

THE VERTEX FORM OF A QUADRATIC FUNCTION

The focus in this lesson will be to convert a Quadratic Function from General Form to Vertex Form. We will only be focusing on Parabolas that open upward or downward in this lesson.

General Form

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

Vertex (Standard) Form

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

***Regardless of the form of the equation, the value of “a” is the same In General or Vertex Form.**

$$y = 2x^2 + 16x - 10$$

In order to convert to vertex form, complete the square leaving y in the problem.

Remember, in order to complete the square, the leading coefficient must be 1.

Convert to vertex form.

$$1) y = 3x^2 + 24x - 9$$

$$2) y = \frac{1}{4}x^2 + 3x - 2$$

SPECIAL CASE

$$y = 5x^2 - 12 \quad \leftarrow \text{Already in Vertex Form}$$

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

PROPERTIES OF A QUADRATIC FUNCTION

Now that the Quadratic Function is in Vertex Form, what do the values a , h and k do? How do they affect the graph of the function?

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

THE VERTEX OF A QUADRATIC FUNCTION

The vertex of a quadratic function can be found in both General
And Vertex Form using the following:

General Form	Vertex (Standard) Form
$y = ax^2 + bx + c$	$y = a(x - h)^2 + k$
Vertex given by:	Vertex is
$\left(-\frac{b}{2a}, f\left(-\frac{b}{2a} \right) \right)$	(h , k)

Determine the vertex of each

a) $y = -2x^2 + 4x - 12$

b) $y = \frac{1}{4}(x + 5)^2 - 3$

MAXIMUM OR MINIMUM VALUE OF A QUADRATIC FUNCTION

The maximum or minimum value of a Quadratic Function is simply the y value of the vertex. To determine whether the y value of the vertex is the maximum or minimum we look to the value of "a."

THE RANGE OF A QUADRATIC FUNCTION (VERTEX FORM)

To determine the range of a quadratic function in vertex form focus on the “a” term and the value of “k.” Since the “a” term tell us whether the parabola opens upward or downward, the value of k will tell us the maximum or minimum y value of the function.

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

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If $a > 0$, the range is $[k, \infty)$.

If $a < 0$, the range is $(-\infty, k]$.

Determine the range of the following:

a) $y = 2(x-4)^2 - 3$

b) $y = -\frac{1}{2}(x+2)^2 + 5$

c) $y = -5(x+1)^2$