Acc. Algebra I/Geom. A
Unit 3: Modeling & Analyzing Quadratic Functions

Volume 1 Issue 3

References

HMH Georgia Analytic Geometry Text:
Unit 5: Modules 14-16

Check with you teacher for online and print access:

Online website:
my.hrw.com

Web Resources

- http://www.purplemath.com/modules/quadform.htm (quadratic equation)
- http://www.purplemath.com/modules/solvquad.htm (solving quadratic equations)
- http://www.purplemath.com/modules/grphquad2.htm (vertex form)
- http://www.analyzemath.com/quadratics/quadratics.htm (standard form)
- http://www.purplemath.com/modules/ineqquad.htm (quadratic inequalities)

Dear Parents

Below you will find a list of concepts that your child will use and understand while completing Unit 3: Modeling & Analyzing Quadratic Functions. Also included are references, vocabulary and examples that will help you assist your child at home.

Concepts Students will Use and Understand

Students will analyze quadratic functions in the forms
$f(x) = ax^2 + bx + c$ and $f(x) = a(x - h)^2 + k$

- Convert between standard and vertex form
- Graph quadratic functions as transformations of $f(x) = x^2$
- Investigate & explain characteristics of quadratic functions
- Explore quadratic sequences recursively and explicitly
- Students will solve quadratic equations and inequalities in one variable.
- Solve equations graphically & with technology
- Find real & complex solutions of equations by factoring, taking square roots, and applying the quadratic formula
- Analyze roots using technology and the discriminant
- Solve quadratic inequalities both graphically and algebraically
- Describe the solutions using linear inequalities and interval notation

Vocabulary and Theorems

- **Complete factorization over the integers.** Writing a polynomial as a product of polynomials so that none of the factors is the number 1, there is at most one factor of degree zero, each polynomial factor has degree less than or equal to the degree of the product polynomial, each polynomial factor has all integer coefficients, and none of the factor polynomial can written as such a product.
- **Completing the square**. Completing the Square is the process of converting a quadratic equation into a perfect square trinomial by adding or subtracting terms on both sides.
- **Difference of two squares**. A squared (multiplied by itself) number subtracted from another squared number. It refers to the identity $a^2 - b^2 = (a + b)(a - b)$ in elementary algebra.
- **Discriminant of a quadratic equation.** The discriminant of a quadratic equation of the form
  $ax^2 + bx + c = 0$, $a \neq 0$, is the number $b^2 - 4ac$.
- **Horizontal shift.** A rigid transformation of a graph in a horizontal direction, either left or right.
- **Perfect square trinomial.** A trinomial that factors into two identical binomial factors.
- **Quadratic equation.** An equation of degree 2, which has at most two solutions.
- **Quadratic function.** A function of degree 2 which has a graph that "turns around" once, resembling an umbrella–like curve that faces either right–side up or upside down. This graph is called a parabola.
- **Root.** The *x*–values where the function has a value of zero.
- **Standard form of a quadratic function.** $ax^2 + bx + c$

parabola is opening up or down, or in terms of x if the parabola is opening left or right.

- **Vertex form of a quadratic function.** A formula for a quadratic equation of the form $f(x) = a(x-h)^2 + k$, where a is a nonzero constant and the vertex of the graph is the point (h, k).

Theorems

For $h = \frac{-b}{2a}$ and $k = f\left(\frac{-b}{2a}\right)$, $f(x) = a(x-h)^2 + k$ is the same function as $f(x) = ax^2 + bx + c$.

The graph of any quadratic function can be obtained from transformations of the graph of the basic function $f(x) = x^2$.

Quadratic formula: The solution(s) of the quadratic equation of the form $ax^2 + bx + c = 0$, where a, b, and c are real numbers with $a \neq 0$, is

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}.$$

The discriminant of a quadratic equation is positive, zero, or negative if and only if the equation has two real solutions, one real solution, or two complex conjugate number solutions respectively.

Algebra 1 Unit 3 Practice Problems

Formulas

Quadratic Equations:

Standard Form:

$y = ax^2 + bx + c$

Vertex Form:

$y = a(x-h)^2 + k$

Quadratic Formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Example 1

What happens to the graph of $y = x^2$ when you multiply x^2 by 3?

Example 2

Find the zeros of $(2x + 3)(3x + 4) = 0$.

Example 3

Factor $6x^2 + 7x - 20$

Example 4

Solve the quadratic equation: $2x^2 + 3x - 54 = 0$.

Example 5

Find the y-intercept of $f(x) = x^2 - 4x + 9$.

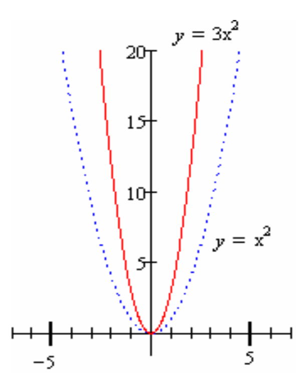
Example 6

Find the discriminate of $3x^2 + 15x = 12$

Answer Key

Example 1

It causes a vertical stretch.
(see graph to right)



Example 2

$x = -3/2$ or $x = -4/3$

Example 3

$(2x + 5)(3x - 4)$

Example 4

$(2x - 9)(x + 6) = 0$

$x = 4.5$ or $x = -6$

Example 5

$f(0) = 0^2 - 4(0) + 9$

y-intercept = 9

Example 6

$b^2 - 4ac = (15)^2 - 4(-36) = 369$