DELAWARE VALLEY SCHOOL DISTRICT

PLANNED INSTRUCTION

A PLANNED COURSE FOR:

Calculus

Grade Level: 12

Date of Board Approval: _____2018_____

DELAWARE VALLEY SCHOOL DISTRICT

Planned Instruction

Title of Planned Instruction: Calculus

Subject Area: Mathematics Grade(s): 12

Course Description:

This course is designed to develop the topics of differential and integral calculus. Emphasis is placed on limits, continuity, derivatives, and integrals of algebraic and transcendental functions of one variable. Upon completion, students should be able to select and use appropriate models, techniques, and representations for finding solutions to theoretical and applied problems with and without technology.

Students will have the opportunity to use a variety of learning methods to attain mastery of the skills and concepts necessary for success. They will demonstrate mastery through explicit textbook applications, collaboration with peers, guided inquiry, and direct instruction. Technology is integrated wherever appropriate in order to support and challenge the learning of the students. Such technological instruction will be through the use of graphing calculators and/or internet-based learning sites.

Students need to have passed Precalculus to be enrolled in Calculus.

Time/Credit for the Course: 2 semesters, 1 Credit, 180 days, meeting 1 period per day

Curriculum Writing Committee:

Gary Dennis, Christine Marcial, Elizabeth Katz

Curriculum Map

1. **Marking Period One - Overview based on 45 days**
   Goals:

Understanding of:

- Review of Exponents and Logarithms
- Review of Polynomials, including Quadratics
- Equations of Lines
- Basic Trigonometry
- Factoring
- Simplifying Expressions
- Literal Equations
- Graph Analysis
- Definition of a Limit
- Properties of Limits
- One-sided and Two-sided Limits
- Finite Limits as x Approaches Positive and Negative Infinity
- Infinite Limits as x Approaches a constant
- End-behavior Models
- Continuity at a Point
- Continuous Functions
- Algebraic Combinations
- Composite Functions
- Intermediate Value Theorem for Continuous Functions
- Instantaneous and Average Rates of Change
- Tangent and Normal Lines to a Curve
- Slope of a Curve

2. **Marking Period Two - Overview based on 45 days**
   Goals:

Understanding of:

- Definition of a derivative
- Notation used for derivatives
- Relationship between the graphs of f and f'
- Graphing the derivative from data
- One-sided derivatives
- How f '(a) might fail to exist
- Derivatives on a calculator
- Differentiability implies continuity
- Intermediate Value Theorem
- Rules for differentiation
- Instantaneous rates of change
- Motion along a line
- Chain rule for finding derivatives of a composite function
- Implicitly defined functions
- Derivatives of higher order
- Derivatives of trigonometric, exponential and logarithmic functions
- L'Hopital's Rule

3. **Marking Period Three - Overview based on 45 days**
   Goals:

Understanding of:

- Utilization of a derivative
- Implicit Differentiation
- Derivatives on a calculator
- Instantaneous rates of change
- Absolute and relative extrema
- Relation of first derivative to increasing/decreasing functions
- Relation of the second derivative to concavity up/down
- Inflection and critical points
- Connecting f, f', and f'' – graphically, algebraically, analytically
- Use of derivatives in economics, business and industry
- Modeling and Optimization
- Implicitly defined functions
- Related Rates – using circle, sphere, cone, cylinder, right triangle
- Related Rates – business applications

Marking Period Four – Overview based on 45 days

Goals:

Understanding of:

- Terminology and notation of Integration
- Integration of Polynomials
- Integration of Quantities Raised to a Power
- Trigonometric Integration
- Integration involving Exponential and Logarithmic Functions
- Finding the area using the Rectangular Approximation Method
- Properties of Definite Integrals
- Fundamental Theorem of Calculus
- Computing Definite Integrals by hand
- Indefinite Integration using U-Substitution
- Definite Integration using U-Substitution
- How to determine the area of regions under a curve
- How to determine the area of a region between two curves
- Applying definite integrals to real-world scenarios

Curriculum Plan

Unit 1: Prerequisites for Calculus Marking Period: 1

Standard(s): PA Core State Standards for Mathematics
http://static.pdesas.org/content/documents/PA%20Core%20Standards%20Mathematics%20PreK-12%20March%202014.pdf

