High School (9-12)
Gateway High School
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Gateway School District
Curriculum Map

Curriculum Map: Mathematics

Course: Calculus
Grade(s): 11/12

Unit 1: Prerequisites for Calculus

Brief Summary of Unit
This initial chapter, A Prerequisites for Calculus, is just that-a review chapter. This chapter will provide a solid understanding of essential algebraic skills that students may have forgotten over the summer months. As with all math courses, calculus is a building process. Therefore, previous taught algebra skills along with trigonometric concepts are necessary to be successful in this calculus course.

Stage One—Desired Results	
Established Goals: (Standards of Learning, Content Standards) 1. Calculate slope of a line. 2. Write an equation of a line. 3. Find the domain & range of a function. 4. Evaluate and simplify problems involving exponents & define exponential functions. 5. Find the equation of a circle. 6. Solve problems involving logarithms. 7. Review concepts of trigonometry.	
Understandings: 1. **Understand that previously learned concepts concerning functions and graphs are the main building blocks of calculus.** 2. **Understand that polynomial functions, exponential functions, logarithmic functions, and trigonometric functions describe real-world situations in mathematical terms.**	**Essential Questions:** **1.** What are the main building blocks of Calculus? **2.** Can you write a function to model and solve real world situations? **3.** How can you apply the formal definition of a limit?

Stage Two—Assessment Evidence
Performance Tasks:

Other Evidence: :(quizzes, tests and so on)

Stage Three—Learning Plan

Unit 2: Limits and Continuity

Brief Summary of Unit

This chapter introduces concepts that are essential for the study of calculus. Calculus is used to model many aspects of the world. Most ideas in calculus have useful geometric interpretations and can be visualized in term of functions. An essential feature of calculus covered in this chapter involves introducing and exploring the limit of a function and a related concept know as continuity.

Stage One—Desired Results

Established Goals: (Standards of Learning, Content Standards)

1. Find the limit of a function and a trigonometric function.
2. Use properties of limits.
3. Find limits involving positive and negative infinity.
4. Determine if a function is continuous.
5. Find the average rate of change.
6. Find the equation of tangent and normal lines.

Understandings:	**Essential Questions:**
1. **Understand that the concept of a limit is one of the ideas that distinguishes calculus from algebra.** 2. **Understand that continuous functions arise frequently in scientific work because they model such an enormous range of natural behavior.**	**1.** What are the four methods to find limits? **2.** How can you apply the formal definition of a limit?

Stage Two—Assessment Evidence

Performance Tasks:

Other Evidence: :(quizzes, tests and so on)

Stage Three—Learning Plan

Unit 3: Derivatives

Brief Summary of Unit

In this chapter, the main ideas of differential calculus are developed. It begins with the limit definition of the derivative followed by a list of rules and formulas for finding the derivatives of a variety of expressions, including polynomial functions, rational functions, trigonometric functions, and root functions. Derivatives are then interpreted as a rate of change and methods are developed for making approximations using the derivative.

Stage One—Desired Results	
Established Goals: (Standards of Learning, Content Standards) 1. Find the derivative of a polynomial and trigonometric function. 2. Use the definition of a derivative to find the equation of the tangent line. 3. Use rules of differentiation. 4. Use derivatives to find velocity, acceleration and other rates of change. 5. Apply the Chain Rule to find derivatives. 6. Find a derivative using implicit differentiation. 7. Find the derivatives of exponential and logarithmic functions.	
Understandings: 1. **Understand that a derivative is a rate of change that has numerous applications in real-life situations**	**Essential Questions:** **1.** How can you use formal definition of limit to find the tangent line? **2.** How do you find the equation of the tangent line by using derivative? **3.** How do you use implicit differentiation to find a derivative?
Stage Two—Assessment Evidence	
Performance Tasks:	
Other Evidence: :(quizzes, tests and so on)	
Stage Three—Learning Plan	

