

# MANCHESTER REGIONAL HIGH SCHOOL

HONORS ALGEBRA 2



Adopted August, 2012

Revised May, 2016

## **Manchester Regional High School District Mission Statement**

*The mission of Manchester Regional High School is to produce respectful, responsible and well-rounded graduates who possess the knowledge and skills to become contributing members of society and life-long learners.*

*Highly qualified, collaborative and innovative staff address the needs of a diverse school community in a stimulating and nurturing environment.*

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# MANCHESTER REGIONAL HIGH SCHOOL

## Honors Algebra 2

**Length of Course:** One School Year (180 Days)

**Periods Per Week:** Five

**Credits:** Five

**Grade Level:** 10 – 11

**Prerequisite:** Completion of Algebra 1 and Geometry (or taken in conjunction with Geometry)

### **Brief Summary of Curriculum (including curricular context and goals):**

#### **Course Description:**

Honors Algebra 2 is a second year course in Algebra. It is a continuation of Algebra 1 and assumes that the student has demonstrated a solid foundation of Algebra 1 topics (and Geometry topics, if completed). The purpose of this course is to further students' knowledge in this field of mathematics. The course begins with a review of Algebra 1 and continues with new topics. Some topics for discussion include linear and quadratic equations, systems of equations in 2 or 3 variables, inequalities, complex numbers, quadratic, cubic, polynomial, exponential, and logarithmic functions.

Honors Algebra 2 emphasizes graphical representations, real-life modeling, reasoning and technology as it develops critical thinking. The TI-83 Plus graphing calculator is used throughout this course as a problem-solving tool. Honors Algebra 2 provides connections within mathematics between data analysis, functions, algebra, geometry and trigonometry, and to other disciplines such as social studies, physical sciences, music and many more.

#### **Evaluation:**

The purposes of evaluation are to provide information about student progress and to determine whether students have learned the subject matter, which has been taught. Teachers will evaluate student progress by utilizing standardized tests, teacher-made quizzes and tests, oral questioning, class participation. Other evaluative criteria will include homework, special projects, special exams and other school records.

**Note:** The following pacing guide was developed during the creation of these curriculum units. The actual implementation of each unit may take more or less time. Time should also be dedicated to preparation for benchmark and State Assessments, and analysis of student results on the same. A separate document is included at the end of this curriculum guide with suggestions and resources related to State Assessments (if applicable). The material in this document should be integrated throughout the school year, and with an awareness of the State Testing Schedule. It is highly recommended that teachers meet throughout the school year to coordinate their efforts in implementing the curriculum and preparing students for benchmark and State Assessments in consideration of both the School and District calendars.

## **Course Goals:**

- The student will be able to complete written assignments, as determined by the teacher, to reinforce skills and concepts explained during class.
- The student will be able to understand the process of solving equations and inequalities with one variable and, where appropriate, represent solutions graphically.
- The student will be able to represent, order, and use numbers in a variety of equivalent forms.
- The student will be able to understand and apply the field properties of the complex numbers, including operations with complex numbers.
- The student will be able to understand the process of solving quadratic equations, systems of equations in two variables, and linear inequalities in two variables, as well as absolute value equations or inequalities.
- The student will be able to understand the concept and use of variables, mathematical vocabulary, and symbolic notation to represent and communicate ideas.
- The student will be able to formulate algebraic expressions and perform operations with the simplify polynomial, rational, and radical expressions, and expressions with rational exponents.
- The student will be able to use algebraic expressions to represent real-world situations.
- The student will be able to factor polynomial expressions.
- The student will be able to apply the concepts and skills of coordinate geometry, such as midpoint, distance, and slope. The student will be able to apply these concepts to represent and analyze the relationship among a table of values, and algebraic formula, a written statement, and a graph, including the line, parabola, and the circle.
- The student will be able to show understanding for operations on, and the general properties and behavior of functions.
- The student will be able to construct, interpret, and/or draw inferences from graphs, tables, and charts that reflect data from real-world situations.
- The student will be able to demonstrate understanding of the concept of finite and infinite relations and functions.

## **Proficiencies/Skills:**

Successful completion of the course will enable a student to:

- Solve equations using the properties of equality, strengthening the ability of translating from verbal to algebraic form and using diagrams and tables to solve word problems.
- Classify, add, subtract, multiply, divide, and use of the distributive property on polynomials and solve equations with polynomials.
- Applying various factoring techniques of polynomials to solving polynomial equations and word problems.
- Simplify, add, subtract, multiply, and divide radical expressions.
- Solve equations involving radicals of any index.
- Simplify and use the four basic operations on rational expressions.
- Discuss rational numbers as fractions and decimals, evaluating square roots, basic operations on radicals, and the geometric connection to the Pythagorean Theorem and distance formula.
- Formulate equations based on exponential and logarithmic functions, use a variety of methods to solve them and analyze the solutions in the terms of the situation.
- Explore the relationship between the geometric and algebraic descriptions of conic sections.

# Manchester Regional High School Curriculum Guide

## Content Area: Mathematics

**Course Title: Honors Algebra 2**

**Grade Level: 10 - 11**

### Unit 1: First Degree Equations and Inequalities

Chapter 1: Equations and Inequalities

≈ 13 days

Chapter 2: Linear Relations and Functions

≈ 19 days

### Unit 2: Systems of Equations and Inequalities

Chapter 3: Systems of Equations and Inequalities

≈ 13 days

### Unit 3: Quadratic and Polynomial Functions and Inequalities

Chapter 5: Quadratic Functions and Inequalities

≈ 36 days

Chapter 6: Polynomial Functions

≈ 39 days

### Unit 4: Radicals

Chapter 7: Radical Equations and Inequalities

≈ 28 days

### Unit 5: Advanced Functions and Relations

Chapter 8: Rational Expressions and Equations

≈ 19 days

Chapter 9: Exponential and Logarithmic Relations

≈ 13 days

### Unit 6: Conic Sections

Chapter 10: Conic Sections

If time permits

### Unit 7: Discrete Mathematics

Chapter 11: Sequences and Series

If time permits

Chapter 12: Probability and Statistics

If time permits

### Unit 8: Matrices

Chapter 4: Matrices

If time permits

### Unit 9: Trigonometry

Chapter 13: Trigonometric Functions

If time permits

Chapter 14: Trigonometric Graphs and Identities

If time permits

## Unit 0 Overview

**Content Area: Mathematics**

**Unit 0 Title: Preparing for Algebra**

**Target Course/Grade Level: Algebra 2**

### Unit Summary and Rationale

Students will be able to perform prerequisite skills for Algebra 2. Pre-testing will determine the specific needs for any group of students. Students will progress through review concepts based on their needs.

