

Lesson # 40: Vertex form of a Parabola

By the end of this lesson you will be able to:

- ~ Write an equation for a graphed function
- ~ Convert equations to it's Vertex Form
- ~ Graph equations from Vertex Form

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Writing Equations From Graphs

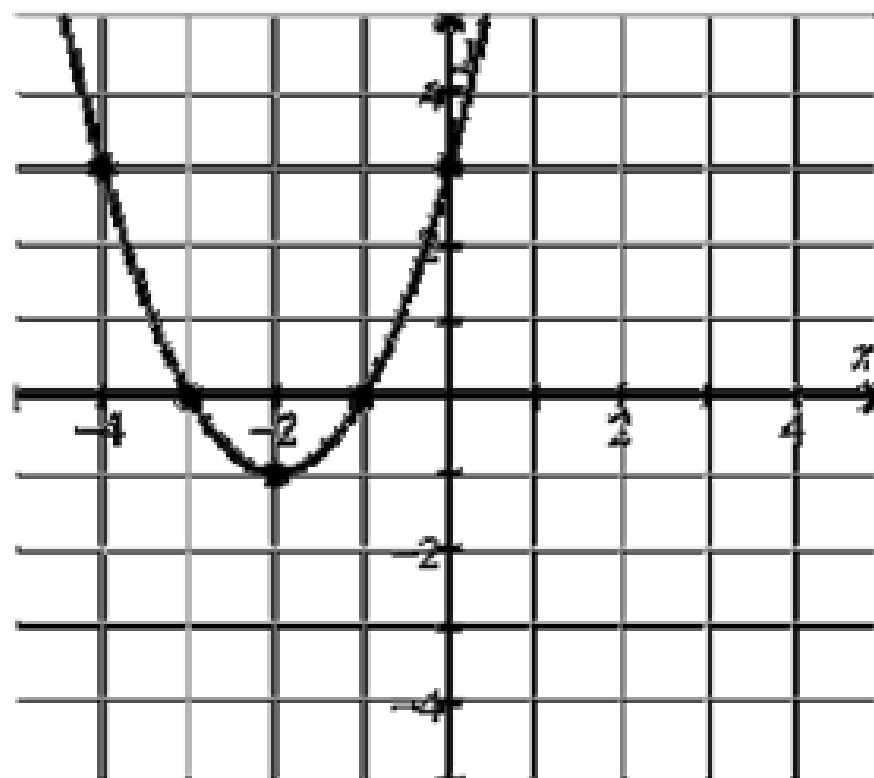
We can determine a function's equation by using the vertex and stretch. Steps for writing an equation from a given graph:

1. Find the vertex, (h,k) .
2. Plug in the h and k values into the vertex formula:
$$y = a(x - h)^2 + k.$$
3. Now pick another point, (x,y) , from the graph.
4. Plug in the values for x and y into your new equation and then solve for a .
5. Plug in the value for a into your equation from step 2.

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Writing Equations From Graphs

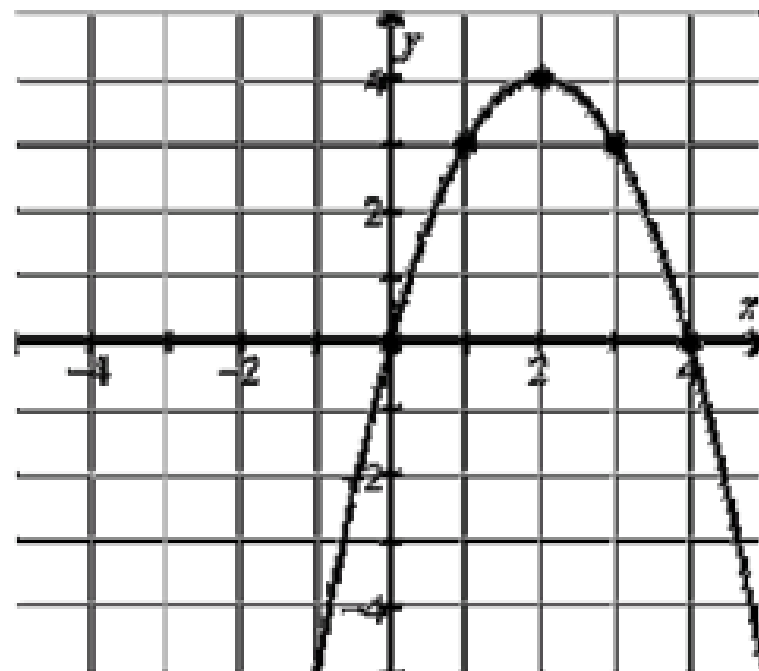
Find the equation for the function.



