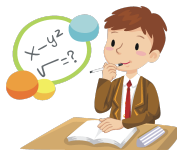


# Glen Ridge Public Schools –Mathematics Curriculum



**Course Title: Algebra II College Prep**

**Subject: Mathematics**

**Grade Level:10/11**

**Duration: Full-year**

**Prerequisites: Algebra I and Geometry**

**Elective or Required: Elective**

## **Mathematics Mission Statement**

Mathematics is an integral part of our lives. Students must be actively involved in their mathematics education through the use of modeling and demonstrating the ability to persevere through problem solving. The mathematics curricula will emphasize critical thinking skills through a balance of logic and reasoning, attention to precision by utilizing patterns and structure, and bridging these ideas to cross-curricular learning. Students will be engaged and challenged in a student-centered learning environment that is developmentally appropriate and will communicate mathematical ideas, both in a verbal and written form. Through effectively applying hands-on manipulatives, basic computation skills and the use of technical writing to justify their processes, students will critique the work of themselves and others.

**Course Description:** This course extends algebraic and geometric concepts after Algebra I and Geometry courses. The course develops advanced algebra skills with graphing, transformations and applications themes throughout each unit. In this context, the following function types are studied: quadratic equations and inequalities with imaginary and complex numbers, polynomial functions, exponential and logarithmic functions, rational and radical functions, piecewise functions, inverse functions and trigonometric functions.

**Author:**Kimberly Burk

**Date Submitted:** Summer 2017

**Algebra II College Prep**  
**Topic/Unit: Function Foundations**

**Approximate # Of Weeks: 1 week**

**Essential Questions:**

1. How does a function express a mathematical relationship between two related variables?
2. How can patterns, relations, and functions be used as tools to best describe and help explain real-life situations?
3. How can you describe parent functions symbolically and graphically?
4. How does graphing an equation make it easier to draw conclusions?
5. How can one operate with functions algebraically and efficiently?
6. What is domain and range?

**Upon completion of this unit students will be able to:**

- Understand and identify the key parent functions by looking at a graph and an equation
- Evaluate, add, subtract, multiply and divide functions using function notation
- Compose functions using function notation
- Find the domain and range of parent functions

NJCCS:

CC.9-12.F.BF.1,3

CC.9-12.F.IF.5

CC.9-12.A.CED.2

CC.9-12.A.CED.3

**Interdisciplinary Standards (njcccs.org)**

- Standard 5.1 – Science Practices
- Standard 8.1--Computer and Information Literacy
- Standard 8.2 – Technology Education
- Standard 9.1 – 21st - Century Life & Career Skills
- Standard 9.3 – Career Awareness, Exploration, and Preparation

**Activities – include 21<sup>st</sup> Century Technologies:**

- TI-Calculator discovery activities
- Desmos/Geogebra--online graphing calculator exploration
- Smart notebook lessons
- Class Discussion

- Khan Academy
- Youtube videos

**Enrichment Activities:**

- College Entrance Exam Practice
- Practice A&B (online text)
- Kuta worksheets
- Teachers Pay Teachers activities

**Methods of Assessments/Evaluation:**

- Thumbs up/down
- Think-pair-share
- Dry erase response
- Kahoot
- Homework
- Graded classwork
- Partner activities
- Google Classroom exit ticket/question
- Chapter Test
- Individual problem assessment during lesson
- Graphing calculator check
- Self-Assessment (4-3-2-1)
- Open-ended question

**Resources/Including Online Resources**

- Online Textbook Information: [my.hrw.com](http://my.hrw.com)
- Google Classroom
- Khan Academy
- Desmos
- TI-84 Graphing calculator
- youtube channel: YayMath and others
- Geogebra

## Topic/Unit: Quadratic Functions

Approximate # Of Weeks: 8 weeks

### Essential Questions:

1. How are the multiple representations of quadratic functions related?
2. What are the roles of  $a$ ,  $h$ , and  $k$  when graphing a parabola?
3. What real life relationships are best modeled by quadratic equations?
4. Where do I find the solutions (if there are any) of a quadratic equation when looking at a graph?
5. How can we express complex numbers?
6. What does it mean if the zeros of a parabola are complex numbers?
7. How do complex numbers fit with the Real number system? With imaginary numbers?
8. When are inequalities more appropriate than equations in describing a situation?