For Honors Algebra 2, a pre-test may establish areas of deficiency that can best be remediated during the appropriate units, rather than a separate unit before beginning the Algebra 2 curriculum.

### Interdisciplinary Connections

Science and Language Arts: journal writing; open-ended extended response questions.

### Technology Integration

TI-83 Plus Graphing Calculator and Promethean Board as available and/or appropriate

### 21<sup>st</sup> Century Themes

Global Awareness, Financial, Economic, Business and Entrepreneurial Literacy

### 21<sup>st</sup> Century Skills

Creativity/Innovation, Critical Thinking/Problem Solving, Life & Career Skills

### Learning Targets

#### Unit Proficiencies:

After completing this unit of study, the student will be able to:

1. Represent numbers and number operations.
2. Use grouping symbols
3. Evaluate variable expressions.
4. Evaluate expressions containing exponents.
5. Use order of operations to evaluate algebraic expressions.
6. Translate verbal phrases into algebraic expressions.

### Common Core Standards

#### Unit Essential Questions:

- How can change be best represented mathematically?
- How can patterns, relations, and functions be used as tools to best describe and help explain real-life situations?

## Unit 0 Overview (continued)

### Unit Enduring Understandings:

- The symbolic language of algebra is used to communicate and generalize the patterns in mathematics.
- Algebraic representation can be used to generalize patterns and relationships.

### Terminology

(for Unit Zero): (choose appropriate topics as needed) integer, positive and negative numbers, natural numbers, whole numbers, square root, principal square root, perfect square, irrational number, real number graph, coordinate, absolute value, opposites, additive inverse, multiplicative inverse, reciprocals, percent, percent proportion, perimeter, circle, diameter, circumference, center, radius, area, volume, surface area, measure of central tendency, mean, median, mode, measures of variation, range, quartiles, lower quartile, upper quartile, frequency table, bar graph, histogram, line graph, stem-and-leaf plot, circle graph, box- and-whisker plot, interquartile range, outliers

### Diverse Learners (ELL, Special Ed, Gifted & Talented)

Differentiation strategies may include, but are not limited to, learning centers and cooperative learning activities in either heterogeneous or homogeneous groups, depending on the learning objectives and the number of students that need further support and scaffolding, versus those that need more challenge and enrichment. Modifications may also be made as they relate to the special needs of students in accordance with their Individualized Education Programs (IEPs) or 504 plans, or English Language Learners (ELL). These may include, but are not limited to, extended time, copies of class notes, refocusing strategies, preferred seating, study guides, and/or suggestions from special education or ELL teachers.

### Resources

Algebra I Textbook, computerized and resource book worksheets based on algebra objectives

## Desired Results for Unit 1 First Degree Equations and Inequalities

**Content Area: Honors Algebra 2**

**Grade Level: 10 – 11**

**≈ 32 days**

### Established Goals

- Use tools to simplify expressions and to transform and solve equations.
- Use properties and attributes of functions and apply functions to problem situations.
- Use the necessary algebraic skills to solve equations and inequalities in problem situations.
- Show a comprehension of concepts of operations.
- Demonstrate the ability to carry out procedures accurately and efficiently.
- Demonstrate the ability to formulate, represent, and solve.
- Use logical thought, reflection, explanation, and justification.
- Be able to see math as relevant to the real world.

### Enduring Understandings

**Students will understand that:**

- The graph of an absolute value function is shaped like a “V” and is made up portions of two lines.
- Functions (linear and nonlinear) are a special type of relation where each value in the domain is paired with exactly one value in the range.
- A line on a graph can be represented by a linear equation. Forms of linear equations include the Slope-Intercept, Point-Slope, and Standard Forms.
- Solutions to a linear inequality in two variables can be shown as the set of all points on one side of a boundary line.
- Graphing can be used to find a line of regression.

### Essential Questions

- How are formulas used in real world problems?
- How is solving an inequality similar to solving an equation?
- How can you use the graph of an equation to graph an inequality?
- What can a line of regression be used for?

Desired Results for Unit 1: First Degree Equations and Inequalities (continued)

**Knowledge: Students will know how to... (*Acquisition*)**

- Apply formulas associated with slope.
- Classify real numbers.
- Solve equations.
- Solve compound and absolute value equations and inequalities.
- Analyze and graph relations.
- Find the slope of a line.
- Write and graph linear equations in standard form.
- Identify and graph special functions.
- Draw a line of regression.
- Identify and graph scatter-plots.
- Apply graphing calculator technology.

**Skills: Students will be able to... (*Transfer: independently demonstrate*)**

- Apply the properties of equality to solve equations.
- Solve absolute value equations.
- Define and describe the characteristics of functions.
- Formulate linear inequalities to solve problems.
- Determine the domain and range of functions using graphs, tables, and symbols.
- Analyze situations and formulate systems of equations.
- Interpret and determine the reasonableness of solutions to systems.
- Use functions and their properties to model and solve real life problems.
- Draw a scatterplot and identify the line of regression.