CC.2.1.HS.F.3	CC.2.1.HS.D.7	CC.2.2.HS.C.2	CC.2.2.HS.B.1
CC.2.1.HS.D.1	CC.2.1.HS.D.8	CC.2.2.HS.C.4	CC.2.2.HS.B.2
CC.2.1.HS.D.2	CC.2.1.HS.D.9	CC.2.2.HS.C.5	CC.2.2.HS.B.3
CC.2.1.HS.D.3	CC.2.1.HS.D.10	CC.2.2.HS.A.1	
CC.2.1.HS.D.4	CC.2.2.HS.C.1	CC.2.2.HS.A.11	

Big Idea # 1: Numbers, measures, expressions, equations, and inequalities can represent mathematical situations and structures in many equivalent forms.

Essential Question:

- How can you extend Algebraic properties and processes to linear, quadratic, absolute value, square root, piece-wise, constant, identity, cubic, cube root, reciprocal, and the greatest integer function and then apply them to solve real world problems?

Concept:

- Algebraic properties, processes and representations

Competencies:

- Extend Algebraic properties and processes to quadratic, exponential, and polynomial expressions and equations and apply them to solve real world problems.

- Represent exponential functions in multiple ways, including tables, graphs, equations, and contextual situations, and make connections among representations; relate the growth/decay rate of the associated exponential equation to each representation.

- Represent a quadratic function in multiple ways, including tables, graphs, equations, and contextual situations, and make connections among representations; relate the solution of the associated quadratic equation to each representation.

Big Idea #2: Families of functions exhibit properties and behaviors that can be recognized across representations. Functions can be transformed, combined, and composed to create new functions in mathematical and real world situations.

Essential Question:

- How do linear, quadratic, absolute value, square root, piece-wise, constant, identity, cubic, cube root, reciprocal functions and their graphs and/or tables help us interpret events that occur in the world around us?

Concept:

- Algebraic properties, processes and representations

Competencies:

- Extend Algebraic properties and processes to quadratic, exponential, and polynomial expressions and equations; apply them to solve real world problems.

- Represent exponential functions in multiple ways, including tables, graphs, equations, and contextual situations, and make connections among representations; relate the growth/decay rate of the associated exponential equation to each representation.

- Represent a quadratic function in multiple ways, including tables, graphs, equations, and contextual situations; make connections among representations; relate the solution of the associated quadratic equation to each representation.

Big Idea #3: Mathematical functions are relationships that assign each member of one set (domain) to a unique member of another set (range), and the relationship is recognizable across representations.

Essential Question:

- How do you explain the benefits of multiple methods of representing linear, quadratic, absolute value, square root, piece-wise, constant, identity, cubic, cube root, and reciprocal functions (tables, graphs, equations, and contextual situations)?

Concept:

- Algebraic properties, processes and representations

Competencies:

- Extend Algebraic properties and processes to quadratic, exponential, and polynomial expressions and equations; apply them to solve real world problems.

- Represent exponential functions in multiple ways, including tables, graphs, equations, and contextual situations, and make connections among

representations; relate the growth/decay rate of the associated exponential equation to each representation.

- Represent a quadratic function in multiple ways, including tables, graphs, equations, and contextual situations, and make connections among representations; relate the solution of the associated quadratic equation to each representation.

Overview: This unit reviews and reteaches the prerequisites needed for Calculus.

Goals: This unit will

- Review key mathematical concepts
- Interpret rates of Change and Limits

Objectives: Students will be able to:

- Graph functions and equations (DOK Level Two)
- Find intercepts from a graph and an equation (DOK Level One)
- Test an equation for symmetry with respect to the x-axis, the y-axis, and the origin (DOK Level Three)
- Calculate and interpret the slope of a line (DOK Level One)
- Graph lines given a point and the slope (DOK Level Two)
- Find the equation of a vertical line (DOK Level One)
- Use the point-slope form of a line (DOK Level One)
- Identify horizontal lines (DOK Level Two)
- Determine the equation of a line given two points (DOK Level Two)
- Write the equation of a line in slope-intercept form (DOK Level Two)
- Identify the slope and y-intercept of a line from its equation (DOK Level One)
- Graph lines written in general form using intercepts (DOK Level Two)
- Formulate equations of parallel and perpendicular lines (DOK Level Three)
- Calculate the value of a function (DOK Level One)
- Factor a quadratic function (DOK Level Two)
- List the domain and range of a function (DOK Level One)
- Perform operations of functions (DOK Level Two)
- Identify the graph of a function (DOK Level One)
- Obtain information from or about the graph of a function (DOK Level Three)
- Use a graph to determine where a function is increasing, decreasing, or constant (DOK Level Two)
- Use a graph to locate local maxima and local minima (DOK Level Two)
- Find the average rate of change of a function (DOK Level Two)