### Upon completion of this unit students will be able to:

- Using transformations to graph quadratic functions.
- Recognize quadratic functions in both standard and vertex form.
- Solving quadratic equations by graphing.
- Solving quadratic equation by factoring.
- Solving quadratic equation by completing the square.
- Convert from standard form to vertex form by completing the square
- Define the imaginary number,  $i$
- Operate with complex numbers and square roots.
- Solve quadratic equations for real and complex zeros using the square root method.
- Solve quadratic equations by using quadratic formula.
- Solve a quadratic inequality in 1 and 2 variables by tables, graphs, and algebra
- Apply quadratic regression to a set of data to find the function algebraically, graphically
- To make predictions from a regression equation and graph

### NJCCS:

CC.9-12.A.CED.1  
CC.9-12.A.CED.2  
CC.9-12.A.CED.3  
CC.9-12.F.IF.5  
CC.9-12.F.IF.7

CC.9-12.F.IF.8  
CC.9-12.F.BF.3,7,8  
CC.9-12.A.REI.11  
CC.9-12.N.CN.1  
CC.9-12.N.CN.2  
CC.9-12.N.CN.7

### **Interdisciplinary Standards (njcccs.org)**

- Standard 5.1 – Science Practices
- Standard 8.1--Computer and Information Literacy
- Standard 8.2 – Technology Education
- Standard 9.1 – 21st - Century Life & Career Skills
- Standard 9.3 – Career Awareness, Exploration, and Preparation

### **Activities – include 21<sup>st</sup> Century Technologies:**

- SmartBoard lessons
- Lecture and class discussion
- Technology Lab – Explore Parameter Changes
- Technology Lab – Explore Graphs and Factors
- Connecting Algebra to Previous Courses – Factoring Quadratic Expressions
- Textbook Activity – Quadratic Functions and Complex Numbers
- Textbook Activity – Applying Quadratic Functions
- TI-Calculator Activity – Using Transformations to Graph Quadratic Functions
- TI-Calculator Activity – Properties of Quadratic Functions in Standard Form
- TI-Calculator Activity – Finding Minimum or Maximum Values
- TI-Calculator Activity – Finding Roots and Zeros Using Tables and Graphs
- TI-Calculator Activity – Curve Fitting with Quadratic Models
- Desmos/Geogebra online graphing explorations
- Khan Academy
- Youtube videos

### **Enrichment Activities:**

- College Entrance Exam Practice
- Practice A&B (online text)
- Kuta worksheets
- Teachers Pay Teachers various activities

### **Methods of Assessments/Evaluation:**

- Verbal Assessment
- Open Ended Questions
- Online Quizzes
- Homework
- Quizzes

- Check it Out Problems (questions during lecture)
- Thumbs up/down
- Think-pair-share
- Dry erase response
- Kahoot
- Graded classwork
- Partner activities
- Google Classroom exit ticket/question
- Chapter Test
- Individual problem assessment during lesson
- Graphing calculator check
- Self-Assessment (4-3-2-1)

### **Resources/Including Online Resources**

- Online Textbook Information: [my.hrw.com](http://my.hrw.com)
- Google Classroom
- Khan Academy
- Desmos
- TI-84 Graphing calculator
- youtube channel: YayMath and others
- Geogebra

## **Topic/Unit: Polynomial Functions**

**Approximate # Of Weeks: 8 weeks**

### **Essential Questions:**

- 1. What are the polynomial functions and how do you graph them?**
- 2. How can we find solutions for polynomial functions?**
- 3. What is the relationship between polynomial division and the Remainder and Factor Theorems?**
- 4. How do you graph factorable polynomial functions?**
- 5. How can you find zeros of polynomial functions?**
- 6. How are the zeros of the polynomial function, the factors of the polynomial, and the solution to the polynomial related?**
- 7. How can you use polynomial functions to model and solve real-world problems?**

### **Upon completion of this unit students will be able to:**

- Identify, evaluate, add, and subtract polynomials
- Classify and graph polynomials
- Multiply polynomials

- Use long division and synthetic division to divide polynomials
- Use the Remainder Theorem to evaluate a polynomial and to identify the zeros
- Use the Factor Theorem to determine factors of a polynomial
- Identify the multiplicity of roots and their effect on the graph
- Use the Rational Root Theorem to solve polynomial equations
- Use the Fundamental Theorem of Algebra and its corollary to write a polynomial equation of least degree with given roots
- Identify all roots of a polynomial equation, real and imaginary
- Use properties of end behavior to analyze, describe, and graph polynomial functions
- Identify and use relative maxima and minima of polynomial functions to solve problems
- Transform polynomial functions
- Use technology and regression to find polynomial models for a given set of data

### **NJCCS:**

CC.9-12.A.APR.1  
 CC.9-12.A.APR.2  
 CC.9-12.A.APR.3  
 CC.9-12.A.APR.4  
 CC.9-12.A.APR.5  
 CC.9-12.A.APR.6  
 CC.9-12.CED.1  
 CC.9-12.CED.2  
 CC.9-12.CED.3  
 CC.9-12.F.IF.4  
 CC.9-12.F.IF.7  
 CC.9-12.F.BF.3  
 CC.9-12.N.CN.7  
 CC.9-12.N.CN.8  
 CC.9-12.N.CN.9  
 CC.9-12.A.SSE.2  
 CC.9-12.A.REI.11

