Quadratic Equations and Functions

To solve a quadratic equation in x by completing the square:

1. If the coefficient of x^2 is not 1, divide both sides of the equation by the coefficients of x^2.

2. Isolate the variable terms.

3. Complete the square by adding the square of half of the coefficient of x to both sides.

4. Write the resulting trinomial as the square of a binomial.

5. Apply the square root property.

To solve a polynomial inequality:

1. Write the inequality in standard form.

2. Solve the related equation.

3. Use solutions from step 2 to separate the number line into regions.

4. Use a test point to determine whether values in each region satisfy the original inequality.

5. Write the solution set as the union of regions whose test point value is a solution.

To solve a rational inequality:

1. Solve for values that make all denominators 0.

2. Solve the related equation.

3. Use solutions from steps 1 and 2 to separate the number line into regions.

4. Use a test point to determine whether values in each region satisfy the original inequality.

5. Write the solution set as the union of regions whose test point value is a solution.

Graph of a Quadratic Function

The graph of a quadratic function written in the form

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

is a parabola with vertex (h, k). If a > 0, the parabola opens downward. The axis of symmetry is the line whose equation is x = h.

Example: $g(x) = 3(x-1)^2 + 4$

The graph is a parabola with vertex (1,4) and axis of symmetry x = 1. Since a = 3 is positive, the graph opens upward.

The graph of $f(x) = ax^2 + bx + c$, a*0, is a parabola with vertex

$$\left(\frac{b}{2a} \right), \quad f\left(\frac{-b}{2a} \right)$$