

Study Guide

Student Edition
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Solving Quadratic Equations by Graphing

Definition of a Quadratic Function

A quadratic function is a function described by an equation that can be written in the form $f(x) = ax^2 + bx + c$ where $a \neq 0$. In a quadratic function, ax^2 is called the **quadratic term**, bx is called the **linear term**, and c is called the **constant term**.

The graph of any quadratic function is a parabola. Parabolas have certain common characteristics. Study the chart below.

Common Characteristics of Parabolas

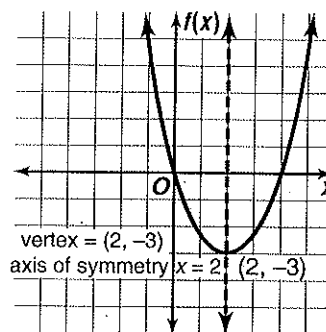
1. Axis of Symmetry: The line about which the parabola is symmetric.
2. Vertex: The point of the parabola where the parabola and the axis of symmetry intersect.
3. The graphs of all parabolas have the same general shape, a U shape.
4. A parabola whose equation is $y = (x - h)^2 + k$ has its vertex at (h, k) and axis of symmetry $x = h$.

Example: Write $f(x) = x^2 - 4x + 1$ in the form $f(x) = (x - h)^2 + k$. Name the vertex and axis of symmetry of the graph. Then draw the graph.

$$\begin{aligned} f(x) &= x^2 - 4x + 1 \\ &= (x^2 - 4x + 4) + (1 - 4) \\ &= (x - 2)^2 - 3 \end{aligned}$$

Vertex: $(2, -3)$

Axis of symmetry: $x = 2$



Identify the quadratic term, the linear term, and the constant term in each function.

1. $f(x) = 4x^2 - 8x + 4$

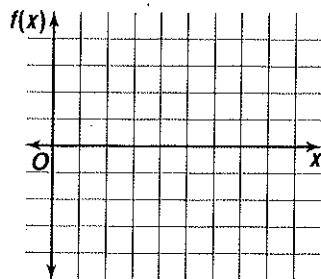
2. $m(p) = p^2 - 6p + 9$

3. $q(x) = -(x^2 - 5)^2 - x^4$

4. $f(x) = 5x^2 + (x - 4)^2$

Graph each function. Name the vertex and the axis of symmetry. Identify the solutions of the related equation.

5. $f(x) = x^2 - 10x + 21$



6. $f(x) = x^2 + 4x + 6$