### **Interdisciplinary Standards (njcccs.org)**

- Standard 5.1 – Science Practices
- Standard 8.1 -- Computer and Information Literacy
- Standard 8.2 – Technology Education
- Standard 9.1 – 21st - Century Life & Career Skills
- Standard 9.3 – Career Awareness, Exploration, and Preparation

### **Activities – include 21<sup>st</sup> Century Technologies:**

- SmartBoard lessons

- Lecture and class discussion
- Textbook Activity – Operations with Polynomials
- Textbook Activity – Applying Polynomial Functions
- TI-Calculator Activity – Graphing Higher Degree Polynomials
- TI-Calculator Activity--Identifying End Behavior
- TI-Calculator Activity – Identifying Multiplicity
- TI-Calculator Activity – Identify all Real Roots
- TI-Calculator Activity – Transforming Polynomial Functions
- TI-Calculator Activity – Curve Fitting with Polynomial Models
- Desmos/Geogebra online graphing exploration
- Khan Academy
- Youtube videos

#### **Enrichment Activities:**

- College Entrance Exam Practice
- Connecting Algebra to Number Theory--Pascal's Triangle
- Practice A&B (online text)
- Kuta worksheets
- Teachers Pay Teachers various activities

#### **Methods of Assessments/Evaluation:**

- Verbal Assessment
- Open Ended Questions
- Online Quizzes
- Homework
- Quizzes
- Check it Out Problems (questions during lecture)
- Thumbs up/down
- Think-pair-share
- Dry erase response
- Kahoot
- Graded classwork
- Partner activities
- Google Classroom exit ticket/question
- Chapter Test
- Individual problem assessment during lesson
- Graphing calculator check
- Self-Assessment (4-3-2-1)

#### **Resources/Including Online Resources**

- Online Textbook Information: [my.hrw.com](http://my.hrw.com)
- Google Classroom
- Khan Academy
- Desmos
- TI-84 Graphing calculator



- youtube channel: YayMath and others
- Geogebra

## **Topic/Unit: Rational Functions**

**Approximate # Of Weeks: 4 weeks**

### **Essential Questions:**

- 1. How can you graph a functions of the form  $f(x)=(bx+c)/dx+e$ ?**
- 2. What methods are there for simplifying rational expressions?**
- 3. What methods are there for solving rational equations?**

### **Upon completion of this unit students will be able to:**

- Simplify rational expressions
- Multiply and divide rational expressions
- Add and subtract rational expressions
- Simplify complex fractions
- Graph rational functions as transformation of  $f(x) = 1/x$  and  $f(x) = p(x)/h(x)$ , where p and h are both polynomials
- Identify the zeros, holes and asymptotes of a rational function by the graph, table and algebraically
- Solve rational equations

### **NJCCS:**

CC.9-12.A.CED.1  
 CC.9-12.A.CED.2  
 CC.9-12.A.CED.3  
 CC.9-12.A.APR.7  
 CC.9-12.A.REI.11  
 CC.9-12.F.IF.5  
 CC.9-12.F.IF.7

### **Interdisciplinary Standards (njcccs.org)**

- Standard 5.1 – Science Practices
- Standard 8.1 -- Computer and Information Literacy
- Standard 8.2 – Technology Education
- Standard 9.1 – 21st - Century Life & Career Skills
- Standard 9.3 – Career Awareness, Exploration, and Preparation

**Activities – include 21<sup>st</sup> Century Technologies:**

- SmartBoard lessons
- Lecture and class discussion
- Technology Lab – Explore Holes in Graphs
- Textbook Activity – Rational Functions
- TI-Calculator Activity – Rational Functions
- Desmos/Geogebra online graphing explorations
- Khan Academy

**Enrichment Activities:**

- College Entrance Exam Practice
- Practice A&B (online text)
- Kuta worksheets
- Teachers Pay Teachers various activities

**Methods of Assessments/Evaluation:**

- Verbal Assessment
- Open Ended Questions
- Online Quizzes
- Homework
- Quizzes
- Check it Out Problems (questions during lecture)
- Thumbs up/down
- Think-pair-share
- Dry erase response
- Kahoot
- Graded classwork
- Partner activities
- Google Classroom exit ticket/question
- Chapter Test
- Individual problem assessment during lesson
- Graphing calculator check
- Self-Assessment (4-3-2-1)

**Resources/Including Online Resources**

- Online Textbook Information: [my.hrw.com](http://my.hrw.com)
- Google Classroom
- Khan Academy
- Desmos
- TI-84 Graphing calculator
- youtube channel: YayMath and others
- Geogebra