- Graph the following functions: linear, polynomial, rational, absolute value, square root, piece-wise, constant, identity, cubic, cube root, and reciprocal function (DOK Level Three)
- Graph functions using transformations (DOK Level Three)
- Build and analyze functions (DOK Level Four)
- Simplify expressions with fractional exponents (DOK Level Two)
- Apply rules of exponents to expressions and equations (DOK Level Three)
- Evaluate trigonometric functions on the unit circle (DOK Level Two)

UNIT 2: Limits and Continuity Marking Period: 1

Standard(s): PA Core State Standards for Mathematics
http://static.pdesas.org/content/documents/PA%20Core%20Standards%20Mathematics%20PreK-12%20March%202014.pdf

CC.2.1.HS.F.3	CC.2.1.HS.D.7	CC.2.2.HS.C.2	CC.2.2.HS.B.1
CC.2.1.HS.D.1	CC.2.1.HS.D.8	CC.2.2.HS.C.4	CC.2.2.HS.B.2
CC.2.1.HS.D.2	CC.2.1.HS.D.9	CC.2.2.HS.C.5	CC.2.2.HS.B.3
CC.2.1.HS.D.3	CC.2.1.HS.D.10	CC.2.2.HS.A.1	
CC.2.1.HS.D.4	CC.2.2.HS.C.1	CC.2.2.HS.A.11	

Big Idea # 1: Relations and functions are mathematical relationships that can be represented and analyzed using words, tables, graphs, and equations.

Essential Question:

- How can you extend Algebraic properties and processes to quadratic, exponential and polynomial expressions and equations and apply them to solve real world problems?

Concept:

- Polynomial functions, equations, and their graphs

Competencies:

- Extend Algebraic properties and processes to quadratic and polynomial expressions, equations, and their graphs; apply them to solve real world problems.

- Represent a polynomial or rational function in multiple ways, including tables, graphs, equations, and contextual situations, and make connections among representations; relate the solution of the associated polynomial or rational equation to each representation.

Big Idea #2: Families of functions exhibit properties and behaviors that can be recognized across representations. Functions can be transformed, combined, and composed to create new functions in mathematical and real world situations.

Essential Question:

- How do you explain the benefits of multiple methods of representing polynomial and rational functions (tables, graphs, equations, and contextual situations)?

Concept:

- Polynomial functions and equations

Competencies:

- Represent a polynomial or rational function in multiple ways, including table, graphs, equations, and contextual situations, and make connections among representations; relate the solution of the associated polynomial or rational equation to each representation.

Overview: This unit introduces the unique idea of limits and continuity. It will teach students how to define and calculate limits of functions at given values. Students will use substitution, graphical investigation, numerical approximation, analytical evaluation, and verbal descriptions, or some combination of these. Limits will be used to test functions for continuity.

Goals: This unit will:

- Use substitution, graphical investigation, numerical approximation, and algebraic methods to determine limits
- Use limits to test a function for continuity at a point of over the entire function
- Explore the graph of a function by using limits

Objectives: Students will be able to:

- Calculate the average and instantaneous rates of change (DOK Level Two)
- Define a limit (DOK Level One)
- Understand and be able to apply the properties of limits (DOK Level Three)
- Determine a limit given a graph (DOK Level Three)
- Understand what it means for a function to be continuous (DOK Level Two)
- Determine continuity at a point (DOK Level Two)
- Explore left and right handed limits (DOK Level Three)
- Determine a limit given an equation (DOK Level Three)
- Calculate and interpret one and two sided limits (DOK Level One)
- Determine limits as x approaches a constant with direct substitution (DOK Level Two)

