

Wallenpaupack Area School District

COURSE: Introductory Calculus

GRADE LEVEL: Twelfth Grade

LENGTH OF COURSE: 1/2 year, 1 Semester (90 DAYS)

TEXT: Calculus (For Business, Economics, and the Social and Life Sciences),

Calculus with Analytic Geometry—A First Course, 3rd Edition

PUBLISHER: McGraw Hill/ Addison Wesley Publishing Co.

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COURSE DESCRIPTION:

Introductory Calculus is designed to meet the needs of a majority of students taking the first year calculus at a college or university. It does not attempt to replace a first year college calculus course. The course provides an introduction to Analytical Geometry through linear relations, conic sections and curve tracing. Calculus, differential and integral, is introduced with an intuitive approach and with emphasis on real-life applications, problem solving, technology and communicating mathematics. The aim is to provide an introduction to calculus to students who will need to use it effectively later in engineering, mathematics, the physical and life sciences and economics.

CURRICULUM WRITING TEAM:

Betty Mang
Mel Vogler

DATE OF REVISION:

2005

Wallenpaupack Area School District

Course: Introductory Calculus
Unit: Functions, Graphs, and Limits

Grade Level: Grade12
PA Standards: 2.1.11.A
 2.2.11.A
 2.2.11.F
 2.3.11.A
 2.4.11.E
 2.5.11.A
 2.5.11.B
 2.5.11.C
 2.8.11.A
 2.8.11.E
 2.8.11.K
 2.8.11.L
 2.8.11.O
 2.8.11.Q
 2.8.11.S
 2.8.11.T
 2.9.11.J

Topics:	Skills:
Functions The graph of a function Linear functions Functional models Limits One-sided limits and continuity Limits using the graphics calculator	Compute values of functions and composite functions Find the domain and range of algebraic and trigonometric functions Graph functions and relations using intercepts, symmetry, domain, range, asymptotes, and x and y intercepts Find the slope of a function and between two points Write equations of lines using point-slope and slope y-intercept forms Determine equations of lines parallel or perpendicular to given a line and through given point Use mathematical models to solve practical problems in business, economics, and the physical or life sciences Evaluate limits of algebraic and trigonometric functions graphically and algebraically Use the algebraic properties of limits to evaluate limits Determine the continuity of a function Know the three criteria for continuity Use a graphics calculator to investigate limits

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

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Course: Introductory Calculus

Grade Level: Grade12

Unit: Differentiation: Basic Concepts

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
 2.3.11.A
 2.4.11.E
 2.5.11.A
 2.5.11.B
 2.5.11.C
 2.8.11.A
 2.8.11.L
 2.8.11.O
 2.8.11.Q
 2.8.11.T

Topics:	Skills:
The derivative Techniques of differentiation Product and quotient rules; higher-order derivatives The chain rule Marginal analysis and approximations using increments Implicit differentiation and related rates Derivatives at a point using graphics calculator	Find the derivative of a function using the definition of derivative Define and find slopes of tangent and secant lines Write equations of tangent lines and normal lines to a curve at a given point Evaluate the average and instantaneous rate of change at a given value Determine instantaneous velocity, velocity, and acceleration of a function Find the derivative of a function using the constant multiple rule, product rule, quotient rule, power rule and chain rule Determine the values of x where the tangent line is horizontal Determine the nth derivative of a function Use differentials to estimate the change in a functions Compare absolute change and relative change of a function Estimate the percent of change in a function Evaluate marginal revenue and marginal profit of a function Investigate and solve related rates problems Determine the slope at a point using the graphics calculator

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Course: Introductory Calculus

Grade Level: Grade12

Unit: Additional Applications of the Derivative

PA Standards: 2.1.11.A
 2.2.11.A
 2.2.11.F
 2.3.11.A
 2.4.11.E
 2.5.11.A
 2.5.11.B
 2.5.11.C
 2.8.11.A
 2.8.11.E
 2.8.11.K
 2.8.11.L
 2.8.11.O
 2.8.11.Q
 2.8.11.S
 2.8.11.T
 2.9.11.J
 2.10.11.A
 2.11.11.A
 2.11.11.B

