Graphing Quadratic Equations with 2 variable

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Here are some examples: ▸ Example 1 ▸ Example 2

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This was a long process, but thankfully we will be able to find some shortcuts both for graphing and for getting this form!

Before we learn these shortcuts, let's look at what we already know about graphing:

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

Graphing Quadratic Equations with 2 variable

Let's graph: $y = a(x - h)^2 + k$

Graphing Quadratic Equations with 2 variable

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▸ Basic Graph

$$y = x^2$$

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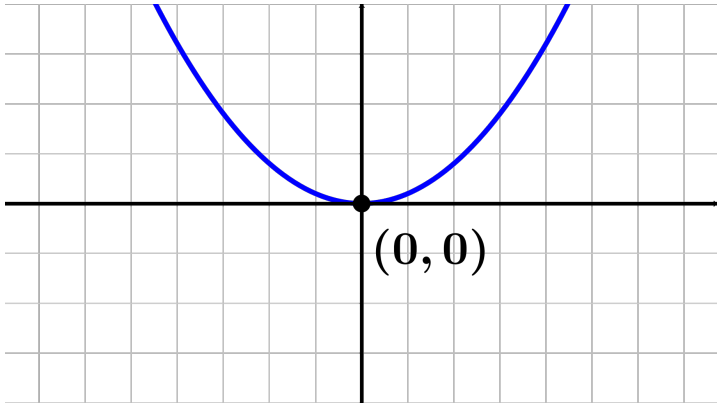

$y = x^2$

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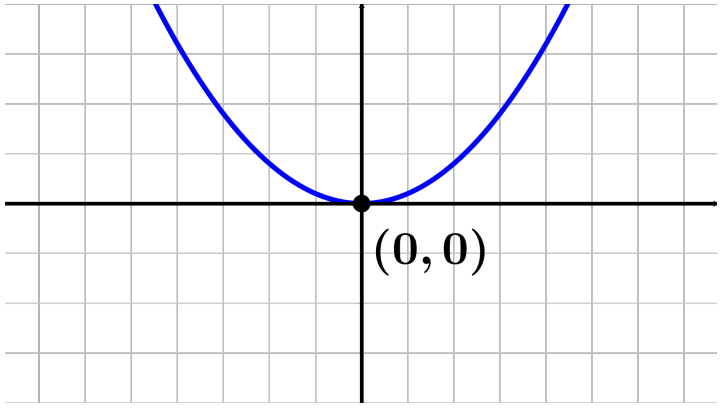

$y = x^2$

▸ Horizontal Shift by h

$y = (x - h)^2$

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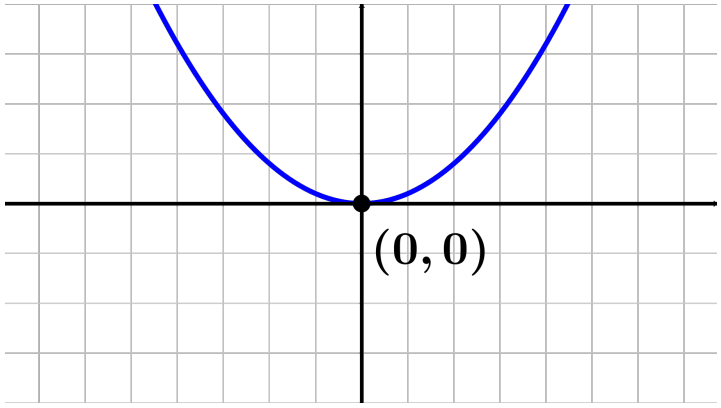

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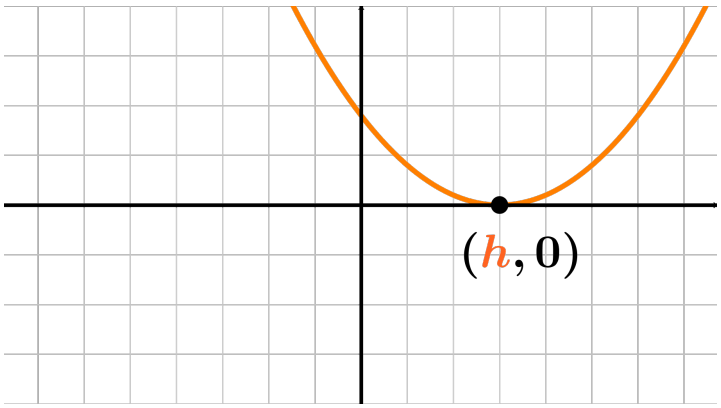

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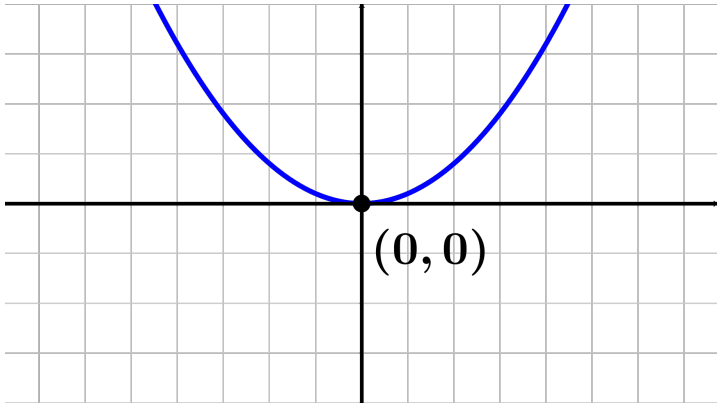
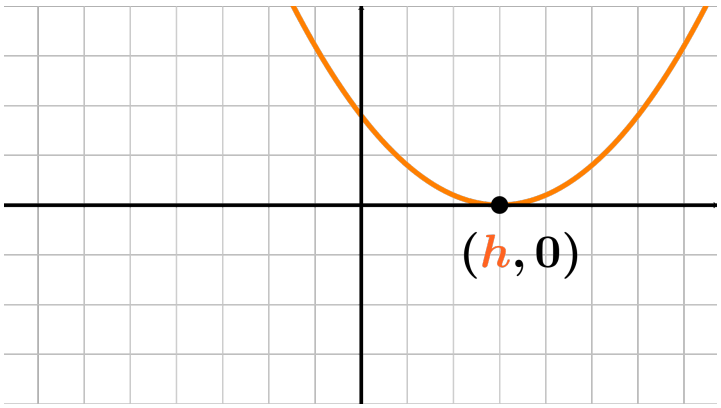