- Determine limits as x approaches a constant with simplification (DOK Level Two)
- Determine limits as x approaches positive or negative infinity using the rules of asymptotes graphically (DOK Three)
- Determine limits as x approaches positive or negative infinity using the rules of asymptotes numerically (DOK Three)
- Describe types of discontinuity (DOK Level Two)
- Determine the equations of both tangent and normal lines to a curve at a point (DOK Level Three)

UNIT 3: Derivatives Marking Period: 2

Standard(s): PA Core State Standards for Mathematics
http://static.pdesas.org/content/documents/PA%20Core%20Standards%20Mathematics%20PreK-12%20March%202014.pdf

CC.2.1.HS.F.3	CC.2.1.HS.D.7	CC.2.2.HS.C.2	CC.2.2.HS.B.1
CC.2.1.HS.D.1	CC.2.1.HS.D.8	CC.2.2.HS.C.4	CC.2.2.HS.B.2
CC.2.1.HS.D.2	CC.2.1.HS.D.9	CC.2.2.HS.C.5	CC.2.2.HS.B.3
CC.2.1.HS.D.3	CC.2.1.HS.D.10	CC.2.2.HS.A.1	
CC.2.1.HS.D.4	CC.2.2.HS.C.1	CC.2.2.HS.A.11	

Big Idea # 1: Relations and functions are mathematical relationships that can be represented and analyzed using words, tables, graphs, and equations.

Essential Question:

- What are the advantages/disadvantages of the various methods to represent functions (table, graph, equation) and how do we choose the most appropriate representation?

Concept:

- Functions & equations and their derivatives

Competencies:

- Extend Algebraic properties and processes to quadratic, exponential, and polynomial expressions and equations and their derivatives; apply them to solve real world problems.

- Represent functions in multiple ways, including tables, graphs, equations, and contextual situations; make connections among representations.

Big Idea #2: Mathematical functions are relationships that assign each member of one set (domain) to a unique member of another set (range), and the relationship is recognizable across representations.

Essential Question:

- What are the advantages/disadvantages of the various methods to represent functions (table, graph, equation) and how do we choose the most appropriate representation?

Concept:

- Functions & equations and their derivatives

Competencies:

- Extend Algebraic properties and processes to quadratic, exponential, and polynomial expressions and equations and to their derivatives; apply them to solve real world problems.

- Represent functions in multiple ways, including tables, graphs, equations, and contextual situations; make connections among representations; relate the growth/decay rate of the associated exponential equation to each representation.

Overview: This unit will define derivatives through graphical, numerical, and algebraic approaches.

Goals: This unit will:

- Review key mathematical concepts essential to properties of derivatives
- Use derivative rules for products, quotients, and powers
- Explore derivatives of exponential, logarithmic, and trigonometric functions
- Explore the graph of the derivative

Objectives: Students will be able to

- Define derivative (DOK Level One)
- Use the proper notations for derivative (DOK Level One)
- Explore the relationships between the graphs of the function and its derivative (DOK Level Two)
- Evaluate a one-sided derivative (DOK Level Two)
- Explore how a derivative of a function may fail to exist (DOK Level Three)
- Explore the Intermediate Value Theorem (DOK Level Two)
- Discover that graphs of differentiable functions can be approximated by their tangent lines at points where the derivative exists (DOK Level Three)
- Use the derivative rule of a constant function (DOK Level One)
- Use the power rule for positive integer powers of x to find a derivative (DOK Level One)
- Use the constant multiple rule to find the derivative of a function (DOK Level One)
- Use the sum and difference rules to find the derivative of a function (DOK Level Two)
- Use the product and quotient rules to find the derivative of a function (DOK Level Two)
- Use the power rule for negative integer powers of x to find a derivative (DOK Level Two)
- Find the derivative of second and higher order derivatives (DOK Level Two)
- Find instantaneous rates of change in real applications (DOK Level Three)
- Find velocity by using derivatives (DOK Level Four)
- Study the relationship between derivatives and particle motion (DOK Level Four)
- Find the derivative of the sine and cosine functions (DOK Level Two)
- Explore the derivative of a composite function (DOK Level Two)
- Use the chain rule to find the derivative of a composite function (DOK Level Three)
- Define Implicit Differentiation (DOK Level One)
- Use implicit differentiation to find derivatives of functions that are not defined or written explicitly as a function of a single variable (DOK Level Three)
- Use laws of derivatives to find the derivative of e^x, $\ln(x)$ and $\log_a(x)$ (DOK Level Two)