Desired Results for Unit 1: First Degree Equations and Inequalities (continued)

Evidence		
CCSS	Evaluative Criteria	Diagnostic Assessments
<ul style="list-style-type: none"> <li>• N-Q-1</li> <li>• N-Q-2</li> <li>• N-Q-3</li> <li>• A-SSE-1</li> <li>• A-SSE-1a</li> <li>• A-SSE-3</li> <li>• A-CED-1</li> <li>• A-CED-2</li> <li>• A-CED-3</li> <li>• A-CED-4</li> <li>• A-REI-1</li> <li>• A-REI-3</li> <li>• A-REI-10</li> <li>• A-REI-12</li> <li>• F-IF-1</li> <li>• F-IF-2</li> <li>• F-IF-5</li> <li>• F-IF-6</li> <li>• F-IF-7</li> <li>• F-IF-7a</li> <li>• F-BF-1</li> <li>• S-ID-7</li> <li>• S-ID-8</li> <li>• S-ID-9</li> </ul>	<ul style="list-style-type: none"> <li>• Conceptual understanding</li> <li>• Procedural fluency</li> <li>• Strategic competence</li> <li>• Adaptive reasoning</li> <li>• Productive disposition</li> </ul>	<p>Diagnostic assessments are used to determine students' readiness based upon required knowledge and skills, interests, and learning profiles.</p> <p><b>Performance Tasks:</b></p> <ul style="list-style-type: none"> <li>• Students will interpret slope as a rate of change given multiple stock market charts.</li> <li>• Have students create a scatterplot. Students will use the slope formula to find the equation of the line of best fit.</li> <li>• Have students define a variable, write an equation, and solve the problem.</li> <li>• Solve a linear equation of one variable and two variables. Explain the steps taken.</li> <li>• Graph a linear equation and explain the steps taken. (What does each point on the line represent?)</li> </ul> <p><b>Other Evidence:</b></p> <ul style="list-style-type: none"> <li>• Formative Assessments</li> <li>• Summative Assessments</li> <li>• Warm-Up Problems</li> <li>• Closure Questions</li> <li>• Chapter Vocabulary Builder</li> <li>• Graphic Organizers</li> <li>• Class Discussions</li> <li>• Classwork</li> <li>• Homework</li> <li>• Projects</li> </ul>

Desired Results for Unit 1: First Degree Equations and Inequalities (continued)

<b>Resources</b>	
<b>Core materials:</b>	<b>Supplemental materials:</b>
<ul style="list-style-type: none"> <li>• Textbook</li> <li>• Binder of Notes</li> </ul>	<ul style="list-style-type: none"> <li>• Resource Workbooks</li> <li>• Promethean Board</li> <li>• Scientific Calculators</li> <li>• Mini Whiteboards</li> <li>• TI-83 Plus Graphing Calculators</li> </ul>
<b>Recommended performance task modifications for at-risk/ELL students</b>	
<ul style="list-style-type: none"> <li>• Group the students based upon their individual instructional needs (peer tutoring)</li> <li>• Teach a mini-lesson on a topic where the students have common misconceptions.</li> <li>• Exit Cards following new lessons</li> <li>• Evaluation and observation of students' participation in a group work activity</li> <li>• Copy of teacher notes</li> <li>• Teach to varied learning styles</li> </ul>	
<b>Other modifications/considerations</b>	
<ul style="list-style-type: none"> <li>• Modified expectations and assignments</li> <li>• Evaluate formative data to determine topics that need to be retaught</li> <li>• Have students share notes</li> <li>• Use a word wall to reinforce key vocabulary words</li> <li>• Repeated practice</li> <li>• Peer guided practice</li> <li>• Peer review of problems</li> <li>• Re-teach based on data from progress monitoring</li> <li>• Small collaborative ability based groups</li> <li>• Spiral topics</li> <li>• Mandatory Extra Help</li> <li>• Use concrete languages and questions</li> <li>• Test corrections with explanations to earn back points</li> </ul>	

Desired Results for Unit 1: First Degree Equations and Inequalities (continued)

**Learning Plan**

**What pre-assessments will you use to check student's prior knowledge, skill levels, and potential misconceptions?**

- Complete the Quick Check Diagnostic before each chapter
- Review the Quick Review Prerequisite Skills
- Complete K-W-L Chart

**Learning Events**

- Introduce essential questions necessary to complete the unit on the First Degree Equations and Inequalities. (A)
- Apply formulas associated with slope. (T)
- Compare and classify real numbers. (M)
- Identify steps used to solve absolute value equations. (A)
- Analyze and graph functions. (M)
- Identify and graph special functions. (A)
- Create a line of regression. (T)
- Verify scatterplot graphs using graphing technology. (T)
- Introduce new vocabulary through daily lessons. (A)
- Discuss real world connections to current mathematical topics. (T)
- Model literacy activities to improve student achievement. (T)
- Use differentiated instruction to help all students achieve desired results. (M)
- Review rubrics prior to completing assessments. (A)
- Evaluate own work using rubrics. (M)
- Prepare students for various assessment techniques. (M)
- Self-assessment. (T)

**Progress Monitoring**

- Student to student feedback
- Exit cards
- Student reflections
- Warm-Up problems
- Closure questions
- Weekly Reports
- Graded Homework
- Graded Classwork
- Graded Groupwork

## Desired Results for Unit 2 Systems of Equations and Inequalities

**Content Area: Honors Algebra 2**

**Grade Level: 10 – 11**

**≈ 13 days**

### Established Goals

- Use algebraic methods, graphs, or tables to solve systems of equations and inequalities.
- Show a comprehension of concepts of operations.
- Demonstrate the ability to carry out procedures accurately and efficiently.
- Demonstrate the ability to formulate, represent, and solve.
- Use logical thought, reflection, explanation, and justification.
- Be able to see math as relevant to the real world

### Enduring Understandings

#### **Students will understand that:**

- Systems of linear equations can be used to model problems. Systems of equations can be solved by graphing, by substitution, or by eliminating a variable.
- Solutions to a system of linear inequalities in two variables can be as the set of all points on one side of a boundary line.
- Linear programming as it is used to identify max and min values for real-world business examples.

### Essential Questions

- How do the classifications of a system of equations affect the solution?
- How can linear programming apply to real-world situations?

### **Knowledge: Students will know how to... (Acquisition)**

- Apply formulas associated with slope.
- Classify real numbers.
- Solve equations.
- Solve compound and absolute value equations and inequalities.
- Analyze and graph relations.
- Find the slope of a line.
- Write and graph linear equations in standard form.
- Apply graphing calculator technology
- Solve systems of linear equations.
- Solve real world problems using linear programming.
- Locate minimum and maximum values in linear programming models.

