.R
2.3.11.A	2.8.11.S
2.3.11.C	2.8.11.T
2.4.11.B	2.9.11.G
2.4.11.C	2.9.11.I
2.4.11.E	2.10.11.A
2.5.11.B	2.11.11.A
2.5.11.C	2.11.11.B
2.5.11.D	

Topics:	Skills:
Curve sketching with first derivatives Concavity and points of inflection Asymptotes and symmetry Maxima and minima: theory Maxima and minima: problems Related rates of change The mean value theorem Indeterminate forms and l'Hopital's rule Quadratic approximations and approximation errors: extending the mean value theorem	Sketch curves using the first and second derivatives, intercepts, asymptotes, domain, range and symmetry Determine the intervals of x-values on which the function is rising, falling, concave up, and concave down Find the maximum and minimum values of a function Determine the point(s) of inflection Investigate symmetry, intercepts, asymptotes, slope at the intercepts, and dominant terms of a function Determine if a function is odd or even Identify location for maximum and minimum values Use second derivative test for local maxima and minima Calculate the absolute extreme value(s) of a function Apply maxima and minima theory in real-life situations Determine related rates of changes in real-life situations Apply the Mean Value Theorem and Rolle's Theorem Evaluate limits using l'Hopital's Rule

	Skills: (continued)
	Find the quadratic approximation for functions Evaluate the error when using the quadratic approximation for functions
Activities:	**Performance Assessments:**
Textbook problem solving Partner work Board work Utilizing the graphics calculator	Teacher produced tests and quizzes Class assignments Homework Class participation Board work Teacher observation

Course: AP Calculus

Unit: Integration

Grade Level: Grade 12

PA Standards:

2.1.11.A	2.4.11.B
2.2.11.B	2.4.11.C
2.2.11.C	2.5.11.C
2.2.11.D	2.5.11.D
2.2.11.E	2.8.11.Q
2.2.11.F	2.11.11.D
2.3.11.C	2.11.11.E

Topics:	Skills:
Indefinite integrals Selecting a value for the constant of integration The substitution method of integration Integrals of trigonometric functions Definite integrals: the area under a curve Calculating definite integrals by summation The fundamental theorems of integral calculus Substitution in definite integrals Rules for approximating definite integrals	Find the antiderivatives of algebraic functions and of trigonometric functions Solve differential equations Determine the position 's' as a function of time 't' given velocity or acceleration as a function in terms of 't' Evaluating definite and indefinite integrals of algebraic and trigonometric functions using substitution method of integration Approximate the definite integral by Riemann Sums Approximate the area under a curve using inscribed, circumscribed, and midpoint rectangles Investigate the properties of definite integrals Use the definition of definite integrals as a limit to compute area under the curve exactly Apply the First and Second Fundamental theorems of Calculus Approximate definite integrals by the trapezoidal rule Estimate the error for the trapezoidal rule Estimate the minimum number of subdivision needed when given an absolute value of error by trapezoidal rule.
Activities:	**Performance Assessments:**
Textbook problem solving Partner work Board work Utilizing the graphics calculator	Teacher produced tests and quizzes Class assignments Homework Class participation Board work Teacher observation

Course: AP Calculus

Unit: Applications of Definite Integrals

Grade Level: Grade 12

PA Standards:

2.1.11.A	2.5.11.B
2.2.11.A	2.5.11.C
2.2.11.F	2.5.11.D
2.3.11.A	2.9.11.G
2.4.11.B	2.9.11.H
2.4.11.C	2.9.11.I

Topics:	Skills:
The net change in position and distance traveled by a moving body Areas between curves Calculating volumes by slicing, volume of revolution Volumes modeled with washers and cylindrical shells Lengths of plane curves The area of a surface of revolution The average value of a function	Calculate the net change and distance traveled by a moving body Find the area between two curves Calculate the volume of solids of revolutions using washers and cylindrical shells Determine the length of plane curves and parametric curves Find the area of a surface of revolution of a given curve Evaluate the average value of a function
Activities:	**Performance Assessments:**
Textbook problem solving Partner work Board work Utilizing the graphics calculator	Teacher produced tests and quizzes Class assignments Homework Class participation Board work Teacher observation

Course: AP Calculus   **Grade Level:** Grade 12

Unit: Transcendental Functions

PA Standards:

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

Topics:	**Skills:**
Inverse functions The inverse trigonometric functions The derivatives of the inverse trigonometric functions: related integrals The natural logarithm and its derivative Properties of natural logarithms, the graph of $y = \ln x$ The exponential functions e^x The functions a^x and a^u The function $y = \log_a u$: rates of growth Applications of exponential and logarithmic functions	Determine and graph the inverse function of functions Re-exam inverse trigonometric functions Find the derivative and antiderivative of inverse trigonometric functions Evaluate the limits containing inverse trigonometric functions Re-exam the properties of natural logarithmic functions and exponential functions Find the derivative and antiderivative of natural logarithmic functions Find the derivative and antiderivative of exponential functions Solve logarithmic and exponential functions Evaluate rates of growth using exponential functions Apply exponential and logarithmic functions to real-life situations
Activities:	**Performance Assessments:**
Textbook problem solving Partner work Board work Utilizing the graphics calculator	Teacher produced tests and quizzes Class assignments Homework Class participation Board work Teacher observation

Course: AP Calculus   **Grade Level:** Grade 12

    Unit: Methods of Integration   **PA Standards:** 2.1.11.A

Topics:	Skills:
Basic integration formulas Integration by parts Products and powers of trigonometric functions Even powers of sines and cosines	Determine the value of indefinite and definite integrals using integration by parts Re-exam trigonometric identities Evaluating definite and indefinite integrals of products and powers of trigonometric functions
Activities:	**Performance Assessments:**
Textbook problem solving Partner work Board work Utilizing the graphics calculator	Teacher produced tests and quizzes Class assignments Homework Class participation Board work Teacher observation

Course: AP Calculus   **Grade Level:** Grade 12

Unit: The Graphics Calculator   **PA Standards:** 2.2.11.F
                                                        2.5.11.C
                                                        2.8.11.A

Topics:	Skills:
Exercises using the graphics calculator	Use a graphics calculator as a tool for graphing functions, evaluating functions, finding the limit of functions, determining continuity of functions, finding the values of derivatives and finding the values of antiderivatives
Activities:	**Performance Assessments:**
Textbook problem solving Partner work Board work Utilizing the graphics calculator	Teacher produced tests and quizzes Class assignments Homework Class participation Board work Teacher observation