

Unit 4: Quadratics

Algebra II

4 Weeks

Essential Questions

- What are the advantages of a quadratic function in vertex form? In standard form?
- How is any quadratic function related to the parent quadratic function?
- How are the real solutions of a quadratic equation related to the graph of the related quadratic function?

Enduring Understandings

1. The graph of any quadratic function is a transformation of the graph of the parent quadratic function.
2. For any quadratic function in standard form, the values of a , b , and c provide key information about its graph.
3. Three noncollinear points, no two of which are in line vertically, are on the graph of exactly one quadratic function.
4. You can factor many quadratic trinomials into products of two binomials.
5. To find the zeros of a quadratic function, you must set the equation equal to zero.
6. Completing a perfect square trinomial allows you to factor the completed trinomial as the square of a binomial.
7. You can solve a quadratic equation in standard form in more than one way. In general, you can find a formula that gives values of x in terms of a , b , and c .
8. A basis for the complex numbers is a number whose square is -1 . Every quadratic equation has complex number solutions.

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Content	
Topics (Pearson): (4-1) Quadratic Function and Transformations (4-2) Standard Form (4-3) Modeling with Quadratic Functions (4-4) Factoring Quadratic Functions (4-5) Quadratic Equations (4-6) Completing the Square (4-7) Quadratic Formula (4-8) Complex Numbers	Students will know... <ul style="list-style-type: none">• Quadratic equations with both real and complex solutions.• Quadratics can model real world problems.• Key features of quadratic functions<ul style="list-style-type: none">○ Intercepts○ Intervals of increasing or decreasing○ Relative maximums and Minimums○ Role of Symmetry• Factoring quadratics• The Quadratic Formula• Completing the Square• Role technology plays

21st Learning Expectations

Students will be able to...

- Employ mathematical problem solving skills effectively.
- Make decisions and solve problems in independent and collaborative settings.

21st Century Learning Skills

Students will be able to...

- ML #1 – Make sense of problems and persevere in solving them.
- ML #2 – Reason abstractly and quantitatively.
- ML #4 – Model with mathematics.
- ML #5 – Use appropriate tools strategically.
- ML #6 – Attend to precision.
- ML #7 – Look for and make use of structure.
- ML #8 – Look for and express regularity in repeated reasoning.

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Connecticut State Standards

- CC.9-12.N.CN.7 Solve quadratic equations with real coefficients that have complex solutions.
- CC.9-12.N.CN.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.
- CC.9-12.N.CN.2 Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers
- CC.9-12.A.REI.4b 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
- CC.9-12.A.CED.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.
- CC.9-12.A.CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- CC.9-12.A.REI.4 Solve quadratic equations in one variable
- CC.9-12.F.IF.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.*
- CC.9-12.F.IF.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. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.*

Objectives

Students will be able to...

- Graph a quadratic function in vertex form.
- Apply transformations to graph similar quadratic functions.
- Graph quadratic functions in standard form.
- Model a real world situation with a quadratic function and identify the real world significance of the minimum or maximum.
- Factor a quadratic functions when $a = 1$.
- Solve quadratic equations by completing the square.
- Derive and apply the quadratic formula.
- Solve equations in quadratic form.
- Write equations given the roots
- Analyze complex solutions and utilize a conjugate to rationalize the denominator.

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Assessments

- Quiz EU1 – Transformations and Vertex Form
- Quiz EU2 – Standard Form
- Quiz EU3 – Modeling with Quadratics
- Quiz EU4 – Factoring Quadratic Functions
- Quiz EU5 – Solving Quadratic Equations
- Quiz EU6 – Completing the Square
- Quiz EU7 – Quadratic Formula
- Quiz EU8 – Complex Numbers
- Unit Test – Quadratics
- Modeling Quadratics Activity

Resources

- Charles, R., Hall, B., Kennedy, D., Bass, L., Johnson, A., Murphy, S., et al. (2012). *Algebra 2: Common Core*. Boston: Pearson.
- Graphing Calculator
- Algebra Tiles
- Graphing Calculator Motion Detectors