Unit 3: Quadratic Functions, Equations and Relations

Content Area: **Math**
Course(s):
Time Period: **October**
Length: **15 classes**
Status: **Published**

State Mandated Topics Addressed in this Unit

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N/A	N/A

Quadratic Functions, Equations and Relations

Learning Objectives

- Objective 1 - Define quantities for descriptive modeling problems. (Incorporate appropriate units).
- Objective 10 - Derive the quadratic formula by completing the square.
- Objective 11 - Use completing the square to transform quadratic equations into the form (x-p)^2=q.
- Objective 12 - Solve and recognize quadratic equations with complex solutions.
- Objective 13 - Solve quadratics by taking the square root.
- Objective 14 - Solve quadratics by completing the square.
- Objective 15 - Solve quadratics via the quadratic formula.
- Objective 16 - Solve quadratics by factoring.
- Objective 17 - Solve a system of linear and quadratic equations algebraically & graphically.
- Objective 18 - Sketch a graph using the key features of a function.
- Objective 19 - Interpret key features from a graph or a table of values.
- Objective 2 - Know the definition of the complex number, i.
- Objective 20 - Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.
- Objective 21 - Identify the effect on a graph of f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k.
- Objective 22 - Find the values of k given a graph.
- Objective 23 - Experiment with cases using technology.
- Objective 24 - Recognize even and odd functions from their graphs.
- Objective 25 - Recognize even and odd functions given an algebraic expression.
- Objective 26 -
- Objective 3 - Know the form a+bi

- Objective 4 - Solve quadratic equations with real coefficients that have complex solutions.
- Objective 5 - Identify zeros of polynomials using factoring.
- Objective 6 - Use the zeros to construct a rough graph of a polynomial function.
- Objective 7 - Create and solve equations.
- Objective 8 - Create and solve inequalities.
- Objective 9 - Solve quadratic equations in one variable, including completing the square and quadratic formula.

Essential Skills

- Essential Skill 1 - The artist will be able to define quantities for descriptive modeling problems. (Incorporate appropriate units)
- Essential Skill 10 - The artist will be able to identify zeros of polynomials using factoring.
- Essential Skill 11 - The artist will be able to use the zeros to construct a rough graph of a polynomial function.
- Essential Skill 12 - The artist will be able to create and solve equations.
- Essential Skill 13 - The artist will be able to create and solve inequalities.
- Essential Skill 14 - The artist will be able to solve quadratic equations in one variable, including completing the square and quadratic formula.
- Essential Skill 16 - The artist will be able to derive the quadratic formula by completing the square.
- Essential Skill 17 - The artist will be able to use completing the square to transform quadratic equations into the form (x-p)^2=q.
- Essential Skill 18 - The artist will be able to solve and recognize quadratic equations with complex solutions.
- Essential Skill 19 - The artist will be able to solve quadratics by taking the square root.
- Essential Skill 2 - The artist will know the definition of the complex number, i.
- Essential Skill 20 - The artist will be able to solve quadratics by completing the square.
- Essential Skill 21 - The artist will be able to solve quadratics via the quadratic formula.
- Essential Skill 22 - The artist will be able to solve quadratics by factoring.
- Essential Skill 23 - The artist will be able to solve a system of linear and quadratic equations algebraically & graphically.
- Essential Skill 24 - The artist will be able to sketch a graph using the key features of a function.
- Essential Skill 25 - The artist will be able to interpret key features from a graph or a table of values. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.
- Essential Skill 26 - The artist will be able to identify the effect on a graph of f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k
- Essential Skill 27 - The artist will be able to find the values of k given a graph.
- Essential Skill 28 - The artist will be able to experiment with cases using technology.
- Essential Skill 29 - The artist will be able to recognize even and odd functions from their graphs.
- Essential Skill 3 - The artist will know the form a+bi
- Essential Skill 30 - The artist will be able to recognize even and odd functions given an algebraic expression.

- Essential Skill 4 - The artist will be able to solve quadratic equations with real coefficients that have complex solutions.
- Essential Skill 5 - The artist will be able to factor expressions.
- Essential Skill 6 - The artist will be able to identify the structure to rewrite expressions.
- Essential Skill 7 - The artist will be able to rewrite using difference of squares.
- Essential Skill 8 - The artist will be able to rewrite expressions using difference of cubes.
- Essential Skill 9 - The artist will be able to rewrite expressions using sum of cubes.

Standards

MATH.9-12.A.APR.B.3	Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.
MATH.9-12.N.Q.A.2	Define appropriate quantities for the purpose of descriptive modeling.
MATH.9-12.F.BF.B.3	Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k\ f(x)$, $f(kx)$, and $f(x + k)$ for specific values of k(both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology.
MATH.9-12.N.CN.A.1	Know there is a complex number i such that $i^2 = –1$, and every complex number has the form $a + bi$ with a and b real.
MATH.9-12.A.CED.A.1	Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.
MATH.9-12.N.CN.C.7	Solve quadratic equations with real coefficients that have complex solutions.
MATH.9-12.A.REI.A.1	Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
MATH.9-12.F.IF.B.4	For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.
MATH.9-12.A.REI.B.4.b	Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b.
MATH.9-12.A.REI.C.7	Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.
MATH.9-12.A.REI.D.11	Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.
MATH.9-12.F.IF.C.9	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
MATH.9-12.A.SSE.A.2	Use the structure of an expression to identify ways to rewrite it.

Instructional Tasks/Activities

- Academic games & Competitions
- Arts inspired projects
- Formative Assessments
- Independent practice
- Ladder Activity
- Notes
- Worksheets

Assessment Procedure

- Classroom Total Participation Technique
- Classwork
- DBQ
- Essay
- Exit Ticket/Entrance Ticket/Do Now
- Journal / Student Reflection
- Kahoot
- Other named in lesson
- Peer Review
- Performance
- Problem Correction
- Project
- Quiz
- Rubric
- Teacher Collected Data
- Test
- Worksheet

Recommended Technology Activities

- Appropriate Content Specific Online Resource
- Chromebook
- Gimkit
- GoGuardian
- Google Classroom
- Google Docs
- Google Forms
- Google Slides
- Kahoot

- MagicSchool AI
- Other- Specified in Lesson
- Power point
- Quizizz
- Screencastify

Accommodations & Modifications & Differentiation

Accommodations and Modifications should be used to meet individual needs. Their IEP and 504 plans should be used in addition to the following suggestions.

Gifted and Talented

- Compare & Contrast
- Conferencing
- Debates
- Jigsaw
- Peer Partner Learning
- Problem Solving
- Structured Controversy
- Think, Pair, Share
- Tutorial Groups

Instruction/Materials

- alter format of materials (type/highlight, etc.)
- color code materials
- eliminate answers
- extended time
- extended time
- large print
- modified quiz
- modified test
- Modify Assignments as Needed
- Modify/Repeat/Model directions
- necessary assignments only
- Other (specify in plans)
- other- named in lesson

- provide assistance and cues for transitions
- provide daily assignment list
- read class materials orally
- reduce work load
- shorten assignments
- study guide/outline
- utilize multi-sensory modes to reinforce instruction

Environment

- alter physical room environment
- assign peer tutors/work buddies/note takers
- assign preferential seating
- individualized instruction/small group
- modify student schedule (Describe)
- other- please specify in plans
- provide desktop list/formula

Honors Modifications

The honors track will move at a faster pace for this unit. They will have more in depth critical thinking and analysis type questions. Honors will also solve systems involving linear and quadratic and two quadratic functions.

Resources

- https://njctl.org/courses/math/algebra-ii/