Topics:	Skills:
Increasing and decreasing functions; relative extrema Concavity and points of inflection Curve sketching Optimization Additional applied optimization Relative extrema using graphics calculator	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 relative extrema Determine the point(s) of inflection Investigate symmetry, intercepts, asymptotes Use the second derivatives test to find the relative and absolute maxima and minima Calculate the absolute extrema of a function by using the critical points Apply maxima and minima theory in real-life situations Investigate the relationship between elasticity of demand and total revenue of a function Determine relative extrema with a graphics calculator Use the graphics calculator to investigate the relationship between the function and the first and second derivative

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Course: Introductory Calculus

Grade Level: Grade12

Unit: Exponential and Logarithmic Functions

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

Topics:	Skills:
Exponential functions Logarithmic functions Differentiation of logarithmic and exponential functions Additional exponential models Exponential and logarithmic functions using graphics calculator	Re-exam the properties of logarithmic and exponential functions Graph logarithmic and exponential functions Solve logarithmic and exponential functions Find the derivative of exponential and logarithmic functions Evaluate rates of exponential growth and decay Find the largest and smallest values of a given function over a closed interval Write an equation of a tangent line to an exponential or logarithmic function at a given value Apply exponential and logarithmic functions to real-life situations Investigate the relationship of logarithmic and exponential functions using the graphics calculator Determine the extrema over a closed interval with a graphics calculator

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Course: Introductory Calculus

Grade Level: Grade12

Unit: Integration

PA Standards: 2.1.11.A
 2.2.11.A
 2.2.11.F
 2.3.11.A
 2.4.11.E
 2.5.11.A
 2.5.11.B
 2.5.11.C
 2.8.11.A
 2.8.11.E
 2.8.11.K
 2.8.11.L
 2.8.11.O
 2.8.11.Q
 2.8.11.S
 2.11.11.E

Topics:	Skills:
Antidifferentiation: the indefinite integral Integration by substitution The definite integral and the fundamental theorem of calculus Applying definite integration: area between curves and average value Additional application to business and economics Additional application to the life and social sciences Definite integrals, area under a curve, area between to curves and average value using graphics calculator	Find the antiderivatives of indefinite integrals Solve a differential equation given an initial value Apply the fundamental theorem of calculus to evaluate a definite integral Investigate the properties of definite integrals Use substitution to integrate indefinite and definite integrals Determine an equation for the position of a body given acceleration and/or velocity Find the net change of a function Determine the area under a curve on a closed interval Apply definite integration to find the area between two curves Find the average value of a given function on a closed interval Use definite integration in real-life problems Evaluate definite integrals, area under a curve, area between two curves and average value of functions using a graphics calculator

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Activities:	Performance Assessments:
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Course: Introductory Calculus

Grade Level: Grade12

Unit: Derivatives and Antiderivatives of Trigonometric functions (Calculus and Analytic Geometry, 7th edition , Addison Wesley, Thomas/Finney, 1988)

PA Standards: 2.1.11.A
2.2.11.A
2.2.11.F
2.5.11.A
2.5.11.B
2.5.11.C
2.8.11.A
2.8.11.0
2.8.11.Q
2.8.11.S
2.8.11.T
2.10.11.A

Topics:	Skills:
<p>A brief review of trigonometry Derivatives of trigonometric functions Antiderivatives of trigonometric functions Parametric functions Limits, derivatives and antiderivatives of trigonometric functions using graphics calculator</p>	<p>Re-exam graphs of trigonometric functions Determine the limits of trigonometric functions Find the derivatives of trigonometric functions Use the chain rule to determine the derivatives of parametric functions Determine the integrals of trigonometric functions Use a graphics calculator to investigate limits of trigonometric functions Evaluate the derivative of a trigonometric function at a point and the definite integral of a trigonometric function using the graphics calculator</p>
Activities:	Performance Assessments:
<p>Textbook problem solving Partner work Board work Utilizing a graphics calculator Individual white board work</p>	<p>Teacher produced tests and quizzes Class assignments Homework Class participation Board work Teacher observation</p>