## **Topic/Unit: Radical Functions**

**Approximate # Of Weeks: 4 weeks**

### **Essential Questions:**

- 1. How can you graph transformations of the parent radical functions?**
- 2. How do you solve radical equations?**
- 3. How can you model real-life situations with radical functions?**

### **Upon completion of this unit students will be able to:**

- Rewrite radical expressions by using rational exponents
- Simplify and evaluate radical expressions and expressions containing rational exponents
- Graph radical functions and inequalities
- Transform radical functions by changing parameters
- Solve radical equations and inequalities

### **NJCCS:**

CC.9-12.A.CED.1  
CC.9-12.A.CED.2  
CC.9-12.A.CED.3  
CC.9-12.A.APR.7  
CC.9-12.A.REI.11  
CC.9-12.F.IF.5  
CC.9-12.F.IF.7

### **Interdisciplinary Standards (njcccs.org)**

- Standard 5.1 – Science Practices
- Standard 8.1 -- Computer and Information Literacy
- Standard 8.2 – Technology Education
- Standard 9.1 – 21st - Century Life & Career Skills
- Standard 9.3 – Career Awareness, Exploration, and Preparation

### **Activities – include 21<sup>st</sup> Century Technologies:**

- SmartBoard powerpoint presentations
- Lecture and class discussion
- Radical Bingo
- TI-Calculator Activity – Radical Functions
- Desmos/Geogebra online graphing explorations
- Khan Academy

- Youtube videos
- Extension – Solving Equations Graphically

**Enrichment Activities:**

- College Entrance Exam Practice
- Practice A&B (online text)
- Kuta worksheets
- Teachers Pay Teachers various activities

**Methods of Assessments/Evaluation:**

- Verbal Assessment
- Open Ended Questions
- Online Quizzes
- Homework
- Quizzes
- Check it Out Problems (questions during lecture)
- Thumbs up/down
- Think-pair-share
- Dry erase response
- Kahoot
- Graded classwork
- Partner activities
- Google Classroom exit ticket/question
- Chapter Test
- Individual problem assessment during lesson
- Graphing calculator check
- Self-Assessment (4-3-2-1)

**Resources/Including Online Resources**

- Online Textbook Information: [my.hrw.com](http://my.hrw.com)
- Google Classroom
- Khan Academy
- Desmos
- TI-84 Graphing calculator
- youtube channel: YayMath and others
- Geogebra

**Topic/Unit: Exponential Functions and Logarithms**

**Approximate # Of Weeks: 6 weeks**

**Essential Questions:**

1. What are the characteristics of an exponential function?
2. How does changing the values of  $a$ ,  $h$ , and  $k$  affect the graph of an exponential growth/decay function?
3. How does the value of  $c$  in  $f(x) = b^{cx}$  affect the graph of  $f(x)$ ?
4. How does the graph of  $f(x) = e^x$  compare to graphs of exponential functions with other bases?
5. What methods can you use to solve exponential and logarithmic equations?
6. What are the characteristics of logarithmic functions?
7. How does changing the values of  $a$ ,  $h$ , and  $k$  affect the graph of  $f(x) = a \log_b(x-h) + k$ ?

**Upon completion of this unit students will be able to:**

- Write, evaluate and graph exponential expressions to model growth and decay situations and percent increase/decrease
- Find inverses of relations and functions
- Graph inverses of functions
- Write exponential expressions in logarithmic form and vice versa
- Use properties to simplify logarithmic expressions
- Translate between logarithms in any base
- Solve exponential equations by getting the same base
- Solve exponential equations by logging both sides
- Solve real-world problems involving exponential equations
- Write and graph exponential functions using natural base,  $e^x$
- To use the natural base to solve real-world problems
- Solve equations and problems involving  $e$  or natural logarithms
- Transform exponential and logarithmic functions by changing parameters
- Model data by using exponential and logarithmic functions
- Use exponential and logarithmic models to analyze and predict

**NJCCCS:**

CC.9-12.A.CED.1  
CC.9-12.A.CED.2  
CC.9-12.A.CED.3  
CC.9-12.F.IF.5  
CC.9-12.F.IF.7  
CC.9-12.F.IF.8  
CC.9-12.F.BF.3  
CC.9-12.F.BF.4  
CC.9-12.A.REI.11  
CC.9-12.F.LE.4

**Interdisciplinary Standards (njcccs.org)**

- Standard 5.1 – Science Practices

- Standard 8.1 -- Computer and Information Literacy
- Standard 8.2 – Technology Education
- Standard 9.1 – 21st - Century Life & Career Skills
- Standard 9.3 – Career Awareness, Exploration, and Preparation