Unit 4: Applications of Derivatives Marking Period: 3

Standard(s): PA Core State Standards for Mathematics
http://static.pdesas.org/content/documents/PA%20Core%20Standards%20Mathematics%20PreK-12%20March%202014.pdf

CC.2.1.HS.F.3	CC.2.1.HS.D.7	CC.2.2.HS.C.2	CC.2.2.HS.B.1
CC.2.1.HS.D.1	CC.2.1.HS.D.8	CC.2.2.HS.C.4	CC.2.2.HS.B.2
CC.2.1.HS.D.2	CC.2.1.HS.D.9	CC.2.2.HS.C.5	CC.2.2.HS.B.3
CC.2.1.HS.D.3	CC.2.1.HS.D.10	CC.2.2.HS.A.1	
CC.2.1.HS.D.4	CC.2.2.HS.C.1	CC.2.2.HS.A.11	

Big Idea # 1: There are some mathematical relationships that are always true, and these relationships are used as the rules of arithmetic and Algebra and are useful for writing equivalent forms of expressions and solving equations and inequalities.

Essential Question:

- How do we recognize when it is appropriate to use a derivative relationship in a situation, and what are the benefits of using this relationship?

Concept:

- Algebraic properties, rules, processes and representations

Competencies:

- Extend Algebraic properties and processes to functions and derivatives, and apply them to solve real world problems.

- Represent functions and their derivatives in multiple ways, including tables, graphs, equations, and contextual situations, and make connections among representations. Relate the derivative to each representation.

Big Idea #2: Families of functions exhibit properties and behaviors that can be recognized across representations. Functions can be transformed, combined, and composed to create new functions in mathematical and real world situations.

Essential Question:

- How do functions and their derivatives – both explicit and implicit - help us interpret events that occur in the world around us?

Concept:

- Algebraic and derivative properties, processes and representations

Competencies:

- Extend Algebraic properties and processes to derivatives, and apply them to solve real world problems.

- Represent functions and their derivatives in multiple ways, including tables, graphs, equations, and contextual situations, and make connections among representations. Relate the derivative to each representation.

Overview: This unit will demonstrate applications of derivatives and how they can be used to optimize situations such as: cost, area, yield, and revenue. In addition, students will use derivatives to calculate related rates of change.

Goals: This unit will:

- Review key concepts of derivatives
- Review key geometric concepts needed for Optimization and Related Rates
- Use proper strategies for solving Optimization problems
- Use proper strategies for solving Related Rates problems

Objectives: Students will be able to

- Find and interpret relative extrema (DOK Two)
- Find and interpret absolute extrema (DOK Two)
- Find and interpret critical points (DOK Two)
- Find and interpret inflection points (DOK Two)
- Relate increasing and decreasing intervals in a function to the first derivative (DOK Three)
- Relate intervals of concavity in a function to the second derivative (DOK Three)
- Solve Optimization problems involving the maximization of area, distance, and volume (DOK Three)
- Solve Optimization problems from economics and business involving maximization or minimization of cost, revenue, and yield (DOK Three)
- Solve Related Rates problems involving area, distance, and volume (DOK Three)
- Solve Related Rates problems from economics and business involving cost, revenue, and yield (DOK Three)

Unit 5: Integrals — Marking Period: 4

Standard(s): PA Core State Standards for Mathematics
http://static.pdesas.org/content/documents/PA%20Core%20Standards%20Mathematics%20PreK-12%20March%202014.pdf

CC.2.1.HS.F.3	CC.2.1.HS.D.7	CC.2.2.HS.C.2	CC.2.2.HS.B.1
CC.2.1.HS.D.1	CC.2.1.HS.D.8	CC.2.2.HS.C.4	CC.2.2.HS.B.2
CC.2.1.HS.D.2	CC.2.1.HS.D.9	CC.2.2.HS.C.5	CC.2.2.HS.B.3
CC.2.1.HS.D.3	CC.2.1.HS.D.10	CC.2.2.HS.A.1	
CC.2.1.HS.D.4	CC.2.2.HS.C.1	CC.2.2.HS.A.11	

Big Idea # 1: Numbers, measures, expressions, equations, and inequalities can represent mathematical situations and structures in many equivalent forms.