$y = x^2$

▸ Dilation by a

▸ Horizontal Shift by h



$y = (x - h)^2$

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

Graphing Quadratic Equations with 2 variable

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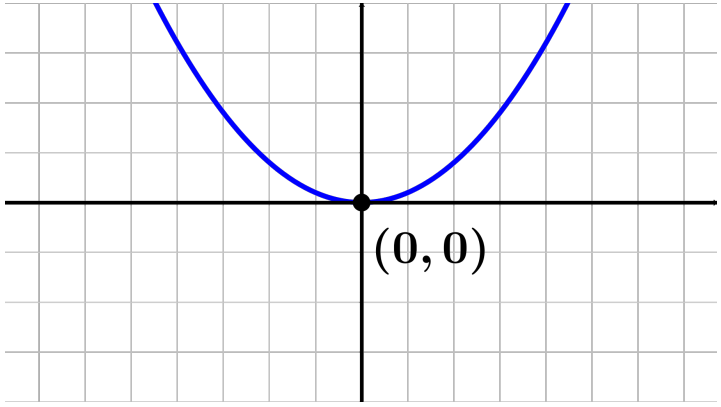

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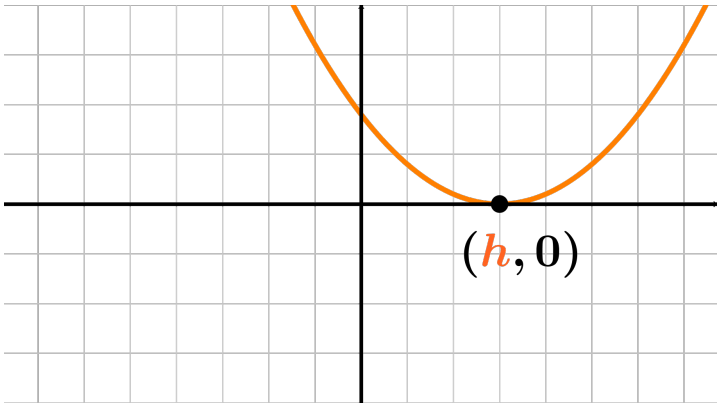

$y = (x - h)^2$

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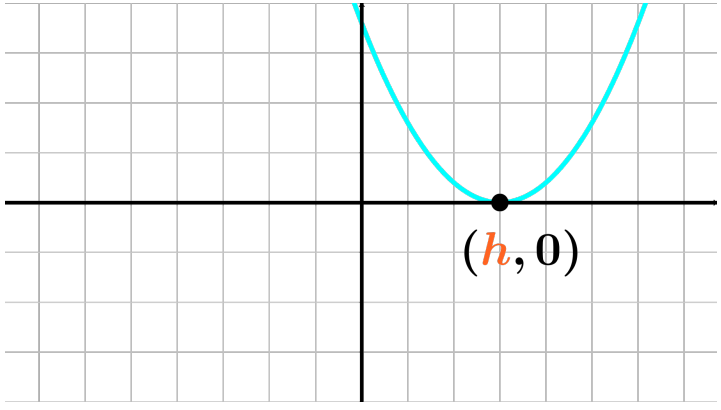

$y = a(x - h)^2$

Graphing Quadratic Equations with 2 variable

Let's graph: $y = a(x - h)^2 + k$

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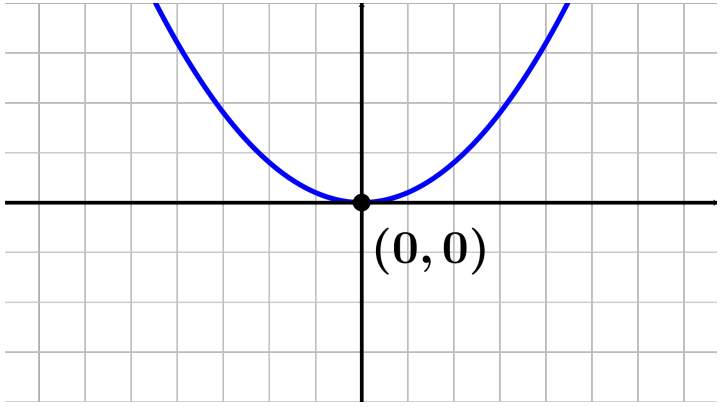

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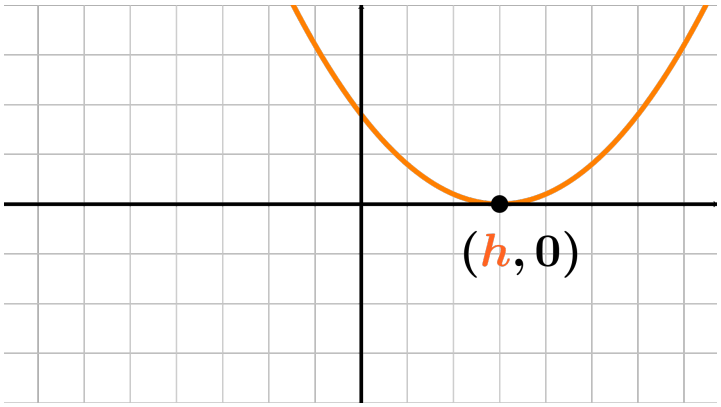