**Activities – include 21<sup>st</sup> Century Technologies:**

- SmartBoard lessons
- Lecture and class discussion
- Technology Lab – Explore Inverses of Functions
- TI-Calculator Activity – Exponential Functions, Growth and Decay
- TI-Calculator Activity – Inverses of Relations and Functions
- TI-Calculator Activity – Logarithmic Functions
- TI-Calculator Activity – Transforming Exponential and Logarithmic Functions
- TI-Calculator Activity – Curve Fitting with Exponential and Logarithmic Models
- Desmos/Geogebra online graphing explorations
- khan academy
- Youtube videos

**Enrichment Activities:**

- College Entrance Exam Practice
- Practice A&B (online text)
- Kuta worksheets
- Teachers Pay Teachers various activities

**Methods of Assessments/Evaluation:**

- Verbal Assessment
- Open Ended Questions
- Online Quizzes
- Homework
- Quizzes
- Check it Out Problems (questions during lecture)
- Thumbs up/down
- Think-pair-share
- Dry erase response
- Kahoot
- Graded classwork
- Partner activities
- Google Classroom exit ticket/question
- Chapter Test
- Individual problem assessment during lesson
- Graphing calculator check
- Self-Assessment (4-3-2-1)

**Resources/Including Online Resources**

- Online Textbook Information: my.hrw.com
- Google Classroom
- Khan Academy
- Desmos
- TI-84 Graphing calculator
- youtube channel: YayMath and others
- Geogebra

### **Topic/Unit: Piecewise Functions and Other Function Attributes**

**Approximate # Of Weeks: 2 weeks**

#### **Essential Questions:**

1. **What problems can be solved using piecewise-defined functions?**
2. **What does it mean for functions to be inverses of one another? How can I define the inverse of a given function?**
3. **Can you perform operations including composition of functions, find inverses, and describe these procedures and results verbally, numerically, symbolically, and graphically?**
4. **How does average rate of change apply to real-world problems?**

#### **Upon completion of this unit students will be able to:**

- Estimate and compare rates of change
- Evaluate piecewise functions
- Graph piecewise functions
- Write piecewise functions for real-world situations
- Determine whether the inverse of a functions is a function
- Write rules for the inverses of functions and prove with function composition

#### **NJCCS:**

CC.9-12.A.CED.2

CC.9-12.A.CED.3

CC.9-12.F.BF.1

CC.9-12.F.BF.3

CC.9-12.F.IF.7

#### **Interdisciplinary Standards (njcccs.org)**

- Standard 5.1 – Science Practices
- Standard 8.1 -- Computer and Information Literacy
- Standard 8.2 – Technology Education
- Standard 9.1 – 21st - Century Life & Career Skills
- Standard 9.3 – Career Awareness, Exploration, and Preparation

**Activities – include 21<sup>st</sup> Century Technologies:**

- SmartBoard lessons
- Lecture and class discussion
- Technology Lab – Graph Piecewise Functions
- Technology Lab – Explore Symmetry
- TI-Calculator Activity – Multiple Representations of Functions
- TI-Calculator Activity – Comparing Functions
- TI-Calculator Activity – Piecewise Functions
- TI-Calculator Activity – Functions and Their Inverses
- Desmos/Geogebra online graphing exploration
- Khan Academy
- Youtube videos

**Enrichment Activities:**

- College Entrance Exam Practice
- Practice A&B (online text)
- Kuta worksheets
- Teachers Pay Teachers various activities

**Methods of Assessments/Evaluation:**

- Verbal Assessment
- Open Ended Questions
- Online Quizzes
- Homework
- Quizzes
- Check it Out Problems (questions during lecture)
- Thumbs up/down
- Think-pair-share
- Dry erase response
- Kahoot
- Graded classwork
- Partner activities
- Google Classroom exit ticket/question
- Chapter Test
- Individual problem assessment during lesson
- Graphing calculator check
- Self-Assessment (4-3-2-1)

**Resources/Including Online Resources**

- Online Textbook Information: [my.hrw.com](http://my.hrw.com)
- Google Classroom
- Khan Academy
- Desmos
- TI-84 Graphing calculator
- youtube channel: YayMath and others
- Geogebra



## Topic/Unit: Trigonometric Functions

Approximate # Of Weeks: 4 weeks

### Essential Questions:

1. What strategies can we use to find missing angles and sides in a right triangle?
2. What strategies can we use to find missing angles and sides in ANY triangle?
3. What is the unit circle?
4. What do the graphs of the trigonometric functions look like?