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Writing Equations From Graphs

Find the equation for the function.



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Writing Equations From Graphs

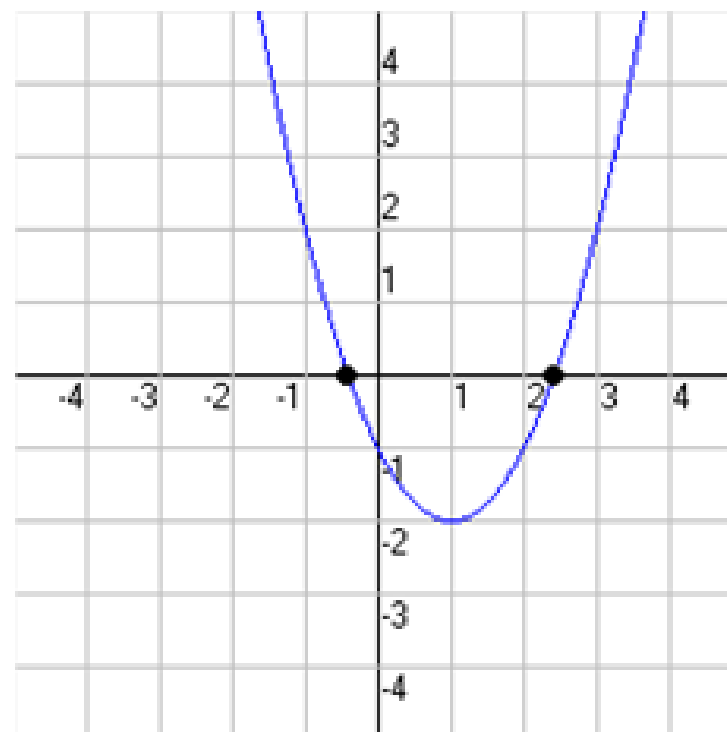
Find the equation for the function.

Vertex is $(2,0)$ and goes through the point $(3,4)$

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Writing Equations From Graphs

Find the equation for the function.



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Converting to Vertex Form

How do we graph a quadratic equation by hand that is not in vertex form?

This is very difficult to do, so instead we will convert the original equation into vertex form.

Remember: The quadratic function form $f(x) = ax^2 + bx + c$

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Finding the vertex:

We will find the x-coordinate of the vertex by using $\frac{-b}{2a}$.

We will find the corresponding y-value of the vertex by plugging $\frac{-b}{2a}$, into our equation and solving for y.

Now we have our VERTEX as $(\frac{-b}{2a}, f(\frac{-b}{2a}))$.

After we've found our vertex we will use it in our vertex form and we will use the original **a** from $f(x) = ax^2 + bx + c$.

So we have $y = a(x - \frac{-b}{2a})^2 + f(\frac{-b}{2a})$.

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Converting to Vertex Form

Example: Write each equation in vertex form.

$$f(x) = 2x^2 + 12x + 13$$

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Converting to Vertex Form

Example: Write each equation in vertex form.

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

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Converting to Vertex Form

Example: Write each equation in vertex form.

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

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Graphing Quadratics

To graph:

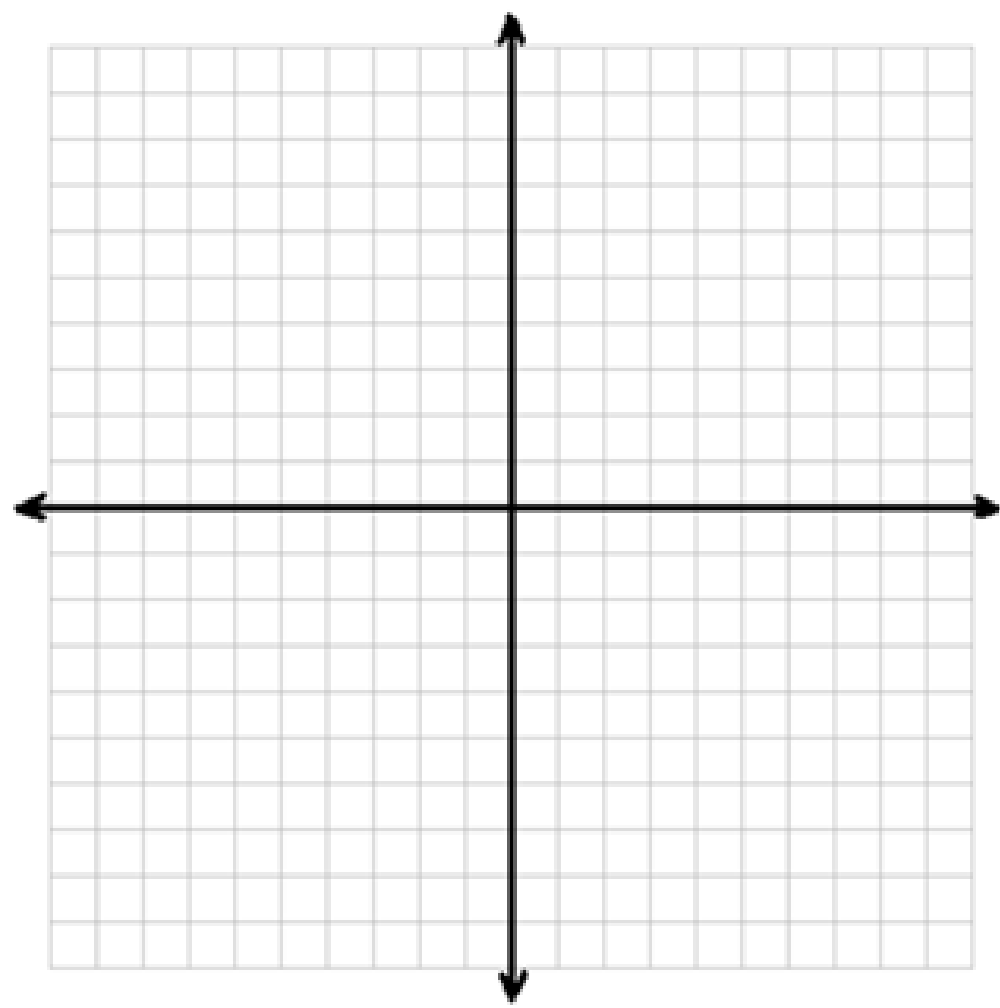
1. Convert to Vertex Form.
2. Plot the Vertex.
3. Use a "t" chart to find two points to the left and two points to the right of the vertex.
4. Plot the points and connect the dots. (Remember arrows!)

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Graphing Quadratics

Ex 1: Graph the function.

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



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Ex 1: Graph the function. (WORK)

