Graphing Calculator Investigation

A Follow-Up of Lesson 10-3

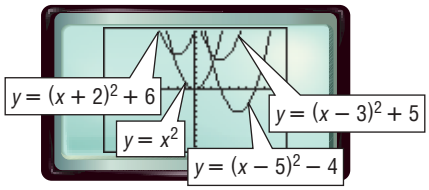
Sharp EL-9900

Graphing Quadratic Functions in Vertex Form

Quadratic functions written in the form $y = a(x - h)^2 + k$ are said to be in **vertex form**.

Graph each group of equations on the same screen. Use the standard viewing window. Compare and contrast the graphs.

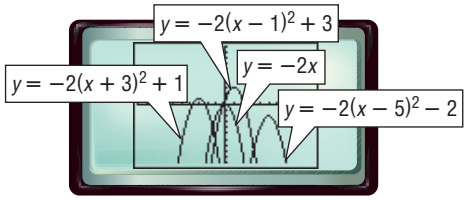
a. $y = x^2$
$y = (x - 3)^2 + 5$
$y = (x + 2)^2 + 6$
$y = (x - 5)^2 - 4$



Each graph opens upward and has the same shape. However, the vertices are different.

Equation	Vertex
$y = x^2$	(0, 0)
$y = (x - 3)^2 + 5$	(3, 5)
$y = (x + 2)^2 + 6$	(−2, 6)
$y = (x - 5)^2 - 4$	(5, −4)

b. $y = -2x^2$
$y = -2(x - 1)^2 + 3$
$y = -2(x + 3)^2 + 1$
$y = -2(x - 5)^2 - 2$



Each graph opens downward and has the same shape. However, the vertices are different.

Equation	Vertex
$y = -2x^2$	(0, 0)
$y = -2(x - 1)^2 + 3$	(1, 3)
$y = -2(x + 3)^2 + 1$	(−3, 1)
$y = -2(x - 5)^2 - 2$	(5, −2)

Exercises

1. Study the relationship between the equations in vertex form and their vertices. What is the vertex of the graph of $y = a(x - h)^2 + k$? **(*h*, *k*)**

2. Completing the square can be used to change a quadratic equation to vertex form. Copy and complete the steps needed to rewrite $y = x^2 - 2x - 3$ in vertex form.

$y = x^2 - 2x - 3$
$y = (x^2 - 2x + \underline{\ ?\ }) - 3 - \underline{\ ?\ }$ **1, 1**
$y = (x - \underline{\ ?\ })^2 - \underline{\ ?\ }$ **1, 4**

3–5. See margin for graphs.

Complete the square to rewrite each quadratic equation in vertex form. Then determine the vertex of the graph of the equation and sketch the graph.

3. $y = x^2 + 2x - 7$
$y = (x + 1)^2 - 8$; (−1, −8)

4. $y = x^2 - 4x + 8$
$y = (x - 2)^2 + 4$; (2, 4)

5. $y = x^2 + 6x - 1$
$y = (x + 3)^2 - 10$; (−3, −10)

www.algebra1.com/other_calculator_keystrokes