### Upon completion of this unit students will be able to:

- Find the sine, cosine, tangent, cosecant, secant and cotangent of an acute angle in a right triangle
- Find side lengths in a right triangle using the 6 trigonometric functions
- Draw angles in standard position in the coordinate plane
- Determine the values of the 6 trig functions for any angle in standard position
- Convert angles from degrees to radian measure and vice versa
- Find the values of sine, cosine and tangent of the special angles in the unit circle.
- Evaluate the inverse trigonometric functions to find an angle
- Use the Law of Sines to find side lengths and angle measures in any triangle
- Use the Law of Cosines to find side lengths and angle measures in any triangle
- Graph the sine and cosine functions
- Graph transformations of sine and cosine functions in the form  $y=a \sin/\cos bx$

### NJCCCS

CC9-12.G.SRT.10

CC9-12.F.TF.2

CC9-12.F.TF.3

CC9-12.F.TF.6

CC9-12.F.IF.7

CC9-12.F.IF.5

### Interdisciplinary Standards ([njcccs.org](http://njcccs.org))

- Standard 5.1 – Science Practices

- Standard 8.1 -- Computer and Information Literacy
- Standard 8.2 – Technology Education
- Standard 9.1 – 21st - Century Life & Career Skills
- Standard 9.3 – Career Awareness, Exploration, and Preparation

**Activities – include 21<sup>st</sup> Century Technologies:**

- SmartBoard lessons
- Lecture and class discussion
- Trigonometry Bee
- Build the Unit circle activity
- TI-84 graphing calculator discovery lesson--Graphs and Transformations of Sine and Cosine
- Desmos/Geogebra online graphing explorations
- Khan Academy
- Youtube videos

**Enrichment Activities:**

- College Entrance Exam Practice
- Practice A and B worksheets
- Kuta worksheet
- TeachersPayTeachers various activities

**Methods of Assessments/Evaluation:**

- Verbal Assessment
- Open Ended Questions
- Online Quizzes
- Homework
- Quizzes
- Check it Out Problems (questions during lecture)
- Thumbs up/down
- Think-pair-share
- Dry erase response
- Kahoot
- Graded classwork
- Partner activities
- Google Classroom exit ticket/question
- Chapter Test
- Individual problem assessment during lesson
- Graphing calculator check
- Self-Assessment (4-3-2-1)

**Resources/Including Online Resources**

- Online Textbook Information: [my.hrw.com](http://my.hrw.com)
- Google Classroom
- Khan Academy

- Desmos
- TI-84 Graphing calculator
- youtube channel: YayMath and others
- Geogebra

**Attachment: Unit Scales for Student Self-Assessment**

**Topic/Unit: Function Foundations**

**Essential Questions:**

1. How does a function express a mathematical relationship between two related variables?
2. How can patterns, relations, and functions be used as tools to best describe and help explain real-life situations?
3. How can you describe parent functions symbolically and graphically?
4. How does graphing an equation make it easier to draw conclusions?
5. How can one operate with functions algebraically and efficiently?
6. What is domain and range?

<u>Level of Learning</u>	<u>Objectives</u>	<u>Student Assessment</u> 4: I can teach others 3: I can pass an assessment on this topic 2: I'm getting there but need more practice 1: I still don't understand
1	<ul style="list-style-type: none"> <li>• Understand and identify the key parent functions by looking at a graph and an equation</li> </ul>	
2	<ul style="list-style-type: none"> <li>• Evaluate, add, subtract, multiply and divide functions using function notation</li> </ul>	
3	<ul style="list-style-type: none"> <li>• Compose functions using function notation</li> </ul>	
4	<ul style="list-style-type: none"> <li>• Find the domain and range of parent functions</li> </ul>	

**Topic/Unit: Quadratic Functions**

**Essential Questions:**

1. How are the multiple representations of quadratic functions related?
2. What are the roles of  $a$ ,  $h$ , and  $k$  when graphing a parabola?
3. What real life relationships are best modeled by quadratic equations?
4. Where do I find the solutions (if there are any) of a quadratic equation when looking at a graph?
5. How can we express complex numbers?
6. What does it mean if the zeros of a parabola are complex numbers?
7. How do complex numbers fit with the Real number system? With imaginary numbers?
8. When are inequalities more appropriate than equations in describing a situation?