Desired Results for Unit 2: Systems of Equations and Inequalities (continued)

<b>Skills: Students will be able to... (<u>Transfer</u>: independently demonstrate)</b>		
<ul style="list-style-type: none"> <li>• Apply the properties of equality to solve equations.</li> <li>• Define and describe the characteristics of functions.</li> <li>• Formulate linear inequalities to solve problems.</li> <li>• Determine the domain and range of functions using graphs, tables, and symbols.</li> <li>• Analyze situations and formulate systems of equations.</li> <li>• Interpret and determine the reasonableness of solutions to systems.</li> <li>• Use systems to model and solve real life problems.</li> <li>• Create, draw, and solve word problems involving linear programming.</li> <li>• Use functions and their properties to model and solve real life problems.</li> </ul>		
<b>Evidence</b>		
CCSS	Evaluative Criteria	Diagnostic Assessments
<ul style="list-style-type: none"> <li>• N-Q-1</li> <li>• N-Q-2</li> <li>• N-Q-3</li> <li>• A-SSE-1</li> <li>• A-SSE-1a</li> <li>• A-SSE-1b</li> <li>• A-SSE-2</li> <li>• A-SSE-3</li> <li>• A-CED-1</li> <li>• A-CED-2</li> <li>• A-CED-3</li> <li>• A-REI-1</li> <li>• A-REI-3</li> <li>• A-REI-5</li> <li>• A-REI-6</li> <li>• A-REI-10</li> <li>• A-REI-12</li> <li>• F-IF-1</li> <li>• F-IF-2</li> <li>• F-IF-4</li> <li>• F-IF-5</li> <li>• F-IF-6</li> <li>• F-IF-7</li> <li>• F-IF-7a</li> <li>• F-BF-1</li> <li>• S-ID-7</li> <li>• S-ID-8</li> </ul>	<ul style="list-style-type: none"> <li>• Conceptual understanding</li> <li>• Procedural fluency</li> <li>• Strategic competence</li> <li>• Adaptive reasoning</li> <li>• Productive disposition</li> </ul>	<p>Diagnostic assessments are used to determine students' readiness based upon required knowledge and skills, interests, and learning profiles.</p> <p><b>Performance Tasks:</b></p> <ul style="list-style-type: none"> <li>• Have students define a variable, write an equation, and solve the problem.</li> <li>• Solve a linear equation of one variable and two variables. Explain the steps taken.</li> <li>• Students will solve and graph one system of equations using all methods from the unit.</li> <li>• Students will complete a project verifying that any of the methods used to solve systems will yield the same result.</li> </ul> <p><b>Other Evidence:</b></p> <ul style="list-style-type: none"> <li>• Formative Assessments</li> <li>• Summative Assessments</li> <li>• Warm-Up Problems</li> <li>• Closure Questions</li> <li>• Chapter Vocabulary Builder</li> <li>• Graphic Organizers</li> <li>• Class Discussions</li> <li>• Classwork</li> <li>• Homework</li> <li>• Projects</li> </ul>

Desired Results for Unit 2: Systems of Equations and Inequalities (continued)

<b>Resources</b>	
<b>Core materials:</b>	<b>Supplemental materials:</b>
<ul style="list-style-type: none"> <li>• Textbook</li> <li>• Binder of Notes</li> </ul>	<ul style="list-style-type: none"> <li>• Resource Workbooks</li> <li>• Promethean Board</li> <li>• Scientific Calculators</li> <li>• Mini Whiteboards</li> <li>• TI-83 Plus Graphing Calculators</li> </ul>
<b>Recommended performance task modifications for at-risk/ELL students:</b>	
<ul style="list-style-type: none"> <li>• Group the students based upon their individual instructional needs (peer tutoring)</li> <li>• Teach a mini-lesson on a topic where the students have common misconceptions.</li> <li>• Exit Cards following new lessons</li> <li>• Evaluation and observation of students' participation in a group work activity</li> <li>• Copy of teacher notes</li> <li>• Teach to varied learning styles</li> </ul>	
<b>Other modifications/considerations:</b>	
<ul style="list-style-type: none"> <li>• Modified expectations and assignments</li> <li>• Evaluate formative data to determine topics that need to be retaught</li> <li>• Have students share notes</li> <li>• Use a word wall to reinforce key vocabulary words</li> <li>• Repeated practice</li> <li>• Peer guided practice</li> <li>• Peer review of problems</li> <li>• Re-teach based on data from progress monitoring</li> <li>• Small collaborative ability based groups</li> <li>• Spiral topics</li> <li>• Mandatory Extra Help</li> <li>• Use concrete languages and questions</li> <li>• Test corrections with explanations to earn back points</li> </ul>	

Desired Results for Unit 2: Systems of Equations and Inequalities (continued)

**Learning Plan**

**What pre-assessments will you use to check student's prior knowledge, skill levels, and potential misconceptions?**

- Complete the Quick Check Diagnostic before each chapter
- Review the Quick Review Prerequisite Skills
- Complete K-W-L Chart

**Learning Events**

- Solve systems of linear equations. (T)
- Solve real world problems using linear programming. (T)
- Analyze and graph functions. (M)
- Locate max and min values in linear programming models. (M)
- Introduce essential questions necessary to complete the unit on Systems. (A)
- Introduce new vocabulary through daily lessons. (A)
- Discuss real world connections to current mathematical topics. (T)
- Model literacy activities to improve student achievement. (T)
- Use differentiated instruction to help all students achieve desired results. (M)
- Review rubrics prior to completing assessments. (A)
- Evaluate own work using rubrics. (M)
- Prepare students for various assessment techniques. (M)
- Self-assessment. (T)

**Progress Monitoring**

- Student to student feedback
- Exit cards
- Student reflections
- Warm-Up Problems
- Closure Questions
- Weekly Reports
- Graded Homework
- Graded Classwork
- Graded Groupwork

## Desired Results for Unit 3 Quadratic and Polynomial Functions

**Content Area: Honors Algebra 2**

**Grade Level: 10 – 11**

**≈ 75 days**

### Established Goals

- Use algebraic methods, graphs, or tables to solve systems of equations and inequalities.
- Show a comprehension of concepts of operations.
- Demonstrate the ability to carry out procedures accurately and efficiently.
- Demonstrate the ability to formulate, represent, and solve.
- Use logical thought, reflection, explanation, and justification.
- Be able to see math as relevant to the real world.
- Formulate equations based on quadratic functions and use a variety of methods to solve them.
- Interpret and describe the effects of changes in the parameters of quadratic functions.
- Use properties and attributes of polynomial functions and apply functions to problem situations.