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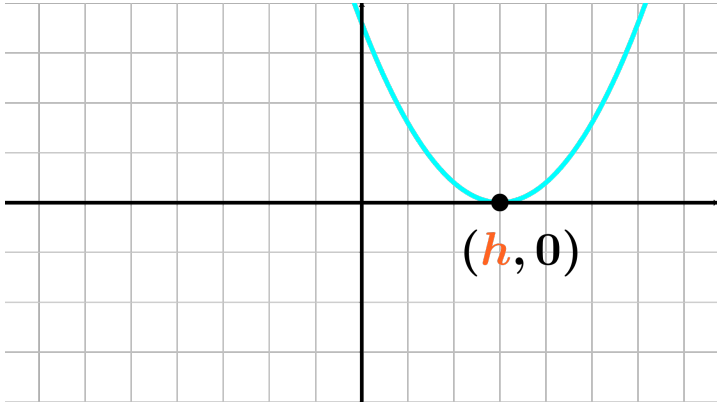


$y = a(x - h)^2$

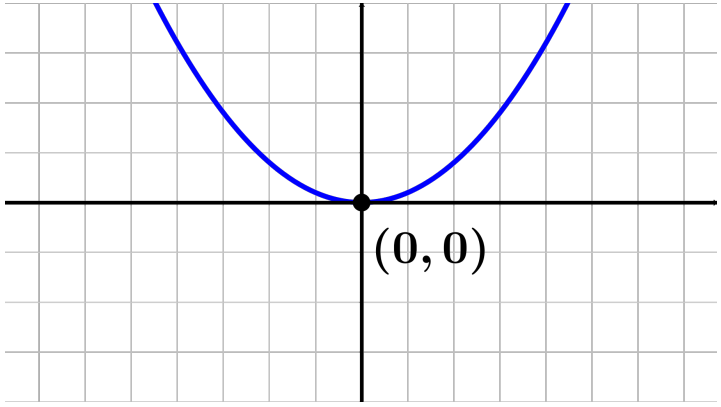
▸ Vertical Shift by k

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

Graphing Quadratic Equations with 2 variable

Let's graph: $y = a(x - h)^2 + k$

▸ Basic Graph



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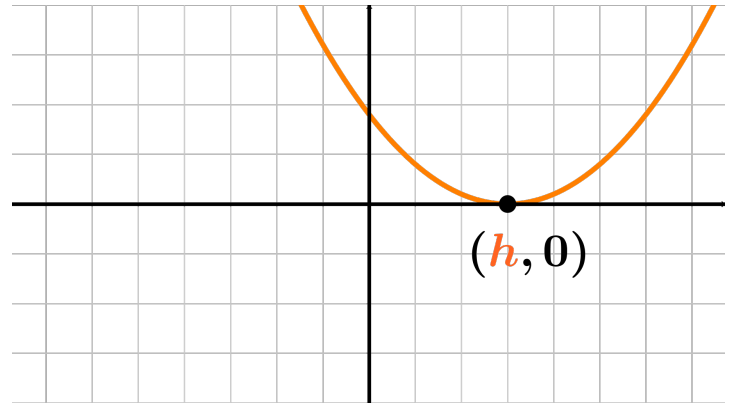

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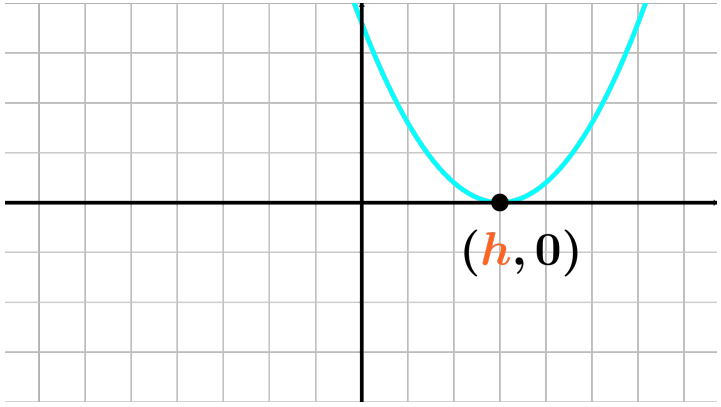
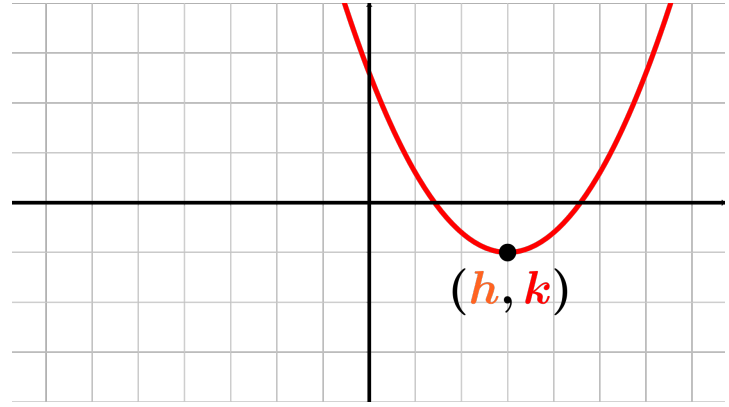


$y = a(x - h)^2$

▸ Vertical Shift by k



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Graphing Quadratic Equations with 2 variable

Let's graph: $y = a(x - h)^2 + k$

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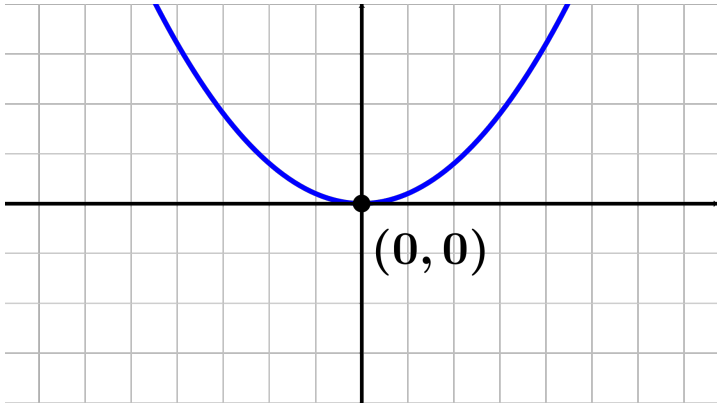