Essential Question:
- How can you extend Algebraic properties and processes to derivatives & antiderivatives and then apply them to solve real world problems?

Concept:
- Antiderivative properties, processes and representations

Competencies:
- Extend derivative properties and processes to antiderivatives and apply them to solve real world problems.
- Represent derivatives & antiderivatives in multiple ways, including tables, graphs, equations, and contextual situations, and make connections among representations.

Big Idea #2: Families of functions exhibit properties and behaviors that can be recognized across representations. Functions can be transformed, combined, and composed to create new functions in mathematical and real world situations.

Essential Question:
- How do derivatives & antiderivatives help us interpret events that occur in the world around us?

Concept:
- Derivative & antiderivative properties, processes and representations

Competencies:
- Extend Algebraic properties and processes to derivatives & antiderivatives and apply them to solve real world problems.

- Represent derivatives & antiderivatives in multiple ways, including tables, graphs, equations, and contextual situations, and make connections among representations.

Overview: This unit will define both the indefinite and the definite integral as the methods used to calculate the area both under one curve or between two curves.

Goals: This unit will:

- Use antiderivative rules for powers
- Use U-substitution for definite and indefinite integrals
- Explore antiderivatives of exponential, logarithmic, and trigonometric functions

Objectives: Students will be able to (for both definite and indefinite integrals)

- Estimate the positive area under a "curve" of known geometric shapes (DOK Level Two)
- Estimating area under a curve using finite sums of increasing numbers of rectangles (DOK Level Two)
- Estimate area under a curve using LRAM, RRAM, and their average (DOK Level Two)
- Define integral / antiderivative (DOK Level One)
- Use the proper notation for an antiderivative (DOK Level One)
- Integrate a constant function (DOK Level One)
- Integrate polynomials. (DOK Level One)
- Use rules and properties to find the antiderivative of a function (DOK Level Two)
- Use U-substitution to find the antiderivative of a function (DOK Level Two)
- Study the relationship between derivatives and antiderivatives (DOK Level Four)
- Find the antiderivative of the sine and cosine functions (DOK Level Two)
- Find the antiderivative of exponential and natural logarithmic functions (DOK Level Three)
- Understand the properties and meaning of definite integrals (DOK Level Three)
- Calculate the value of a definite integral both with and without U-substitution (DOK Level Three)

Unit 6: Applications of Integrals Marking Period: 4

Standard(s): PA Core State Standards for Mathematics
http://static.pdesas.org/content/documents/PA%20Core%20Standards%20Mathematics%20PreK-12%20March%202014.pdf

CC.2.1.HS.F.3	CC.2.1.HS.D.7	CC.2.2.HS.C.2	CC.2.2.HS.B.1
CC.2.1.HS.D.1	CC.2.1.HS.D.8	CC.2.2.HS.C.4	CC.2.2.HS.B.2
CC.2.1.HS.D.2	CC.2.1.HS.D.9	CC.2.2.HS.C.5	CC.2.2.HS.B.3
CC.2.1.HS.D.3	CC.2.1.HS.D.10	CC.2.2.HS.A.1	
CC.2.1.HS.D.4	CC.2.2.HS.C.1	CC.2.2.HS.A.11	

Big Idea #1: Patterns exhibit relationships that can be extended, described, and generalized.

Essential Question:
- How do you explain the benefits of multiple methods of representing functions and their derivatives & antiderivatives (tables, graphs, equations, and contextual situations)?

Concept:
- Algebraic properties, processes, and representations

Competencies:
- Represent functions in multiple ways, including tables, graphs, equations, and contextual situations; make connections among representations; relate the solution of the associated equation to each representation.

Big Idea #2: Families of functions exhibit properties and behaviors that can be recognized across representations. Functions can be transformed, combined, and composed to create new functions in mathematical and real world situations.

Essential Question:
- How do derivatives & antiderivatives help us interpret events that occur in the world around us?