### Enduring Understandings

#### Students will understand that:

- Properties of Exponents make it easier to simplify products or quotients of powers with the same base or powers raised to a power or products raised to a power.
- The properties of real numbers can be used to multiply a monomial by a polynomial or simplify the product of binomials.
- The properties of real numbers can be used to factor trinomials.
- The family of quadratic functions models certain situations where the rate of change is not constant.
- In a quadratic function, the value of  $b$  translates the position of the axis of symmetry.
- Quadratic equations can be solved by using a variety of methods.
- Linear, quadratic, or exponential functions can be used to model various sets of data.
- Synthetic and long division can be used to divide polynomials.
- The Rational Root Theorem is used to make the process for finding roots simpler.

### Essential Questions

- How do the characteristics of a quadratic function relate to the properties of its graph?
- What are the advantages and disadvantages of using each type of methods to solve quadratic equations?
- How can you use the constant term and the leading coefficient to find all the possible rational zeros of a function?
- What two methods can be used to evaluate a polynomial function? Describe how these methods can be applied to simplifying/solving a polynomial.

Desired Results for Unit 3: Quadratic and Polynomial Functions and Inequalities (continued)

**Knowledge: Students will know how to... (*Acquisition*)**

- Graph quadratic functions.
- Find the minimum and maximum values of a quadratic function.
- Solve quadratic functions by factoring.
- Perform operations with complex numbers.
- Solve quadratics by completing the square and the quadratic formula.
- Perform operations with polynomials.
- Solve polynomial equations by factoring.
- Find the zeros of a polynomial function.
- Find the compositions and inverses of functions.
- Simplify polynomials through division.
- Apply the rational root theorem when finding roots of a polynomial function.
- Classify real numbers.
- Solve equations.
- Apply graphing calculator technology.

**Skills: Students will be able to... (*Transfer: independently demonstrate*)**

- Apply the properties of equality to solve equations.
- Define and describe the characteristics of functions.
- Use functions and their properties to model and solve real life problems.
- Determine the domain and range of functions using graphs, tables, and symbols.
- Determine reasonable domain and range values of quadratic functions.
- Analyze situations involving quadratic functions and formulate quadratic equations to solve problems.
- Determine a quadratic function from its roots.
- Use tools including factoring and properties of exponents to simplify expressions and transform and solve equations.
- Perform operations including composition on functions, finding inverses, and describing these procedures.
- Divide polynomials using synthetic and long division.

Desired Results for Unit 3: Quadratic and Polynomial Functions and Inequalities (continued)

Evidence		
CCSS	Evaluative Criteria	Diagnostic Assessments
<ul style="list-style-type: none"> <li>• N-CN-1</li> <li>• N-CN-2</li> <li>• N-CN-3 (+)</li> <li>• N-CN-7</li> <li>• N-CN-8 (+)</li> <li>• N-CN-9 (+)</li> <li>• N-Q-1</li> <li>• N-Q-2</li> <li>• N-Q-3</li> <li>• A-APR-1</li> <li>• A-APR-2</li> <li>• A-APR-3</li> <li>• A-APR-6</li> <li>• A-SSE-1</li> <li>• A-SSE-1a</li> <li>• A-SSE-1b</li> <li>• A-SSE-2</li> <li>• A-SSE-3</li> <li>• A-SSE-3a</li> <li>• A-SSE-3b</li> <li>• A-SSE-3c</li> <li>• A-CED-1</li> <li>• A-CED-2</li> <li>• A-REI-4</li> <li>• F-IF-1</li> <li>• F-IF-2</li> <li>• F-IF-4</li> <li>• F-IF-7</li> <li>• F-IF-7a</li> <li>• F-IF-7b</li> <li>• F-IF-7c</li> <li>• F-IF-8</li> <li>• F-IF-9</li> <li>• F-BF-1</li> <li>• F-BF-3</li> </ul>	<ul style="list-style-type: none"> <li>• Conceptual understanding</li> <li>• Procedural fluency</li> <li>• Strategic competence</li> <li>• Adaptive reasoning</li> <li>• Productive disposition</li> </ul>	<p>Diagnostic assessments are used to determine students' readiness based upon required knowledge and skills, interests, and learning profiles.</p> <p><b>Performance Tasks:</b></p> <ul style="list-style-type: none"> <li>• Have students use synthetic and long division on polynomials and determine the strengths of each process.</li> <li>• Have students explain how to tell by examining a quadratic function whether its graph will have a maximum or minimum value. Then have them give examples of what such values might mean in a real world problem.</li> <li>• Have students evaluate functions using substitution and synthetic substitution.</li> <li>• Have students solve a quadratic function and identify the characteristics of the function</li> <li>• Have students solve quadratics using all methods available.</li> <li>• Given a quadratic equation, determine the best method for solving.</li> <li>• Students will complete a Rocket Project comparing and calculating the quadratic components of the flight path.</li> </ul> <p><b>Other Evidence:</b></p> <ul style="list-style-type: none"> <li>• Formative Assessments</li> <li>• Summative Assessments</li> <li>• Warm-Up Problems</li> <li>• Closure Questions</li> <li>• Chapter Vocabulary Builder</li> <li>• Graphic Organizers</li> <li>• Class Discussions</li> <li>• Classwork</li> <li>• Homework</li> <li>• Projects</li> </ul>

Desired Results for Unit 3: Quadratic and Polynomial Functions and Inequalities (continued)