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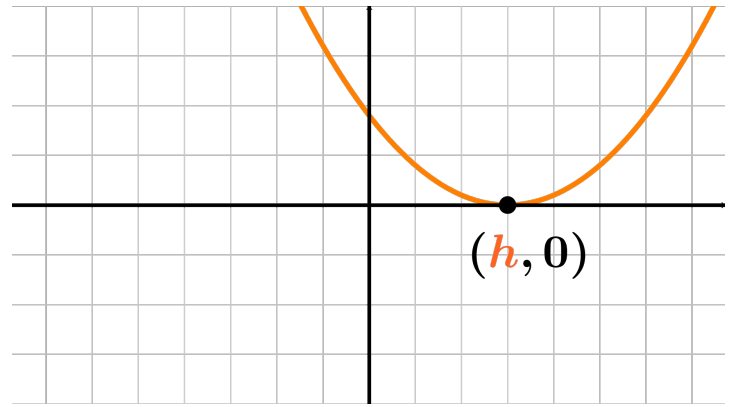

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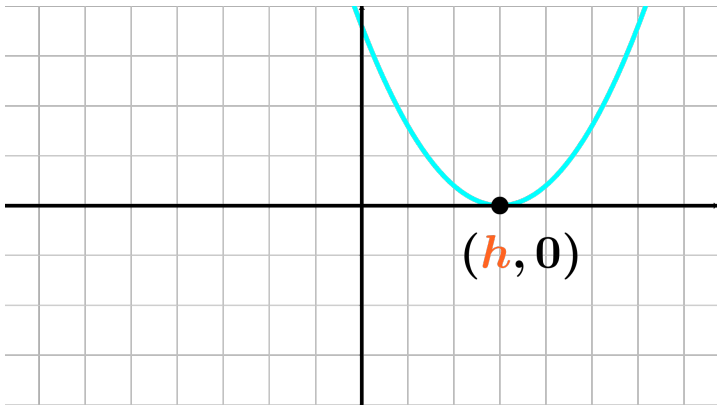

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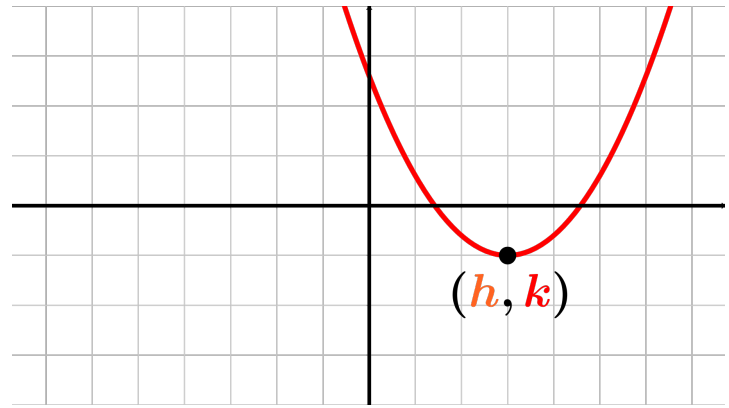

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The extreme point (h, k) on the graph is called the *vertex*.

Graphing Quadratic Equations with 2 variable

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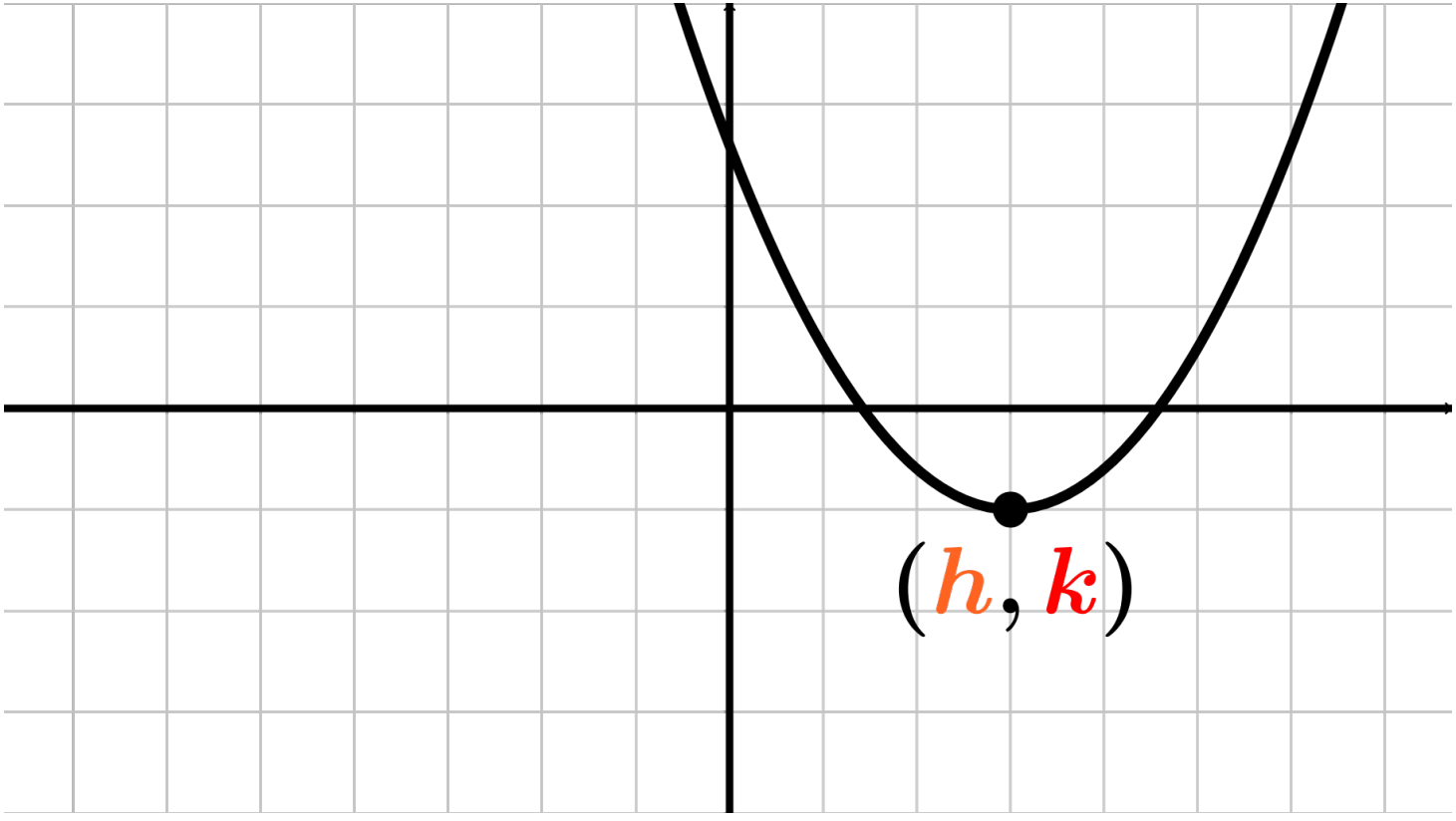