Unit 4: Applications of Derivatives

Brief Summary of Unit	
The primary goal of this chapter is to examine the use of calculus in curve sketching, optimization, and other applications of calculus.	
Stage One—Desired Results	
Established Goals: (Standards of Learning, Content Standards) 1. Determine that local or absolute values of functions by finding critical points 2. Use the First and Second Derivative Tests to determine the local extreme values of a function 3. Determine concavity of a functions and locate the points of inflection by analyzing the second derivative 4. Graph a function using information about the first derivative 5. Solve related rate problems	
Understandings:	**Essential Questions:**

1. **Understand the connection between the first and second derivatives and the graph of the function** 2. **Understand that the information given from the first and second derivative can help make predictions on real-world situations.**	**1.** How can the slope determine the optimization of a problem? **2.** How can the derivative be used to determine max/mins and intervals of I/D, concavity and Inflection points.
Stage Two—Assessment Evidence	
Performance Tasks:	
Other Evidence: :(quizzes, tests and so on)	
Stage Three—Learning Plan	

Unit 5: The Definite Integral

Brief Summary of Unit	
This chapter formally introduces the second fundamental concept of calculus, integral calculus. The key concept in integral calculus is integration, a procedure that involves computing a special kind of limit of sums called the definite integral. Finding integral and solving differential equations are extremely important processes in calculus.	
Stage One—Desired Results	
Established Goals: (Standards of Learning, Content Standards) 1. Apply the Rectangle Approximation Method (RAM) 2. Evaluate summations 3. Express the limit as a definite integral 4. Evaluate the integral as a constant 5. Use the graph of the integrand & area to evaluate the integral 6. Use the graphing calculator to evaluate an integral 7. Use the Trapezoidal Rule & Simpson's Rule to approximate area under a curve 8. Evaluate definite integrals using the Fundamental Theorem of Calculus	
Understandings: 1. **Understand the connection between integral calculus and the area under the curve.** 2. **Understand that using approximation methods to find the area under the curve can help make predictions on real-world situations.**	**Essential Questions:** **1.** How to use calculus to find the area under a curve?
Stage Two—Assessment Evidence	
Performance Tasks:	

Other Evidence: :(quizzes, tests and so on)

Stage Three—Learning Plan

Unit 6: Differential Equations and Mathematical Modeling

Brief Summary of Unit

In this chapter, the number of techniques and procedures for integrating a function increases. One of the most important techniques, substitution, is reviewed and then expanded in several different contexts. Other important integration procedures include using tables, integration by parts, and partial fractions. In addition, improper integrals are discussed.

Stage One—Desired Results

Established Goals: (Standards of Learning, Content Standards)

1. Use substitution to evaluate definite integrals.
2. Use integration by parts to find indefinite and definite integrals.
3. Use substitution to find indefinite integrals.
4. Use integration tables to find indefinite integrals.
5. Solve exponential growth and decay problems using calculus.

Understandings:	**Essential Questions:**
1. **Understand that that major part of integration is determining which basic integration formula or formulas to use to solve the problem.**	1. How do you know which integration rule to use when finding the integral of a function?

Stage Two—Assessment Evidence

Performance Tasks:

Other Evidence: :(quizzes, tests and so on)

Stage Three—Learning Plan

Unit 7: Applications of Definite Integrals

Brief Summary of Unit

This chapter explores methods of finding the exact answers to find areas and volumes of irregular shapes.

Stage One—Desired Results

Established Goals: (Standards of Learning, Content Standards)

1. Find the areas of regions bounded by 2 graphs.
2. Find the area enclosed by intersection curves.
3. Find the length of a curve.

Understandings:	**Essential Questions:**
1. Understand that numerous real-life situations use integration to find area between 2 curves.	1. How do you find the area and volume of complicated curves?
Stage Two—Assessment Evidence	
Performance Tasks:	
Other Evidence: :(quizzes, tests and so on)	
Stage Three—Learning Plan	