<u>Level of Learning</u>	<u>Objectives</u>	<u>Student Assessment</u> 4: I can teach others 3: I can pass an assessment on this topic 2: I'm getting there but need more practice 1: I still don't understand
1	<ul style="list-style-type: none"> <li>● Recognize quadratic functions in both standard and vertex form.</li> <li>● Define the imaginary number, <math>i</math></li> </ul>	
2	<ul style="list-style-type: none"> <li>● Using transformations to graph quadratic functions.</li> <li>● Operate with complex numbers and square roots.</li> </ul>	
3	<ul style="list-style-type: none"> <li>● Apply quadratic regression to a set of data to find the function algebraically, graphically</li> <li>● To make predictions from a regression equation and graph</li> </ul>	
4	<ul style="list-style-type: none"> <li>● Solving quadratic equations by graphing.</li> <li>● Solving quadratic equation by factoring.</li> <li>● Solving quadratic equation by completing the square</li> </ul>	

	<ul style="list-style-type: none"> <li>• Convert from standard form to vertex form by completing the square</li> <li>• Solve quadratic equations for real and complex zeros using the square root method.</li> <li>• Solve quadratic equations by using quadratic formula.</li> <li>• Solve a quadratic inequality in 1 and 2 variables by tables, graphs, and algebra</li> </ul>	
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**Topic/Unit: Polynomial Functions**

**Essential Questions:**

1. What are the polynomial functions and how do you graph them?
2. How can we find solutions for polynomial functions?
3. What is the relationship between polynomial division and the Remainder and Factor Theorems?
4. How do you graph factorable polynomial functions?
5. How can you find zeros of polynomial functions?
6. How are the zeros of the polynomial function, the factors of the polynomial, and the solution to the polynomial related?
7. How can you use polynomial functions to model and solve real-world problems?

<u>Level of Learning</u>	<u>Objectives</u>	<u>Student Assessment</u> 4: I can teach others 3: I can pass an assessment on this topic 2: I'm getting there but need more practice 1: I still don't understand
1	<ul style="list-style-type: none"> <li>• Identify polynomials</li> <li>• Identify the multiplicity of roots and their effect on the graph</li> </ul>	
2	<ul style="list-style-type: none"> <li>• Evaluate, add, and subtract polynomials</li> <li>• Classify and graph polynomials</li> <li>• Multiply polynomials</li> </ul>	

	<ul style="list-style-type: none"> <li>• Use long division and synthetic division to divide polynomials</li> <li>• Transform polynomial functions</li> </ul>	
3	<ul style="list-style-type: none"> <li>• Use the Remainder Theorem to evaluate a polynomial and to identify the zeros</li> <li>• Use the Factor Theorem to determine factors of a polynomial</li> <li>• Use properties of end behavior to analyze, describe, and graph polynomial functions</li> <li>• Use technology and regression to find polynomial models for a given set of data</li> </ul>	
4	<ul style="list-style-type: none"> <li>• Use the Rational Root Theorem to solve polynomial equations</li> <li>• Use the Fundamental Theorem of Algebra and its corollary to write a polynomial equation of least degree with given roots</li> <li>• Identify all roots of a polynomial equation, real and imaginary</li> <li>• Identify and use relative maxima and minima of polynomial functions to solve problems</li> </ul>	

**Topic/Unit: Rational Functions**

**Essential Questions:**

1. How can you graph a functions of the form  $f(x)=(bx+c)/dx+e$ ?
2. What methods are there for simplifying rational expressions?
3. What methods are there for solving rational equations?

<u>Level of Learning</u>	<u>Objectives</u>	<u>Student Assessment</u>
1	<ul style="list-style-type: none"> <li>• None</li> </ul>	4: I can teach others 3: I can pass an assessment on this topic 2: I'm getting there but need more practice 1: I still don't understand

2	<ul style="list-style-type: none"> <li>• Simplify rational expressions</li> <li>• Multiply and divide rational expressions</li> <li>• Add and subtract rational expressions</li> <li>• Simplify complex fractions</li> <li>• Graph rational functions as transformation of <math>f(x) = 1/x</math> and <math>f(x) = p(x)/h(x)</math>, where p and h are both polynomials</li> </ul>	
3	<ul style="list-style-type: none"> <li>• Identify the zeros, holes and asymptotes of a rational function by the graph, table and algebraically</li> </ul>	
4	<ul style="list-style-type: none"> <li>• Solve rational equations</li> </ul>	

**Topic/Unit: Radical Functions**

**Essential Questions:**

1. How can you graph transformations of the parent radical functions?
2. How do you solve radical equations?
3. How can you model real-life situations with radical functions?

<u>Level of Learning</u>	<u>Objectives</u>	<u>Student Assessment</u> 4: I can teach others 3: I can pass an assessment on this topic 2: I'm getting there but need more practice 1: I still don't understand
1	<ul style="list-style-type: none"> <li>• Rewrite radical expressions by using rational exponents</li> </ul>	
2	<ul style="list-style-type: none"> <li>• Simplify and evaluate radical expressions and expressions containing rational exponents</li> <li>• Graph radical functions and inequalities</li> </ul>	
3	<ul style="list-style-type: none"> <li>• Transform radical functions by changing parameters</li> </ul>	
4	<ul style="list-style-type: none"> <li>• Solve radical equations and inequalities</li> </ul>	

## Topic/Unit: Exponential Functions and Logarithms

### Essential Questions:

1. What are the characteristics of an exponential function?
2. How does changing the values of  $a$ ,  $h$ , and  $k$  affect the graph of an exponential growth/decay function?
3. How does the value of  $c$  in  $f(x) = b^{cx}$  affect the graph of  $f(x)$ ?
4. How does the graph of  $f(x) = e^x$  compare to graphs of exponential functions with other bases?
5. What methods can you use to solve exponential and logarithmic equations?
6. What are the characteristics of logarithmic functions?
7. How does changing the values of  $a$ ,  $h$ , and  $k$  affect the graph of  $f(x) = a \log_b(x-h) + k$ ?