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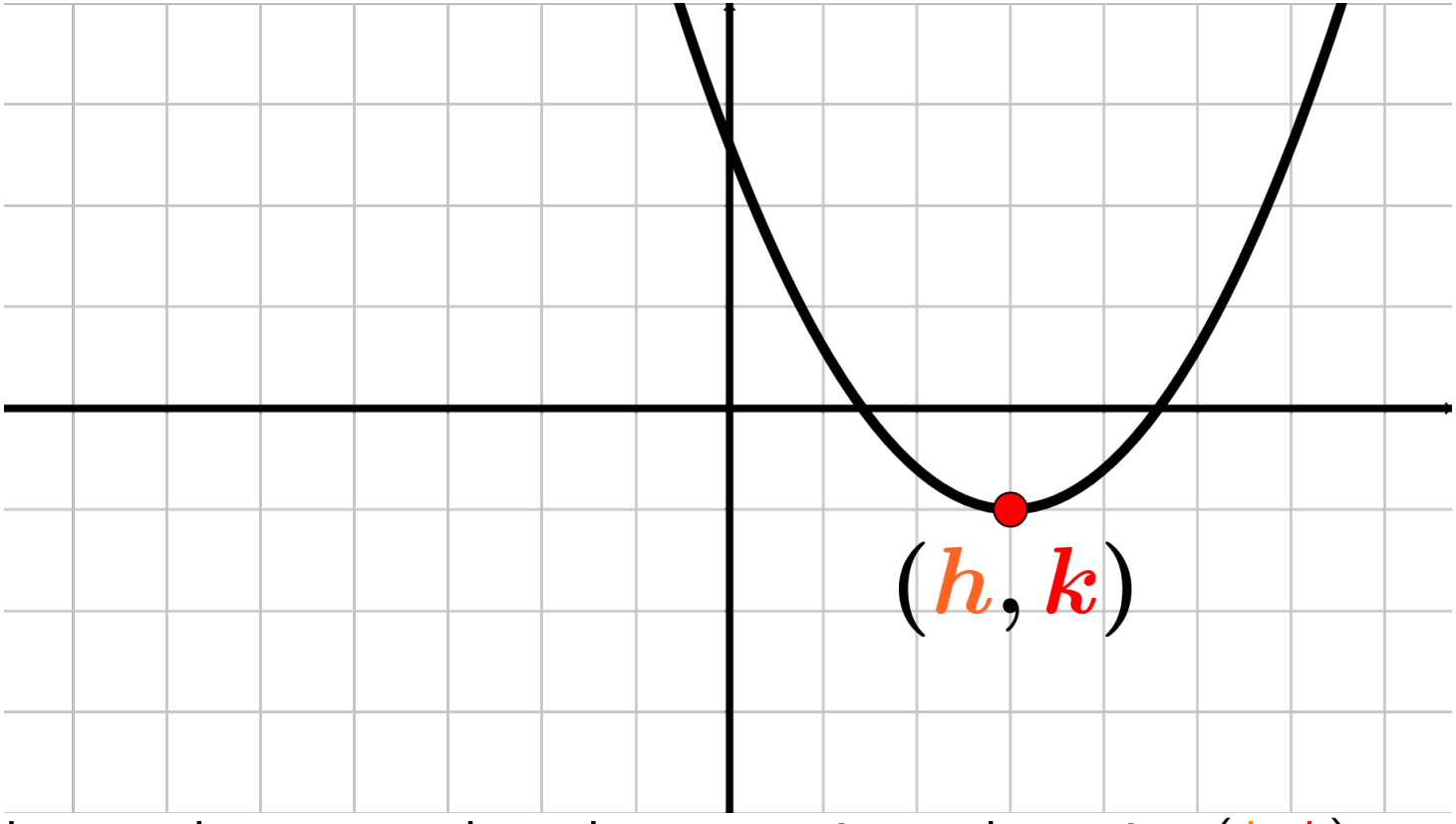

Using the graph, we see that the vertex is at the point (h, k)

