



Gateway School District

Curriculum Map

High School (9-12)

Gateway High School
3000 Gateway Campus Blvd.
Monroeville, PA 15146
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Curriculum Map: Mathematics

Course: Precalculus and Trigonometry

Grade(s): 11-12

Unit 1: Functions and Their Graphs

Brief Summary of Unit

A review of All principles involving graphing of linear functions as well as transformations of several of basic functions. Students should also be able to find domain and ranges of these functions, and develop new functions through math operations and composition. The Unit will also show students how to write algebraic models for variation problems.

Stage One—Desired Results

Established Goals: (Standards of Learning, Content Standards)

1. Find and use the slopes of lines to write and graph linear equations in two variables
2. Solve quadratic equations
3. Evaluate functions and find their domains
4. Calculate and interpret the average rate of change of a function over a specified interval
5. Analyze graphs of functions and as well as identify and graph transformations of functions
6. Build new functions from existing functions
7. Find arithmetic combinations and compositions of functions
8. Find inverse functions graphically and algebraically
9. Write algebraic models for direct, inverse and joint variation
10. Fit a linear function for a scatterplot that suggests a linear association

Understandings:

1. **Equations can be used to model and solve real-life examples.**
2. **Functions can be used as models to represent a wide variety of real-life data sets.**

Essential Questions:

1. How to sketch the graphs of equations.
2. How to find and the slopes of lines to write and graph linear equations in two variables.
3. How to evaluate functions and find their domains.
4. How to analyze graphs of functions
5. How to identify and graph transformations of functions.
6. How to find arithmetic combinations and compositions functions.

	<ol style="list-style-type: none"> How to find inverse functions graphically and algebraically How to write algebraic models for direct, inverse, and joint variation.
Stage Two—Assessment Evidence	
Performance Tasks:	
Other Evidence: (quizzes, tests and so on)	
Stage Three—Learning Plan	

Unit 2: Polynomials and Rational Functions

Brief Summary of Unit	
The basis of this unit is to show students how to graph more complex functions by using the prior tools of intercepts but also using end behavior and the ability to find multiple x-intercepts through the rational root theorem and synthetic division.	
Stage One—Desired Results	
Established Goals: (Standards of Learning, Content Standards)	
<ol style="list-style-type: none"> Sketch and analyze graphs of polynomial functions key features include: intercepts, intervals of increasing and decreasing, relative maxs and mins, end behavior Use Long Division and Synthetic Division to Divide Polynomials Perform operations with complex numbers Determine the number of rational and real zeros of a polynomial then find them Apply the remainder theorem Determine domain and find asymptotes of rational functions then sketch Find partial fraction decomposition of rational expressions 	
Understandings:	Essential Questions:
<ol style="list-style-type: none"> Equations can be used to model and solve real-life examples. Functions can be used as models to represent a wide variety of real-life data sets. Complex numbers can be used to model and solve real-life problems in electronics. 	<ol style="list-style-type: none"> How to sketch and analyze graphs of polynomial functions. How to use long division and synthetic division. How to perform operations with complex numbers. How to determine and find the number of rational and real zeros of a polynomial How to determine the domain of rational functions. How to find asymptotes of rational functions.

7. How to sketch graphs of rational functions.

Stage Two—Assessment Evidence

Performance Tasks:

Other Evidence: (quizzes, tests and so on)

Stage Three—Learning Plan

Unit 3: Exponential and Logarithmic Function.

Brief Summary of Unit

Students will explore how to manipulate and solve logarithmic and exponential expressions and equations as well how to graph them. They will also model real world problem situations with these transcendental functions.

Stage One—Desired Results

Established Goals: (Standards of Learning, Content Standards)

1. Use the properties of exponents to interpret expressions for exponential functions
2. Evaluate exponential functions with base a and base e
3. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.
4. Graph exponential and log functions showing intercepts and end behaviors
5. Evaluate logarithmic functions with base a and natural logarithmic functions
6. Graph logarithmic functions
7. Use exponential and logarithmic functions to model and solve real-life applications.

Understandings:

1. **Exponential Functions can be used to model and solve real-life applications.**
2. **Logarithmic Functions can be used to model and solve real-life applications.**

Essential Questions:

1. How to recognize and evaluate exponential and logarithmic functions.
2. How to graph exponential and logarithmic functions.
3. How to use change of base formula to rewrite and evaluate logarithmic functions.
4. How to use properties of logarithms to evaluate, rewrite, expand, or condense.
5. How to solve exponential and logarithmic equations.
6. How to use exponential, growth/decay models, logistic growth models to solve real-life problems.

Stage Two—Assessment Evidence

Performance Tasks:

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

Stage Three—Learning Plan

Unit 4: **Trigonometry**

Brief Summary of Unit

Students will discover basic Trig. Principles with the Unit Circle and then follow with right triangle Trigonometry to solve for sides and angles in triangles. Students will also learn how to graph the basic Trig. Functions as well as their transformations. Students will also learn how to apply inverse Trig. Functions to solve Trig. Equations.