<u>Level of Learning</u>	<u>Objectives</u>	<u>Student Assessment</u> 4: I can teach others 3: I can pass an assessment on this topic 2: I'm getting there but need more practice 1: I still don't understand
1	<ul style="list-style-type: none"> <li>● Write exponential expressions to model growth and decay situations and percent increase/decrease</li> <li>● Use properties to simplify logarithmic expressions</li> <li>● Translate between logarithms in any base</li> </ul>	
2	<ul style="list-style-type: none"> <li>● Evaluate and graph exponential expressions to model growth and decay situations and percent increase/decrease</li> <li>● Find inverses of relations and functions</li> <li>● Graph inverses of functions</li> <li>● Write exponential expressions in logarithmic form and vice versa</li> <li>● Write and graph exponential functions using natural base, <math>e^x</math></li> </ul>	
3	<ul style="list-style-type: none"> <li>● Model data by using exponential and logarithmic functions</li> <li>● Use exponential and logarithmic models to analyze and predict</li> </ul>	



4	<ul style="list-style-type: none"> <li>● Solve exponential equations by getting the same base</li> <li>● Solve exponential equations by logging both sides</li> <li>● Solve real-world problems involving exponential equations</li> <li>● To use the natural base to solve real-world problems</li> <li>● Solve equations and problems involving <math>e</math> or natural logarithms</li> </ul>	
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**Topic/Unit: Piecewise Functions and Other Function Attributes**

**Essential Questions:**

1. What problems can be solved using piecewise-defined functions?
2. What does it mean for functions to be inverses of one another? How can I define the inverse of a given function?
3. Can you perform operations including composition of functions, find inverses, and describe these procedures and results verbally, numerically, symbolically, and graphically?
4. How does average rate of change apply to real-world problems?

<u>Level of Learning</u>	<u>Objectives</u>	<u>Student Assessment</u>
		4: I can teach others 3: I can pass an assessment on this topic 2: I'm getting there but need more practice 1: I still don't understand
1	<ul style="list-style-type: none"> <li>● None</li> </ul>	
2	<ul style="list-style-type: none"> <li>● Evaluate piecewise functions</li> <li>● Graph piecewise functions</li> <li>● Write rules for the inverses of functions and prove with function composition</li> </ul>	
3	<ul style="list-style-type: none"> <li>● Estimate and compare rates of change</li> <li>● Determine whether the inverse of a functions is a function</li> </ul>	
4	<ul style="list-style-type: none"> <li>● Write piecewise functions for real-world situations</li> </ul>	

## Topic/Unit: Trigonometric Functions

### Essential Questions:

1. What strategies can we use to find missing angles and sides in a right triangle?
2. What strategies can we use to find missing angles and sides in ANY triangle?
3. What is the unit circle?
4. What do the graphs of the trigonometric functions look like?

<u>Level of Learning</u>	<u>Objectives</u>	<u>Student Assessment</u> 4: I can teach others 3: I can pass an assessment on this topic 2: I'm getting there but need more practice 1: I still don't understand
1	<ul style="list-style-type: none"> <li>● Convert angles from degrees to radian measure and vice versa</li> </ul>	
2	<ul style="list-style-type: none"> <li>● Find the sine, cosine, tangent, cosecant, secant and cotangent of an acute angle in a right triangle</li> <li>● Evaluate the inverse trigonometric functions to find an angle</li> <li>● Find side lengths in a right triangle using the 6 trigonometric functions</li> <li>● Draw angles in standard position in the coordinate plane</li> <li>● Determine the values of the 6 trig functions for any angle in standard position</li> <li>● Graph the sine and cosine functions</li> </ul>	
3	<ul style="list-style-type: none"> <li>● Graph transformations of sine and cosine functions in the form <math>y=a \sin/\cos bx</math></li> <li>● Find the values of sine, cosine and tangent of the special angles in the unit circle.</li> </ul>	
4	<ul style="list-style-type: none"> <li>● Use the Law of Sines to find side lengths and angle measures in any triangle</li> <li>● Use the Law of Cosines to find side lengths and angle measures in any triangle</li> </ul>	