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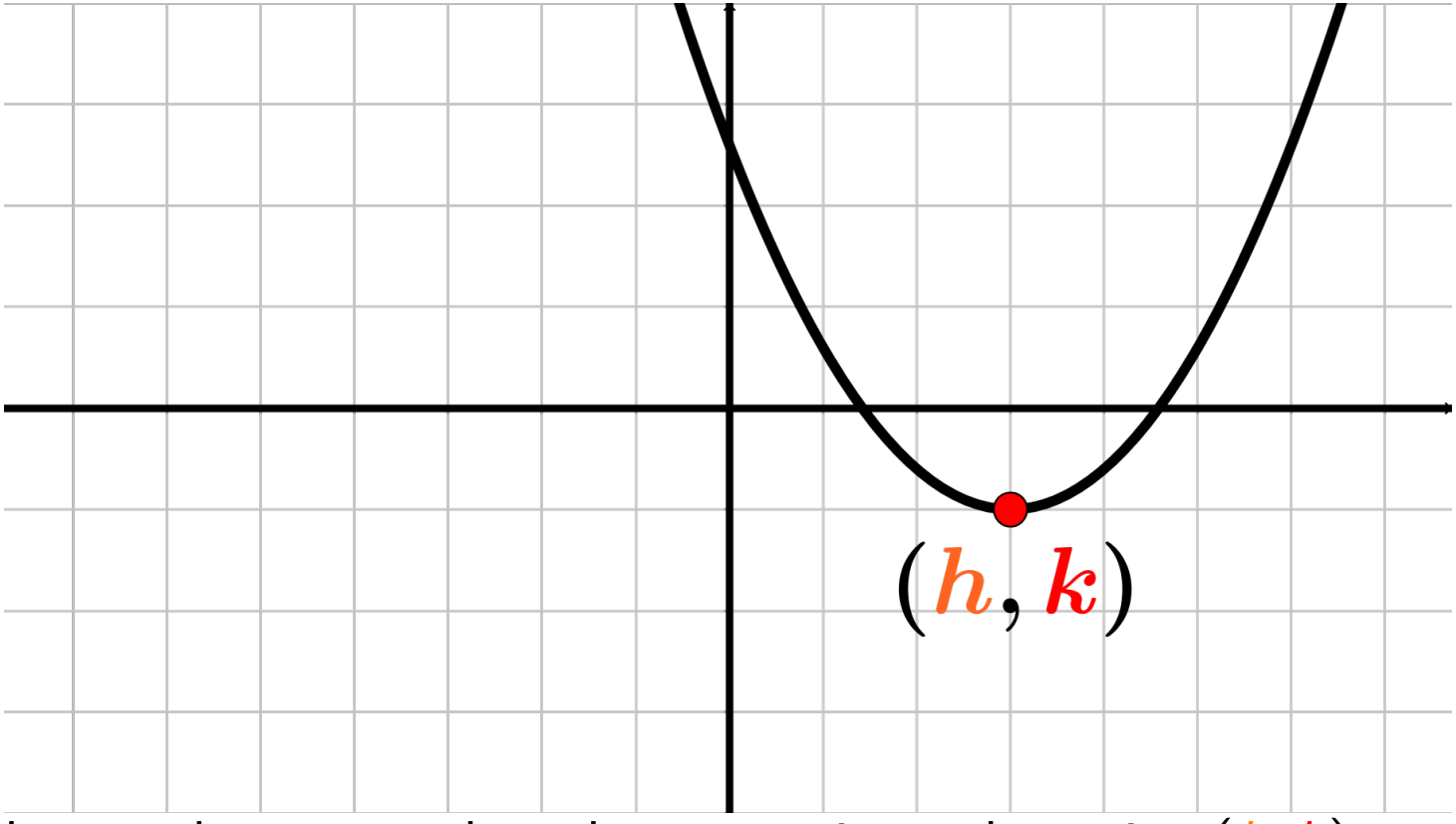

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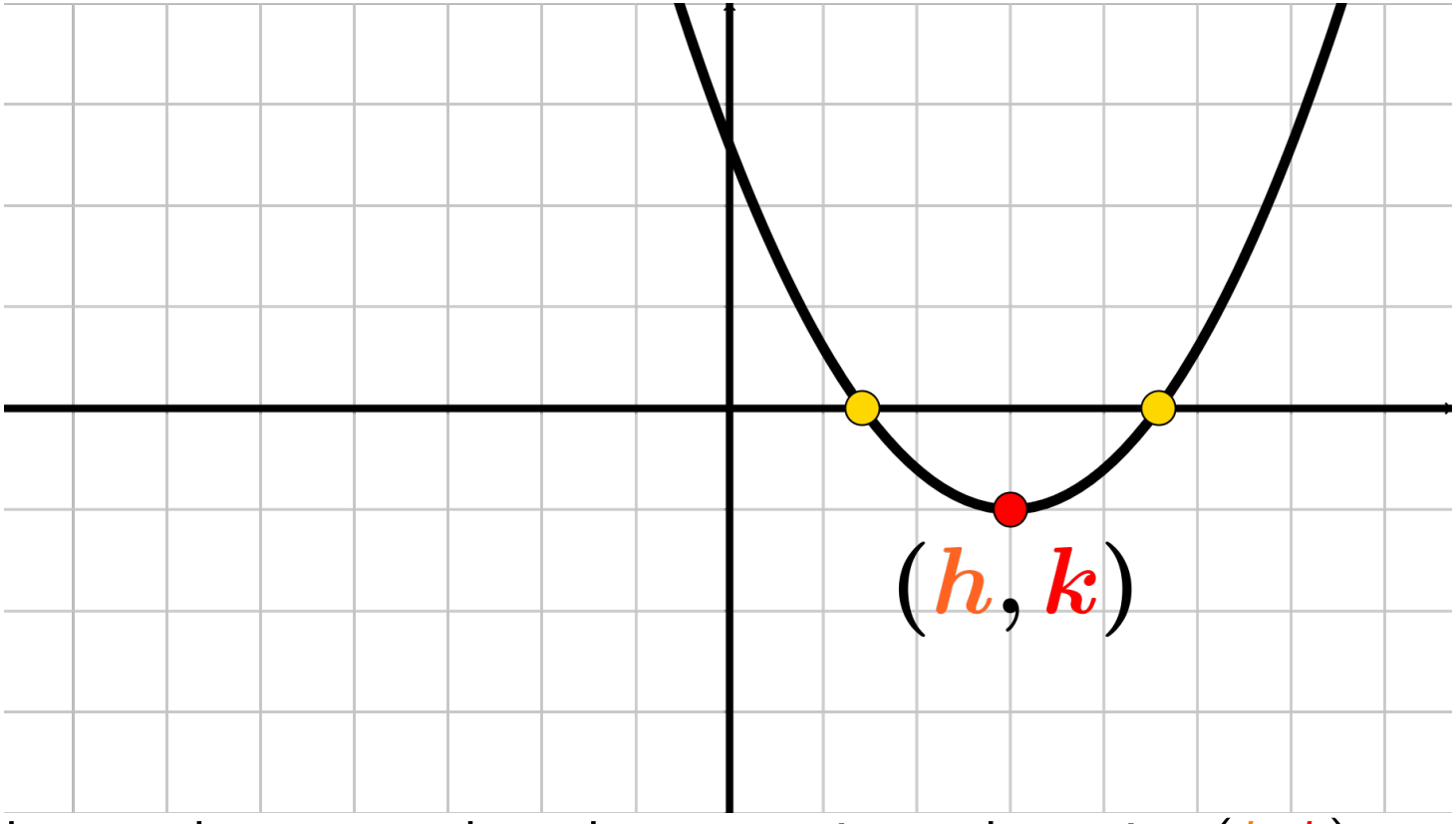