Concept:
- Derivative & antiderivative properties, processes and representations

Competencies:
- Extend Algebraic properties and processes to derivatives & antiderivatives and apply them to solve real world problems.
- Represent derivatives & antiderivatives in multiple ways, including tables, graphs, equations, and contextual situations, and make connections among representations.

Overview: This unit will define the use and application of integrals to find the area under a curve as well as the area between two given curves on a specified or determined interval.

Goals: This unit will:

- Review how to determine the intersection points of two curves
- Review key integral / antiderivative concepts
- Review finding area by LRAM and RRAM
- Review how to determine the area under a given curve as well as between two curves
- Use integration in modeling

Objectives: Students will be able to

- Determine the intersection points of two given curves (DOK Two)
- Find the area under a given curve (DOK Three)
- Find the area between two given curves (DOK Three)
- Calculate the integral as net change (DOK Three and Four)

Core Activities and Corresponding Instructional Methods:

- Integrate academic and content specific vocabulary
    - Direct instruction and practice on the aforementioned various parent functions
    - Lead a classroom discussion that prompts students to compare and contrast various methods utilized in obtaining solutions
    - Guided practice: Include step-by-step written/verbal explanation of solutions to open-ended questions
    - Build background knowledge by utilizing graphing calculators and TI-SmartView to support solutions to questions and problems

- Analyze coordinate plane
    - Direct instruction by using visual demonstration of sets of points in the Cartesian coordinate plane
    - Classroom discussion by using content specific vocabulary
    - Guided practice on identifying the content specific vocabulary
    - Graphing utility (TI-SmartView and/or Geometer's Sketchpad)

- Identify properties of and graph functions
    - Direct instruction and classroom discussion about properties: intervals of increase, intervals of decrease and constant intervals; local extrema supported by visual aids on the SmartBoard

  - Guided practice: Include step-by-step written/verbal explanation of the behavior of a graph
  - Graphing utility (TI-SmartView and/or Geometer's Sketchpad)

- Develop students' ability to solve real world problems by applying their understanding of various functions and their properties
  - Guided practice
  - Cooperative learning groups
  - Step-by-step written/verbal explanation of the behavior of a graph
  - Graphing utility (TI-SmartView and/or Geometer's Sketchpad)

Assessments:

Diagnostic:

- Pre-calculus Cumulative Assessment
- Teacher prepared pre-test or diagnostic test
- Teacher questioning and observation
- Previous chapter tests

Formative:

- Teacher observation and questioning
- Homework
- Graded classwork
- Teacher prepared assessments

Summative:

- Common Assessments for each unit
- Quizzes
- Final Exam

Extensions:

- Rigorous worksheets prepared from Kuta software
- Textbook applications and extensions
- Internet based investigation

Correctives:

- Remediation practice worksheets prepared from Kuta software
- Internet based tutoring sites
- More extensive direct instruction

Materials and Resources:

- Print text
- Kuta software
- Graphing calculator
- TI SmartView software
- Smart Notebook Gallery Essentials
- Internet Calculus-based websites
- Teacher Generated Worksheets
- Websites such as those from Collegeboard and Khan Academy

Primary Textbook(s) Used for this Course of Instruction

Name of Textbook: Calculus: Graphical, Numerical, Algebraic
(Finney, Demana, Waits, Kennedy)

Textbook ISBN #: 978-0-13-368840

Textbook Publisher &Year of Publication: Pearson Prentice Hall 2010

Curriculum Textbook is utilized in (title of course): Calculus

DELAWARE VALLEY SCHOOL DISTRICT

Checklist to Complete and Submit with Curriculum:

_____ A hard copy of the curriculum using The template entitled "Planned Instruction," available on the district website

_____ Hard copies of all supplemental resources not available electronically

_____ The primary textbook form(s)

_____ The appropriate payment form, in compliance with the maximum curriculum writing hours noted on the first page of this document

_____ A USB/Flash Drive containing a single file that will print the curriculum in its intended sequence from beginning to end and all supplemental resources that are available in electronic format.

Each principal and/or department chair has a schedule of First and Second Readers/Reviewers. Each Reader/Reviewer must sign & date below.

First Reader/Reviewer Printed Name_____

First Reader/Reviewer Signature_____ Date_____

Second Reader/Reviewer Printed Name_____

Second Reader/Reviewer Signature _____ Date_____