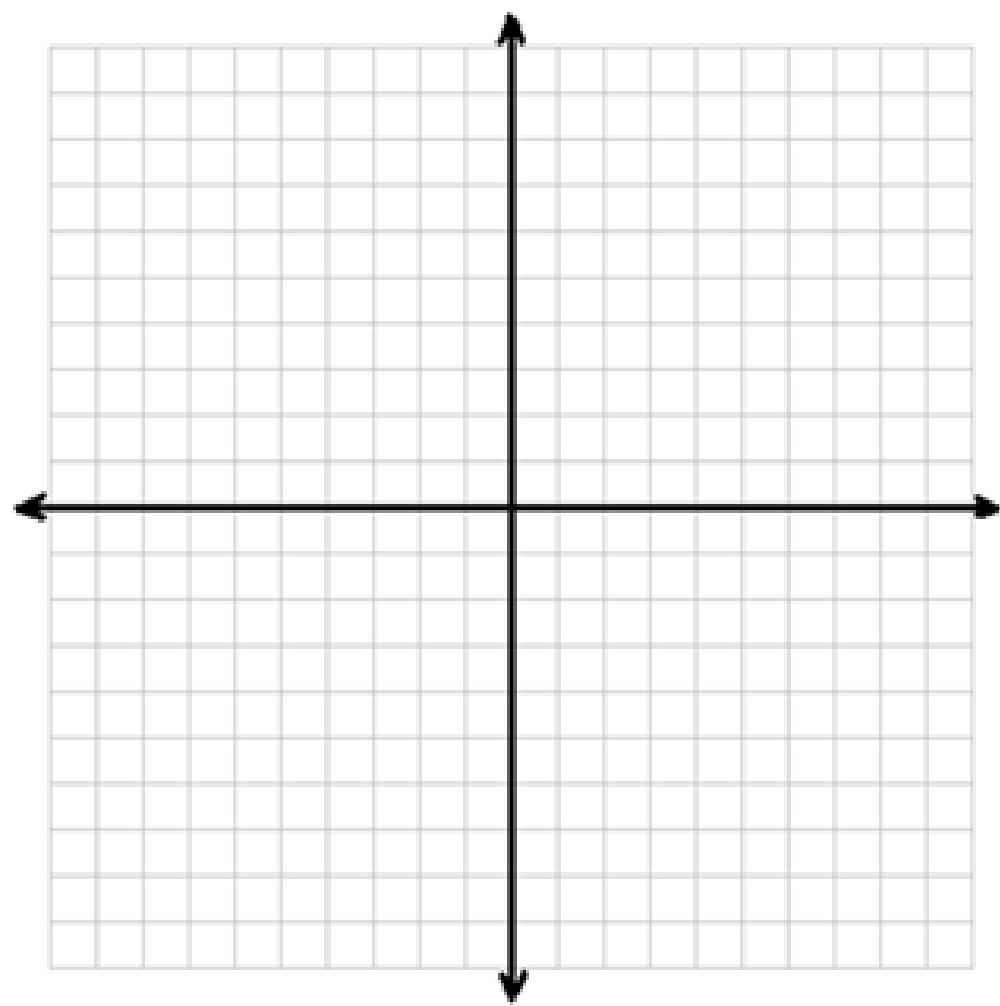
$$f(x) = 3(x + 3)^2$$

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Graphing Quadratics

Ex 2: Graph the function.

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



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Ex 2: Graph the function. (WORK)

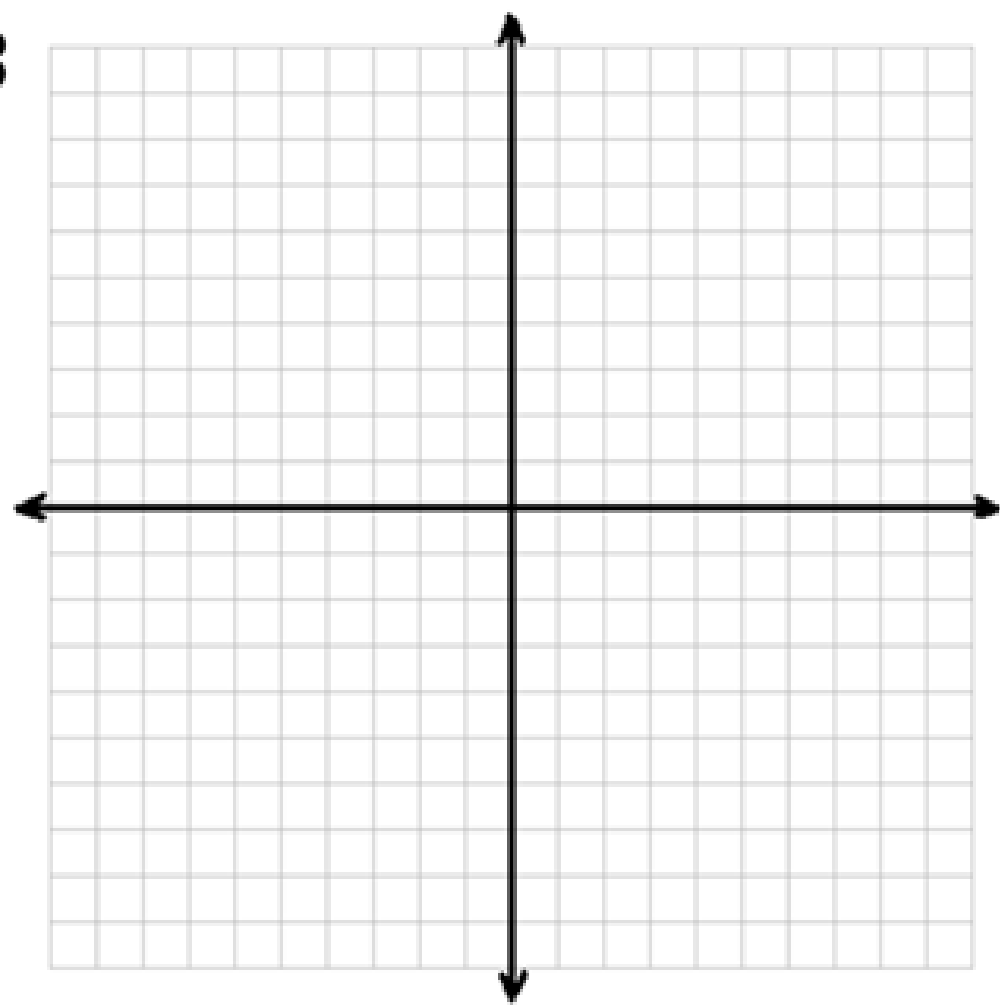
$$f(x) = x^2 + 6x + 2$$

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Graphing Quadratics

Ex 3: Graph the function.

$$f(x) = -5x^2 - 40x - 8$$



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Ex 3: Graph the function. (WORK)

$$f(x) = -5x^2 - 40x - 80$$

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Can you?

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Homework:

Instructions: Ignore the "axis of symmetry".

Assignment 40