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What other interesting points are on this graph?
This graph has 2 $x-$intercepts

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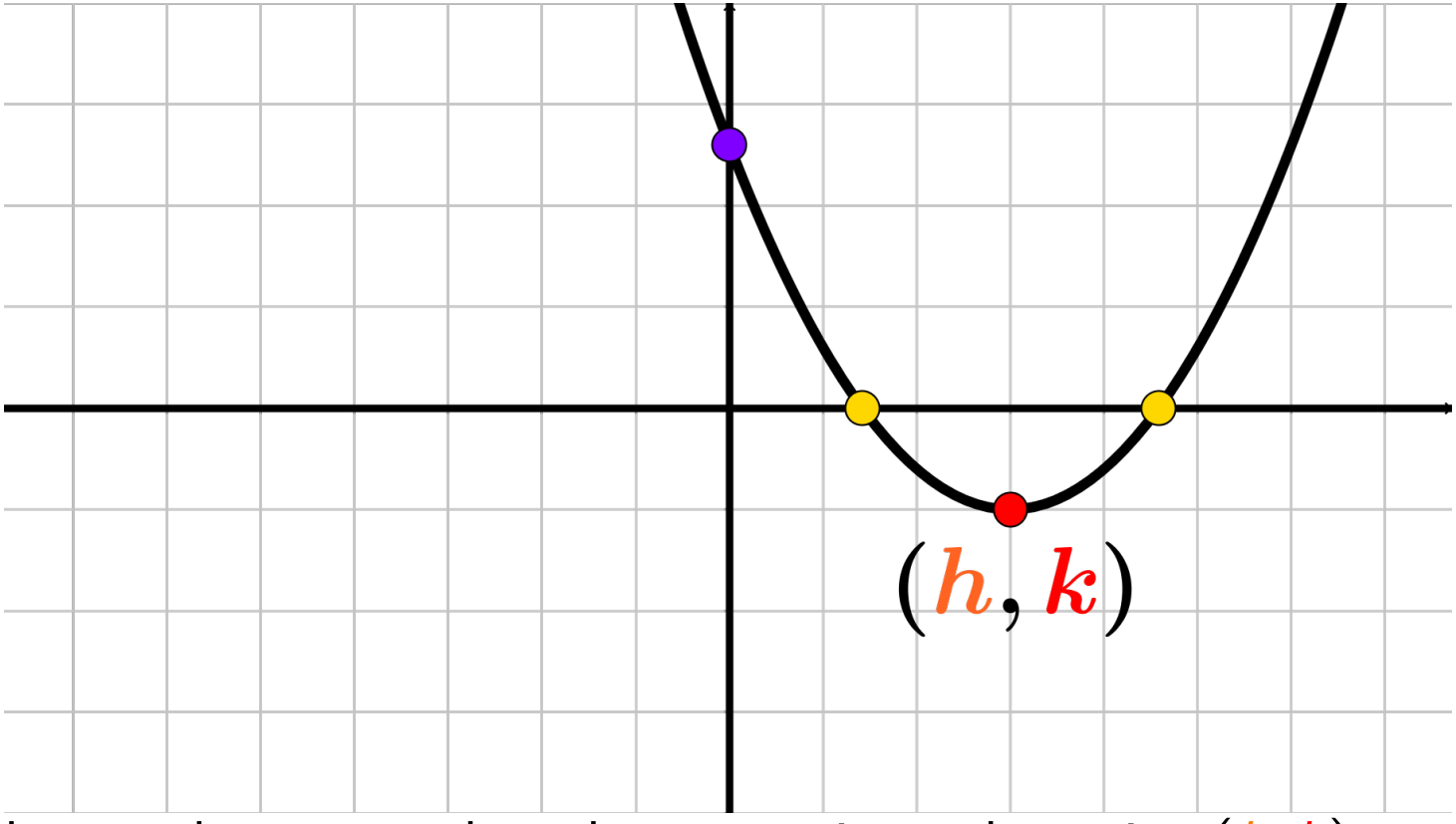

