

# *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, 3<sup>rd</sup> Edition

**PUBLISHER:** McGraw Hill/ Addison Wesley Publishing Co.

**COPYRIGHT:** 2004/1977

### **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:**

2006

# Wallenpaupack Area School District

**Course:** Introductory Calculus

**Grade Level:** Grade12

**Unit:** Functions, Graphs, and Limits

**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

<b>Topics:</b>	<b>Skills:</b>
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

## *Wallenpaupack Area School District*

<b>Activities:</b>	<b>Performance Assessments:</b>
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

# Wallenpaupack Area School District

**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

<b>Topics:</b>	<b>Skills:</b>
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

## *Wallenpaupack Area School District*

<b>Activities:</b>	<b>Performance Assessments:</b>
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

# Wallenpaupack Area School District

**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:
<p>Increasing and decreasing functions;            relative extrema            Concavity and points of inflection            Curve sketching            Optimization            Additional applied optimization            Relative extrema using graphics calculator</p>	<p>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</p>

## *Wallenpaupack Area School District*

<b>Activities:</b>	<b>Performance Assessments:</b>
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

# Wallenpaupack Area School District

**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

<b>Topics:</b>	<b>Skills:</b>
<p>Exponential functions          Logarithmic functions          Differentiation of logarithmic and exponential functions          Additional exponential models          Exponential and logarithmic functions using graphics calculator</p>	<p>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</p>
<b>Activities:</b>	<b>Performance Assessments:</b>
<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>

# Wallenpaupack Area School District

**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

<p><b>Topics:</b></p> <p>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</p>	<p><b>Skills:</b></p> <p>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</p>
<p><b>Activities:</b></p> <p>Textbook problem solving        Partner work        Board work        Utilizing a graphics calculator        Individual white board work</p>	<p><b>Performance Assessments:</b></p> <p>Teacher produced tests and quizzes        Class assignments        Homework        Class participation        Board work        Teacher observation</p>

# Wallenpaupack Area School District

**Course:** Introductory Calculus

**Grade Level:** Grade12

**Unit:** Derivatives and Antiderivatives of Trigonometric functions (Calculus and Analytic Geometry, 7<sup>th</sup> 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.O  
2.8.11.Q  
2.8.11.S  
2.8.11.T  
2.10.11.A

<b>Topics:</b>	<b>Skills:</b>
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	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
<b>Activities:</b>	<b>Performance Assessments:</b>
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