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Study Guide

Student Edition
Pages 367–375

Analyzing Graphs of Quadratic Functions

Since any quadratic function can be described by an equation of the form $f(x) = ax^2 + bx + c$, with $a \neq 0$, any quadratic function can be expressed in the general form $f(x) = a(x - h)^2 + k$. The following conclusions can be made about the graph of $f(x) = a(x - h)^2 + k$.

$y = a(x - h)^2 + k$	a is positive	a is negative
Vertex	(h, k)	(h, k)
Axis of symmetry	$x = h$	$x = h$
Direction of opening	upward	downward
As the value of $\lvert a \rvert$ increases, the graph of $y = a(x - h)^2 + k$ narrows.		

Example: Name the vertex, axis of symmetry, and direction of opening for the graph of $f(x) = -2(x - 5)^2$.

This function can be written in the form

$$f(x) = -2(x - 5)^2 + 0.$$

In the case of this equation, $a = -2$, $h = 5$, and $k = 0$. So the vertex is $(5, 0)$, the axis of symmetry is $x = 5$, and since a is negative, the graph opens downward.

Write each equation in the form $f(x) = a(x - h)^2 + k$. Then name the vertex, axis of symmetry, and direction of opening for the graph of each quadratic function.

1. $f(x) = x^2 - 6x + 11$

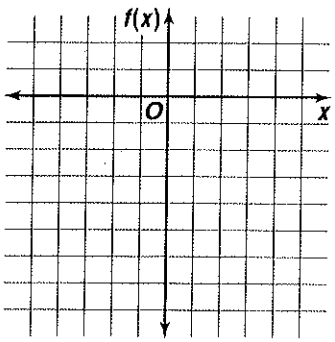
2. $f(x) = x^2 + 2x + 5$

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

4. $f(x) = -\frac{1}{2}x^2 + 2x - 6$

Graph each function.

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



6. $f(x) = -2x^2 + 8x - 5$