

6 1 study guide and intervention graphing quadratic functions

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How to Solve and Graph Quadratic Functions

Understanding Quadratic Equations

Quadratic equations, of the form $ax^2 + bx + c = 0$, are defined by a parabolic graph. They have three key features:

1. **Appearance:** A parabola is a U-shaped curve that opens either upward or downward.
2. **Vertex:** The highest or lowest point of the parabola, where the axis of symmetry intersects the graph.
3. **Roots (Solutions):** The points where the parabola crosses the x-axis, representing the solutions to the equation.

Solving Quadratic Functions

1. Graphing Method:

- Graph the quadratic function using a graphing calculator or by plotting points.
- Identify the x-intercepts (roots) of the parabola, which are the solutions.

2. Other Methods:

- **Factorization:** Factor the quadratic into two binomials and set each factor equal to zero.
- **Completing the Square:** Rewrite the equation in the form $(x - h)^2 + k = 0$, where (h, k) is the vertex.
- **Quadratic Formula:** Use the formula $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ to find the solutions directly.

Formula for Quadratic Graph

The general formula for a quadratic graph is:

$$y = ax^2 + bx + c$$

where:

- **a** is the coefficient of x^2 (determines the parabola's shape)
- **b** is the coefficient of x (determines the axis of symmetry)
- **c** is the constant term (determines the y-intercept)

Examples of Quadratic Equations

1. $x^2 + 2x - 3 = 0$
2. $y = x^2 - 5x + 6$
3. $f(x) = -2x^2 + 4x + 1$
4. $3x^2 - 12x + 9 = 0$
5. $y = (x - 2)^2 + 3$
6. $f(x) = x^2 - 4$
7. $2x^2 + 5x - 9 = 0$
8. $y = -x^2 + 3x - 2$
9. $f(x) = x^2 + 2x + 1$
10. $5x^2 - 3x + 1 = 0$

Steps to Graph Quadratic Functions

1. Determine the axis of symmetry: $x = -b / 2a$
2. Find the y-intercept: $(0, c)$

3. Plot the vertex: (h, k)
4. Plot additional points to complete the parabola
5. Identify the roots (x-intercepts)

Finding the Vertex of a Quadratic Function

- Vertex: $(-b / 2a, f(-b / 2a))$

Solving Quadratic Equations by Graphing

- Locate the x-intercepts (roots) of the parabola on the graph.

Graphing Quadratic Equations on a Calculator

- Input the quadratic equation into the calculator's graphing function.
- Adjust the window settings to show the relevant portion of the graph.
- Find the x-intercepts using the "ZERO" or "TRACE" functions.

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