



# Gateway School District

## Curriculum Map

### High School (9-12)

Gateway High School  
3000 Gateway Campus Blvd.  
Monroeville, PA 15146  
412-373-5744

## Curriculum Map: Mathematics

**Course:** Algebra III and Trigonometry  
**Grade(s):** 11-12

### Unit 1: Relations, Functions and Their Graphs

Brief Summary of Unit	
<b>Stage One—Desired Results</b>	
<b>Established Goals:</b> (Standards of Learning, Content Standards)	
<ol style="list-style-type: none"><li>1. Find and use the slopes of lines to write and graph linear equations in two variables</li><li>2. Evaluate functions and find their domains</li><li>3. Analyze graphs of functions and as well as identify and graph transformations of functions</li><li>4. Find arithmetic combinations and compositions of functions</li><li>5. Find inverse functions graphically and algebraically</li><li>6. Write algebraic models for direct, inverse and joint variation</li><li>7. Fit a linear function for a scatterplot that suggests a linear association</li></ol>	
<b>Understandings:</b> <ol style="list-style-type: none"><li>1. <b>Equations can be used to model and solve real-life examples.</b></li><li>2. <b>Functions can be used as models to represent a wide variety of real-life data sets.</b></li></ol>	<b>Essential Questions:</b> <ol style="list-style-type: none"><li>1. How to sketch the graphs of equations.</li><li>2. How to find and the slopes of lines to write and graph linear equations in two variables.</li><li>3. How to evaluate functions and find their domains.</li><li>4. How to analyze graphs of functions.</li><li>5. How to identify and graph transformations of functions.</li><li>6. How to find arithmetic combinations and compositions functions.</li><li>7. How to find inverse functions graphically and algebraically.</li><li>8. How to write algebraic models for direct, inverse, and joint variation.</li></ol>

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

**Unit 2: Systems of Linear Equations and Inequalities**

<b>Brief Summary of Unit</b>	
<b>Stage One—Desired Results</b>	
<b>Established Goals:</b> (Standards of Learning, Content Standards)	
<ol style="list-style-type: none"> <li>1. Solve a linear system and a system of inequalities by graphing</li> <li>2. Solve a linear system using the substitution method</li> <li>3. Solve a linear system using the elimination method</li> <li>4. Solve problems using linear programming</li> <li>5. Identify a matrix element, classify the dimensions of a matrix</li> <li>6. Organize data into a matrix</li> <li>7. Add and subtract matrices, multiply matrices</li> <li>8. Perform scalar multiplication</li> <li>9. Solve a matrix equation</li> </ol>	
<b>Understandings:</b> <ol style="list-style-type: none"> <li>1. <b>The solution of a system of linear equations/inequalities can be found graphically or algebraically and is the point where the linear equations intersect.</b></li> <li>2. <b>Systems of linear equations/inequalities can model real world situations and solve complex problems.</b></li> <li>3. <b>Data can be organized and manipulated in matrices to solve complex problems.</b></li> </ol>	<b>Essential Questions:</b> <ol style="list-style-type: none"> <li>1. How does representing functions graphically help you solve a system of equations?</li> <li>2. How does writing equivalent equations help you solve a system of equations?</li> <li>3. How can you model data with a linear function?</li> </ol>
<b>Stage Two—Assessment Evidence</b>	
<b>Performance Tasks:</b>	
<b>Other Evidence:</b> :(quizzes, tests and so on)	
<b>Stage Three—Learning Plan</b>	

### Unit 3: Nature of Graphs

Brief Summary of Unit	
<b>Stage One—Desired Results</b>	
<b>Established Goals:</b> (Standards of Learning, Content Standards)	
<ol style="list-style-type: none"><li>1. Find the Inverse of Functions;</li><li>2. Graph functions and their inverses</li><li>3. Determine whether a function is continuous or discontinuous.</li><li>4. Describe the end behavior of a function.</li><li>5. Determine whether a function is increasing or decreasing over an interval.</li><li>6. Classify and name the extrema of a function.</li><li>7. Determine the critical points of a function.</li><li>8. Graph rational functions; and determine vertical, horizontal and slant asymptotes</li><li>9. Solve problems involving direct, inverse, and joint variation.</li><li>10. Find the constant of variation.</li></ol>	
<b>Understandings:</b>	<b>Essential Questions:</b>
<ol style="list-style-type: none"><li>1. <b>The inverse of a function may not necessarily be a function.</b></li><li>2. <b>The inverse of a relation is the reflection of the original graph over the line <math>y = x</math>.</b></li><li>3. <b>Linear and quadratic functions are continuous at all points.</b></li><li>4. <b>Graphs can have more than one maximum or minimum.</b></li><li>5. <b>Direct variation can be used to solve distance problems</b></li></ol>	<ol style="list-style-type: none"><li>1. Why is the inverse of a relation a reflection of the original graph over the line <math>y=x</math>?</li><li>2. What makes a function continuous?</li><li>3. How do you determine the maximum and minimum of a function?</li></ol>
<b>Stage Two—Assessment Evidence</b>	
<b>Performance Tasks:</b>	
<b>Other Evidence:</b> :(quizzes, tests and so on)	
<b>Stage Three—Learning Plan</b>	