<b>Resources</b>	
<b>Core materials:</b>	<b>Supplemental materials:</b>
<ul style="list-style-type: none"> <li>• Textbook</li> <li>• Binder of Notes</li> </ul>	<ul style="list-style-type: none"> <li>• Resource Workbooks</li> <li>• Promethean Board</li> <li>• Scientific Calculators</li> <li>• Mini Whiteboards</li> <li>• TI-83 Plus Graphing Calculators</li> </ul>
<b>Recommended performance task modifications for at-risk/ELL students:</b>	
<ul style="list-style-type: none"> <li>• Group the students based upon their individual instructional needs (peer tutoring)</li> <li>• Teach a mini-lesson on a topic where the students have common misconceptions.</li> <li>• Exit Cards following new lessons</li> <li>• Evaluation and observation of students' participation in a group work activity</li> <li>• Copy of teacher notes</li> <li>• Teach to varied learning styles</li> </ul>	
<b>Other modifications/considerations:</b>	
<ul style="list-style-type: none"> <li>• Modified expectations and assignments</li> <li>• Evaluate formative data to determine topics that need to be retaught</li> <li>• Have students share notes</li> <li>• Use a word wall to reinforce key vocabulary words</li> <li>• Repeated practice</li> <li>• Peer guided practice</li> <li>• Peer review of problems</li> <li>• Re-teach based on data from progress monitoring</li> <li>• Small collaborative ability based groups</li> <li>• Spiral topics</li> <li>• Mandatory Extra Help</li> <li>• Use concrete languages and questions</li> <li>• Test corrections with explanations to earn back points</li> </ul>	

Desired Results for Unit 3: Quadratic and Polynomial Functions and Inequalities (continued)

**Learning Plan**

**What pre-assessments will you use to check student’s prior knowledge, skill levels, and potential misconceptions?**

- Complete the Quick Check Diagnostic before each chapter
- Review the Quick Review Prerequisite Skills
- Complete K-W-L Chart

**Learning Events**

- Compare and classify real numbers. (M)
- Analyze and graph functions. (M)
- Explain the parts needed for graphing quadratic functions. (M)
- Find the minimum and maximum values of a quadratic function. (A)
- Solve quadratic functions by factoring. (T)
- Perform operations with complex numbers. (T)
- Perform operations with polynomials. (T)
- Solve quadratics by completing the square. (T)
- Solve quadratics by using the quadratic formula. (T)
- Compare and contrast solutions found by various methods of solving a quadratic function. (M)
- Identify the zeros of a polynomial function. (A)
- Simplify polynomials through division. (M)
- Apply the rational root theorem when finding roots of a polynomial function. (T)
- Introduce essential questions necessary to complete the unit on the Quadratics and Polynomials. (A)
- Introduce new vocabulary through daily lessons. (A)
- Discuss real world connections to current mathematical topics. (T)
- Model literacy activities to improve student achievement. (T)
- Use differentiated instruction to help all students achieve desired results. (M)
- Review rubrics prior to completing assessments. (A)
- Evaluate own work using rubrics. (M)
- Prepare students for various assessment techniques. (M)
- Self-assessment. (T)

**Progress Monitoring**

- Student to student feedback
- Exit cards
- Student reflections
- Warm-Up Problems
- Closure Questions
- Weekly Reports
- Graded Homework
- Graded Classwork
- Graded Groupwork

## Desired Results for Unit 4 Radicals

**Content Area: Honors Algebra 2**

**Grade Level: 10 – 11**

**≈ 28 days**

### Established Goals

- Show a comprehension of concepts of operations.
- Demonstrate the ability to carry out procedures accurately and efficiently.
- Demonstrate the ability to formulate, represent, and solve.
- Use logical thought, reflection, explanation, and justification.
- Be able to see math as relevant to the real world.
- Simplify radical expressions by adding, subtracting, multiplying, and dividing.
- Solve equations and inequalities that contain radicals
- Demonstrate the ability to formulate, represent, and solve.

### Enduring Understandings

**Students will understand that:**

- A function that contains a variable inside a square root symbol is called a square root function.
- Radical expressions can be simplified using properties of square roots.

### Essential Questions

- What are the connections among the domain and range, solutions of radical equations, and the zeros of the related functions?
- How do radical functions model real-world problems and their solutions?

### Knowledge: Students will know how to... (*Acquisition*)

- Graph and transform radical functions.
- Simplify radical expressions.
- Solve radical equations.
- Solve equations.
- Apply graphing calculator technology.

### Skills: Students will be able to... (*Transfer: independently demonstrate*)

- Apply the properties of equality to solve equations.
- Add, subtract, multiply, and simplify radical expressions.
- Solve radical equations.

Desired Results for Unit 4: Radicals (continued)

Evidence		
CCSS	Evaluative Criteria	Diagnostic Assessments
<ul style="list-style-type: none"> <li>• N-RN-1</li> <li>• N-RN-2</li> <li>• N-CN-7</li> <li>• N-CN-8 (+)</li> <li>• A-SSE-1</li> <li>• A-SSE-1a</li> <li>• A-SSE-1b</li> <li>• A-SSE-2</li> <li>• A-SSE-3a</li> <li>• A-SSE-3c</li> <li>• A-REI-2</li> <li>• A-REI-4</li> <li>• F-IF-1</li> <li>• F-IF-2</li> <li>• F-IF-4</li> <li>• F-IF-7</li> <li>• F-IF-7b</li> <li>• F-IF-9</li> <li>• F-BF-1</li> <li>• F-BF-4</li> </ul>	<ul style="list-style-type: none"> <li>• Conceptual understanding</li> <li>• Procedural fluency</li> <li>• Strategic competence</li> <li>• Adaptive reasoning</li> <li>• Productive disposition</li> </ul>	<p>Diagnostic assessments are used to determine students' readiness based upon required knowledge and skills, interests, and learning profiles.</p> <p><b>Performance Tasks:</b></p> <ul style="list-style-type: none"> <li>• Give a radical expression to each student, and have them simplify the radicals and ask them to tell you the simplified expression.</li> <li>• Have students solve a radical equation and an inequality. Students will then determine if their solutions are extraneous.</li> </ul> <p><b>Other Evidence:</b></p> <ul style="list-style-type: none"> <li>• Formative Assessments</li> <li>• Summative Assessments</li> <li>• Warm-Up Problems</li> <li>• Closure Questions</li> <li>• Chapter Vocabulary Builder</li> <li>• Graphic Organizers</li> <li>• Class Discussions</li> <li>• Classwork</li> <li>• Homework</li> </ul>
Resources		
Core materials:	Supplemental materials:	
<ul style="list-style-type: none"> <li>• Textbook</li> <li>• Binder of Notes</li> </ul>	<ul style="list-style-type: none"> <li>• Resource Workbooks</li> <li>• Promethean Board</li> <li>• Scientific Calculators</li> <li>• Mini Whiteboards</li> <li>• TI-83 Plus Graphing Calculators</li> </ul>	