Stage One—Desired Results

Established Goals: (Standards of Learning, Content Standards)

1. Describe an angle and convert between radian and degree measure
2. Identify a unit circle and its relationship to real numbers
3. Evaluate trig functions of any angle
4. Use fundamental trig identities
5. Sketch the graph of trig functions and translations of sine and cosine functions

Understandings:

1. **You can use angles to model and solve real-life applications.**
2. **Trig and inverse trig functions are used to analyze real life situations.**
3. **Sine and cosine functions are used for scientific calculations.**

Essential Questions:

1. How to describe an angle and convert between radian and degree measure.
2. How to identify a unit circle and its relationship to real numbers.
3. How to evaluate trig functions of any angle.
4. How to use the fundamental trig identities.
5. How to sketch the graph of trig functions and translation of sine and cosine functions.
6. How to evaluate trig functions.

Stage Two—Assessment Evidence

Performance Tasks:

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

Stage Three—Learning Plan

Unit 5: Analytic Trigonometry

Brief Summary of Unit	
Students will learn basic fundamental identities and use them to verify other Trig. Identities. They will also be able to solve trig. Equations. Some of the formulas taught are the Sum and Difference as well as Multiple-Angle and Product-to-Sum formulas.	
Stage One—Desired Results	
Established Goals: (Standards of Learning, Content Standards)	
<ol style="list-style-type: none">1. Use fundamental trig Identities to evaluate trig functions and simplify trig expressions2. Prove and apply trigonometric identities3. Use standard algebraic techniques and inverse tri functions to solve trigonometric equations4. Use sum/diff form., multiple angle form., power reducing form., half-angle form., and product to sum formula to rewrite and evaluate trig functions5. Evaluate the inverse trig functions	
Understandings: <ol style="list-style-type: none">1. Fundamental trig identities can be used to simplify trig expressions.2. Trig identities can be rewritten to trig equations that model real-life situations.3. Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trig ratios for acute angles.	Essential Questions: <ol style="list-style-type: none">1. How to use fundamental trig identities to evaluate trig functions and simplify trig expressions2. How to verify trig identities.3. How to use standard algebraic techniques and inverse trig functions to solve trig equations..
Stage Two—Assessment Evidence	
Performance Tasks:	
Other Evidence: :(quizzes, tests and so on)	
Stage Three—Learning Plan	

Unit 6: Additional Topics in Trig

Brief Summary of Unit	
Students will learn to apply non-right triangle trigonometry to solve for angles and sides by using the Law of Sines and Law of Cosines.	
Stage One—Desired Results	
Established Goals: (Standards of Learning, Content Standards)	
<ol style="list-style-type: none">1. Use Law of Sines and Cosines to solve oblique triangles2. Find the area of an oblique triangle	

<p>Understandings:</p> <p>4. Law of Sines and Cosines can be used to real life problems involving oblique triangles</p>	<p>Essential Questions:</p> <ol style="list-style-type: none"> 1. How to use law of sines and law of cosines to solve oblique triangles. 2. How to find the area of an oblique triangles. 3. How to sketch graphs of rational functions.
Stage Two—Assessment Evidence	
<p>Performance Tasks:</p>	
<p>Other Evidence: :(quizzes, tests and so on)</p>	
Stage Three—Learning Plan	

Unit 7: Sequence, Series, and Probability

Brief Summary of Unit	
<p>Students will learn how to use sequence, factorial and summation notation that will be needed in Calculus. They will also learn how to manipulate arithmetic and geometric sequences as well as learn basic counting principles and probability techniques.</p>	
Stage One—Desired Results	
<p>Established Goals: (Standards of Learning, Content Standards)</p> <ol style="list-style-type: none"> 1. Use counting principles, permutations, and combinations to solve problems. 2. Find the probability of Mutually Exclusive, Union of 2, Independent, and Dependent events. 3. Find the complement of an event. 4. Use the rules of probabilities to compute the probabilities of compound events 5. Recognize that sequences are functions sometimes defined recursively, whose domain is a subset of the integers 6. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations and translate between the two forms. 7. Use the formulas for the sum of finite arithmetic and geometric series 	
<p>Understandings:</p> <ol style="list-style-type: none"> 1. Counting principles can be used to solve counting problems that occur in real life. 2. Probability can be used to solve many problems that occur in real life. 3. Counting principle and probability formulas can make solving certain problems more manageable. 	<p>Essential Questions:</p> <ol style="list-style-type: none"> 1. How to use sequence, factorial, and summation notation to write the terms of a sum and sequence 2. How to recognize arithmetic and geometric sequences. 3. How to Use binomial theorem. 4. How to solve counting problems using the fundamental counting principle, permutation, and combinations. 5. How to find the probabilities of events and their complements.

Stage Two—Assessment Evidence	
Performance Tasks:	
Other Evidence: (quizzes, tests and so on)	
Stage Three—Learning Plan	