### Unit 4: Polynomials and Rational Functions

Brief Summary of Unit
<b>Stage One—Desired Results</b>
<b>Established Goals:</b> (Standards of Learning, Content Standards)

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<b>Understandings:</b> <ol style="list-style-type: none"> <li>1. <b>Equations can be used to model and solve real-world examples.</b></li> <li>2. <b>Why some solutions are extraneous.</b></li> <li>3. <b>How the leading coefficient and the degree of a polynomial can determine the number of roots of an equation</b></li> </ol>	<b>Essential Questions:</b> <ol style="list-style-type: none"> <li>1. How to write equations to model real-world situations?</li> <li>2. What makes a solution extraneous?</li> <li>3. How to determine the number and types of roots of a polynomial equation?</li> </ol>
<b>Stage Two—Assessment Evidence</b>	
<b>Performance Tasks:</b>	
<b>Other Evidence:</b> :(quizzes, tests and so on)	
<b>Stage Three—Learning Plan</b>	

## Unit 5: Trigonometry

<b>Brief Summary of Unit</b>	
<b>Stage One—Desired Results</b>	
<b>Established Goals:</b> (Standards of Learning, Content Standards)	
<ol style="list-style-type: none"> <li>1. Describe an angle and convert between radian and degree measure</li> <li>2. Identify a unit circle and its relationship to real numbers</li> <li>3. Evaluate trig functions of any angle and model periodic phenomena with trig functions</li> <li>4. Define trig ratios and solve problems involving right triangles</li> <li>5. Find the area of triangles</li> </ol>	
<b>Understandings:</b> <ol style="list-style-type: none"> <li>1. <b>You can use angles to model and solve real-life applications.</b></li> <li>2. <b>Trig functions are used to analyze real life situations.</b></li> <li>3. <b>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.</b></li> </ol>	<b>Essential Questions:</b> <ol style="list-style-type: none"> <li>1. How do you use angles to model real world applications?</li> <li>2. Where are trig functions used to analyze real world situations?</li> <li>3. How triangles are used to create structural integrity in bridges?</li> </ol>
<b>Stage Two—Assessment Evidence</b>	

<b>Performance Tasks:</b>
<b>Other Evidence:</b> :(quizzes, tests and so on)
<b>Stage Three—Learning Plan</b>

**Unit 6: Graphs of Trigonometric Functions**

<b>Brief Summary of Unit</b>	
<b>Stage One—Desired Results</b>	
<b>Established Goals:</b> (Standards of Learning, Content Standards)	
<ol style="list-style-type: none"> <li>1. Describe an angle and convert between radian and degree measure</li> <li>2. Translate sine and cosine functions</li> <li>3. Graphing trig functions identifying amplitude and periods</li> <li>4. Identify trigonometric inverses and their graphs</li> </ol>	
<b>Understandings:</b>	<b>Essential Questions:</b>
<ol style="list-style-type: none"> <li>1. <b>Graphs of trigonometric functions can be used to model real-world functions.</b></li> </ol>	<ol style="list-style-type: none"> <li>1. How to sketch the graph of trig functions and translation of sine and cosine functions.</li> <li>2. How to evaluate trig functions</li> <li>3. How to describe an angle and convert between radian and degree measure.</li> </ol>
<b>Stage Two—Assessment Evidence</b>	
<b>Performance Tasks:</b>	
<b>Other Evidence:</b> :(quizzes, tests and so on)	
<b>Stage Three—Learning Plan</b>	

**Unit 7: Exponential and Logarithmic Function.**

<b>Brief Summary of Unit</b>
<b>Stage One—Desired Results</b>

**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 8: Sequence, Series, and Probability

### Brief Summary of Unit

#### Stage One—Desired Results

**Established Goals:** (Standards of Learning, Content Standards)

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

**Understandings:**

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.**

**Essential Questions:**

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