Desired Results for Unit 4: Radicals (continued)

**Recommended performance task modifications for at-risk/ELL students:**

- Group the students based upon their individual instructional needs (peer tutoring)
- Teach a mini-lesson on a topic where the students have common misconceptions.
- Exit Cards following new lessons
- Evaluation and observation of students' participation in a group work activity
- Copy of teacher notes
- Teach to varied learning styles

**Other modifications/considerations:**

- Modified expectations and assignments
- Evaluate formative data to determine topics that need to be retaught
- Have students share notes
- Use a word wall to reinforce key vocabulary words
- Repeated practice
- Peer guided practice
- Peer review of problems
- Re-teach based on data from progress monitoring
- Small collaborative ability based groups
- Spiral topics
- Mandatory Extra Help
- Use concrete languages and questions
- Test corrections with explanations to earn back points

Desired Results for Unit 4: Radicals (continued)

**Learning Plan**

**What pre-assessments will you use to check student's prior knowledge, skill levels, and potential misconceptions?**

- Complete the Quick Check Diagnostic before each chapter
- Review the Quick Review Prerequisite Skills
- Complete K-W-L Chart

**Learning Events**

- Introduce new vocabulary through daily lessons. (A)
- Discuss real world connections to current mathematical topics. (T)
- Model literacy activities to improve student achievement. (T)
- Use differentiated instruction to help all students achieve desired results. (M)
- Review rubrics prior to completing assessments. (A)
- Evaluate own work using rubrics. (M)
- Prepare students for various assessment techniques. (M)
- Self-assessment. (T)
- Introduce essential questions necessary to complete the unit on the Radicals. (A)
- Analyze and graph functions. (M)
- Identify and graph special functions. (A)
- Graph radical functions. (T)
- Transform radical functions. (M)
- Solve radical equations. (T)

**Progress Monitoring**

- Student to student feedback
- Exit cards
- Student reflections
- Warm-Up Problems
- Closure Questions
- Weekly Reports
- Graded Homework
- Graded Classwork
- Graded Groupwork

## Desired Results for Unit 5 Advanced Functions and Relations

**Content Area: Honors Algebra 2**

**Grade Level: 10 – 11**

**≈ 32 days**

### Established Goals

- Show a comprehension of concepts of operations.
- Demonstrate the ability to carry out procedures accurately and efficiently.
- Demonstrate the ability to formulate, represent, and solve.
- Use logical thought, reflection, explanation, and justification.
- Be able to see math as relevant to the real world.
- Simplify radical expressions by adding, subtracting, multiplying, and dividing.
- Solve equations and inequalities that contain radicals
- Demonstrate the ability to formulate, represent, and solve.

### Enduring Understandings

**Students will understand that:**

- To simplify a rational expression, divide out the common factors from the numerator and denominator.
- Rational expressions and polynomials can be simplified using the same properties to multiply and divide fractions.
- To graph a rational function  $f(x)$ , it is necessary to understand the graphs behavior
- Logarithms with a base of 10 are called common logarithms.
- Logarithms can be used to solve problems involving exponential decay and growth.
- Exponential and logarithmic functions are inverses of each other.
- Exponential functions are continuous and one-to-one.
- Logarithms with a base  $e$  are called natural logs.
- Natural logs can be used to solve financial and banking problems.

### Essential Questions

- How are rational functions related to each other and inverse functions?
- What are the characteristics of rational functions and how can they be used to graph?
- What is the relationship between the exponential function and the log function?
- How do exponential functions differ from polynomial functions?
- How can you use base  $e$  to solve natural log equations?
- How do properties of logarithms help us simplify expressions and solve exponential equations?
- Why do we need logarithms?
- How do logarithms make calculations easier?

Desired Results for Unit 5: Advanced Functions and Relations (continued)

**Knowledge: Students will know how to... (*Acquisition*)**

- Simplify rational expressions.
- Perform operations of rational expressions.
- Simplify complex fractions.
- Determine the LCM of polynomials.
- Solve rational equations.
- Find the compositions and inverses of functions.
- Graph and solve exponential functions.
- Evaluate and solve logarithmic equations.
- Graph logarithmic functions.
- Evaluate logs using the Change of Base formula.
- Use properties of logarithms to simplify expressions.
- Evaluate Base e and natural logs
- Solve equations.
- Apply graphing calculator technology.

**Skills: Students will be able to... (*Transfer: independently demonstrate*)**

- Apply the properties of equality to solve equations.
- Define and describe the characteristics of functions.
- Use functions and their properties to model and solve real life problems.
- Determine the domain and range of functions using graphs, tables, and symbols.
- Use tools including factoring and properties of exponents to simplify expressions and transform and solve equations.
- Add, subtract, multiply, and simplify rational expressions.
- Multiply and divide rational expressions.
- Solve rational equations and eliminate extraneous roots.
- Analyze a situation modeled by an exponential function, formulate an equation, and solve the problem.
- Determine solutions of exponential and logarithmic equations using graphs, tables, and algebraic methods.
- Simplify logarithmic expressions by using the various properties of logarithms.
- Determine the solutions of natural log equations using base e and natural logs.

Desired Results for Unit 5: Advanced Functions and Relations (continued)

Evidence		
CCSS	Evaluative Criteria	Diagnostic Assessments
<ul style="list-style-type: none"> <li>• N-Q-1</li> <li>• N-Q-2</li> <li>• N-Q-3</li> <li>• A-SSE-1</li> <li>• A-SSE-1a</li> <li>• A-SSE-1b</li> <li>• A-SSE-2</li> <li>• A-SSE-3</li> <li>• A-SSE-3a</li> <li>• A-SSE-3b</li> <li>• A-SSE-3c</li> <li>• A-CED-1</li> <li>• A-CED-2</li> <li>• A-REI-1</li> <li>• A-REI-2</li> <li>• A-REI-10</li> <li>• A-REI-11</li> <li>• F-IF-1</li> <li>• F-IF-2</li> <li>• F-IF-4</li> <li>• F-IF-5</li> <li>• F-IF-7</li> <li>• F-IF-7d (+)</li> <li>• F-IF-7e</li> <li>• F-IF-8</li> <li>• F-IF-9</li> <li>• F-BF-1</li> <li>• F-BF-4</li> <li>• F-BF-5 (+)</li> <li>• F-LE-1</li> <li>• F-LE-2</li> <li>• F-LE-3</li> <li>• F-LE-4</li> <li>• F-LE-5</li> </ul>	<ul style="list-style-type: none"> <li>• Conceptual understanding</li> <li>• Procedural fluency</li> <li>• Strategic competence</li> <li>• Adaptive reasoning</li> <li>• Productive disposition</li> </ul>	<p>Diagnostic assessments are used to determine students' readiness based upon required knowledge and skills, interests, and learning profiles.</p> <p><b>Performance Tasks:</b></p> <ul style="list-style-type: none"> <li>• Have students simplify and graph a rational function. Then have them identify any holes or asymptotes.</li> <li>• Have students solve real world problems similar to those they have seen in the lesson on solving rational equations.</li> <li>• Have students solve a logarithmic equation and explain their procedures.</li> <li>• Have students graph exponential growth and decay problems. Have them explain what the y-intercept means.</li> <li>• Students will complete an exponential growth and decay lab.</li> <li>• Have each student write a natural logarithmic equation and inequality. Then have students write all the steps for solving the problems</li> </ul> <p><b>Other Evidence:</b></p> <ul style="list-style-type: none"> <li>• Formative Assessments</li> <li>• Summative Assessments</li> <li>• Warm-Up Problems</li> <li>• Closure Questions</li> <li>• Chapter Vocabulary Builder</li> <li>• Graphic Organizers</li> <li>• Class Discussions</li> <li>• Classwork</li> <li>• Homework</li> <li>• Projects</li> </ul>

Desired Results for Unit 5: Advanced Functions and Relations (continued)

<b>Resources</b>	
<b>Core materials:</b>	<b>Supplemental materials:</b>
<ul style="list-style-type: none"> <li>• Textbook</li> <li>• Binder of Notes</li> </ul>	<ul style="list-style-type: none"> <li>• Resource Workbooks</li> <li>• Promethean Board</li> <li>• Scientific Calculators</li> <li>• Mini Whiteboards</li> <li>• TI-83 Plus Graphing Calculators</li> </ul>
<b>Recommended performance task modifications for at-risk/ELL students:</b>	
<ul style="list-style-type: none"> <li>• Group the students based upon their individual instructional needs (peer tutoring)</li> <li>• Teach a mini-lesson on a topic where the students have common misconceptions.</li> <li>• Exit Cards following new lessons</li> <li>• Evaluation and observation of students’ participation in a group work activity</li> <li>• Copy of teacher notes</li> <li>• Teach to varied learning styles</li> </ul>	
<b>Other modifications/considerations:</b>	
<ul style="list-style-type: none"> <li>• Modified expectations and assignments</li> <li>• Evaluate formative data to determine topics that need to be retaught</li> <li>• Have students share notes</li> <li>• Use a word wall to reinforce key vocabulary words</li> <li>• Repeated practice</li> <li>• Peer guided practice</li> <li>• Peer review of problems</li> <li>• Re-teach based on data from progress monitoring</li> <li>• Small collaborative ability based groups</li> <li>• Spiral topics</li> <li>• Mandatory Extra Help</li> <li>• Use concrete languages and questions</li> <li>• Test corrections with explanations to earn back points</li> </ul>	
<b>Learning Plan</b>	
<p><b>What pre-assessments will you use to check student’s prior knowledge, skill levels, and potential misconceptions?</b></p> <ul style="list-style-type: none"> <li>• Complete the Quick Check Diagnostic before each chapter</li> <li>• Review the Quick Review Prerequisite Skills</li> <li>• Complete K-W-L Chart</li> </ul>	

Desired Results for Unit 5: Advanced Functions and Relations (continued)

**Learning Events**

- Analyze and graph functions. (M)
- Simplify rational expressions. (M)
- Perform operations of rational expressions. (T)
- Simplify complex fractions. (M)
- Determine the LCM of polynomials. (M)
- Solve rational equations. (T)
- Compare and contrast direct, inverse, and joint variation problems. (M)
- Introduce essential questions necessary to complete the unit on the Rational Expressions and Equations. (A)
- Graph exponential functions. (T)
- Solve exponential functions. (T)
- Evaluate logarithmic expressions. (M)
- Solve logarithmic equations. (T)
- Evaluate logarithms using Change of Base formula. (M)
- Apply properties of logarithms to simplify expressions. (T)
- Evaluate base e and natural logs. (M)
- Introduce essential questions necessary to complete the unit on the Exponential & Logarithmic Relations. (A)
- Introduce new vocabulary through daily lessons. (A)
- Discuss real world connections to current mathematical topics. (T)
- Model literacy activities to improve student achievement. (T)
- Use differentiated instruction to help all students achieve desired results. (M)
- Review rubrics prior to completing assessments. (A)
- Evaluate own work using rubrics. (M)
- Prepare students for various assessment techniques. (M)
- Self-assessment. (T)

**Progress Monitoring**

- Student to student feedback
- Exit cards
- Student reflections
- Warm-Up Problems
- Closure Questions
- Weekly Reports
- Graded Homework
- Graded Classwork
- Graded Groupwork