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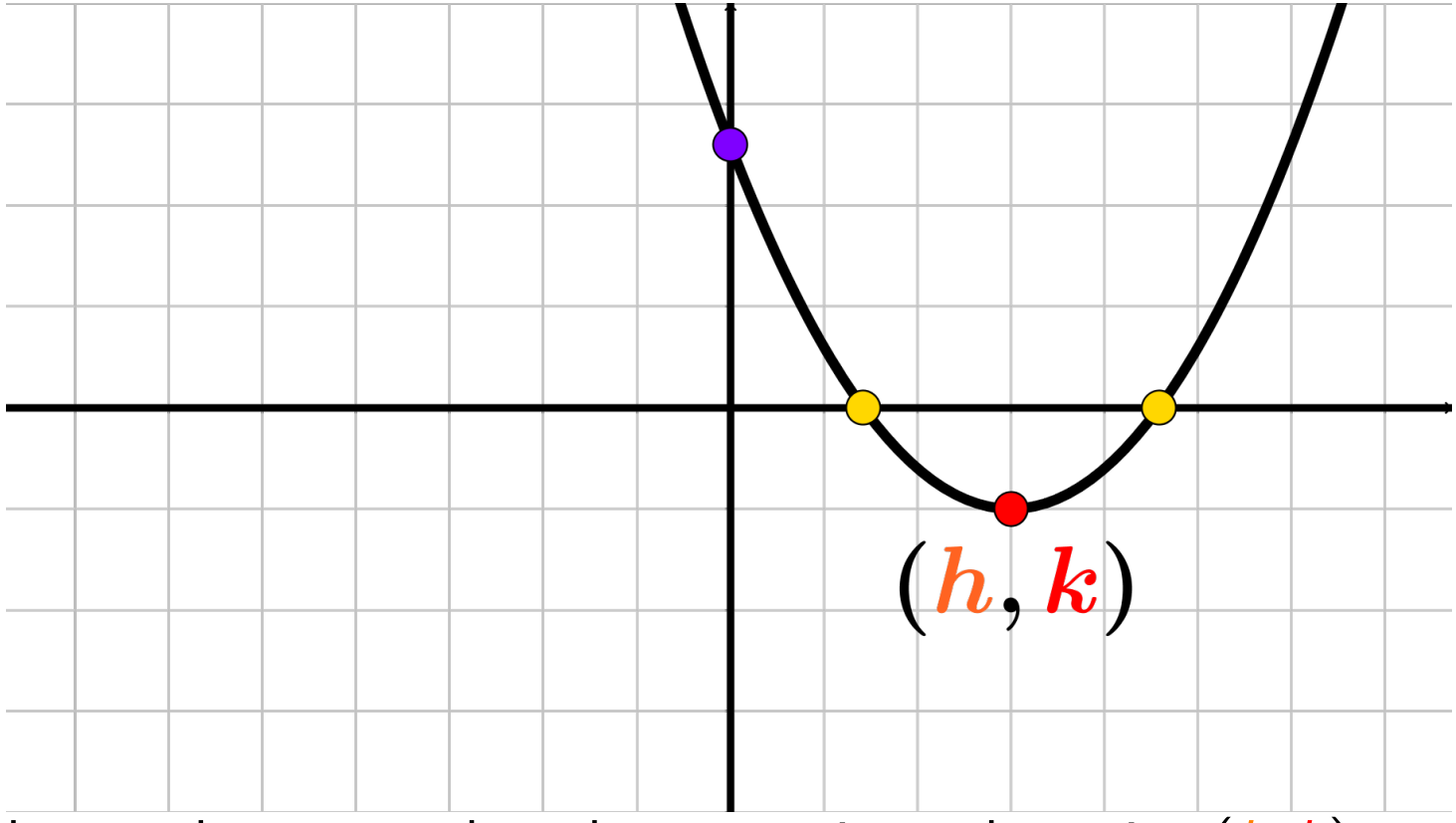

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This graph has 2 $x-$intercepts
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Similar to the basic graph $y = x^2$ this graph is symmetric

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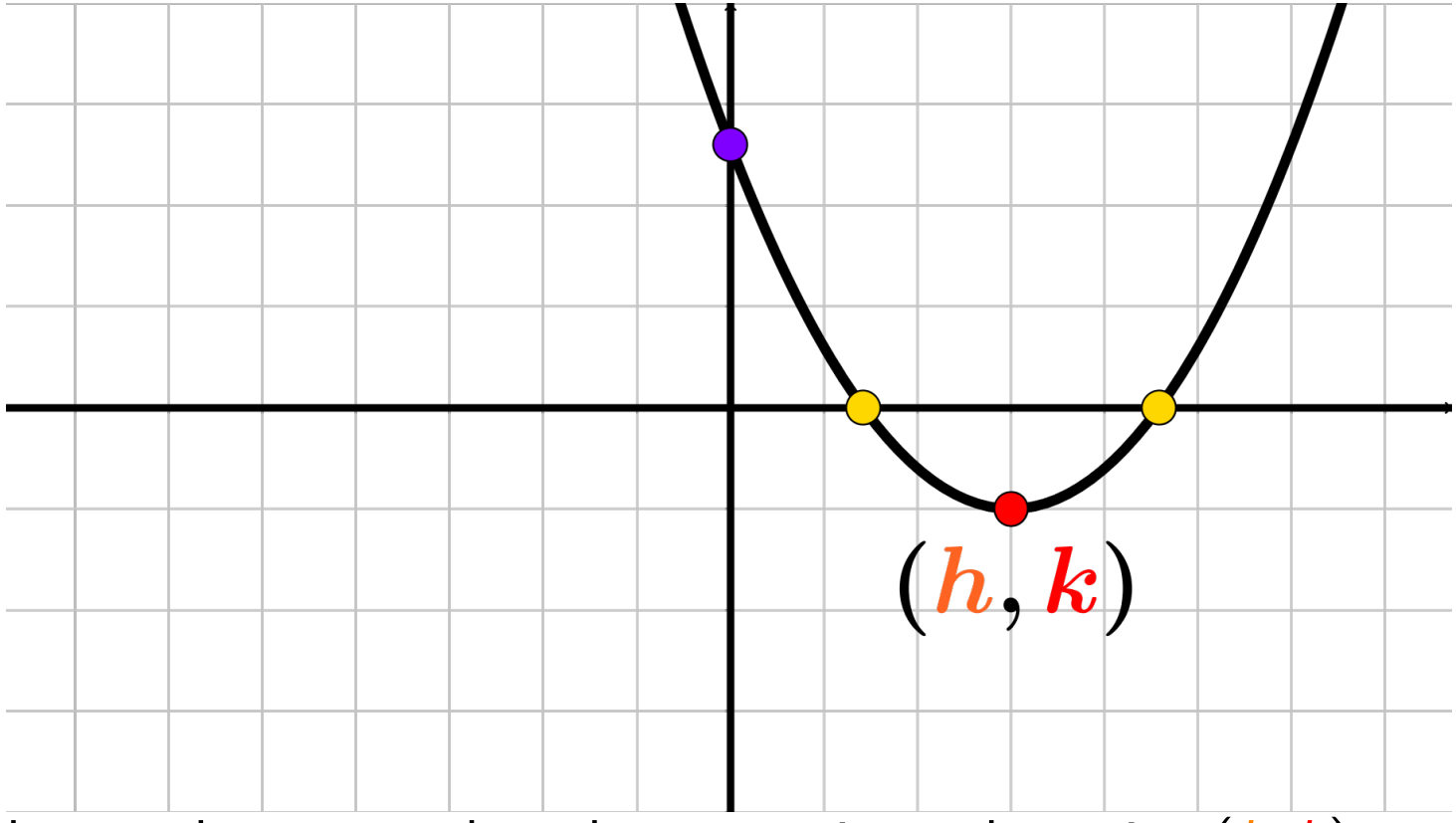

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Unlike $y = x^2$, this graph is not symmetric across the $y-$axis

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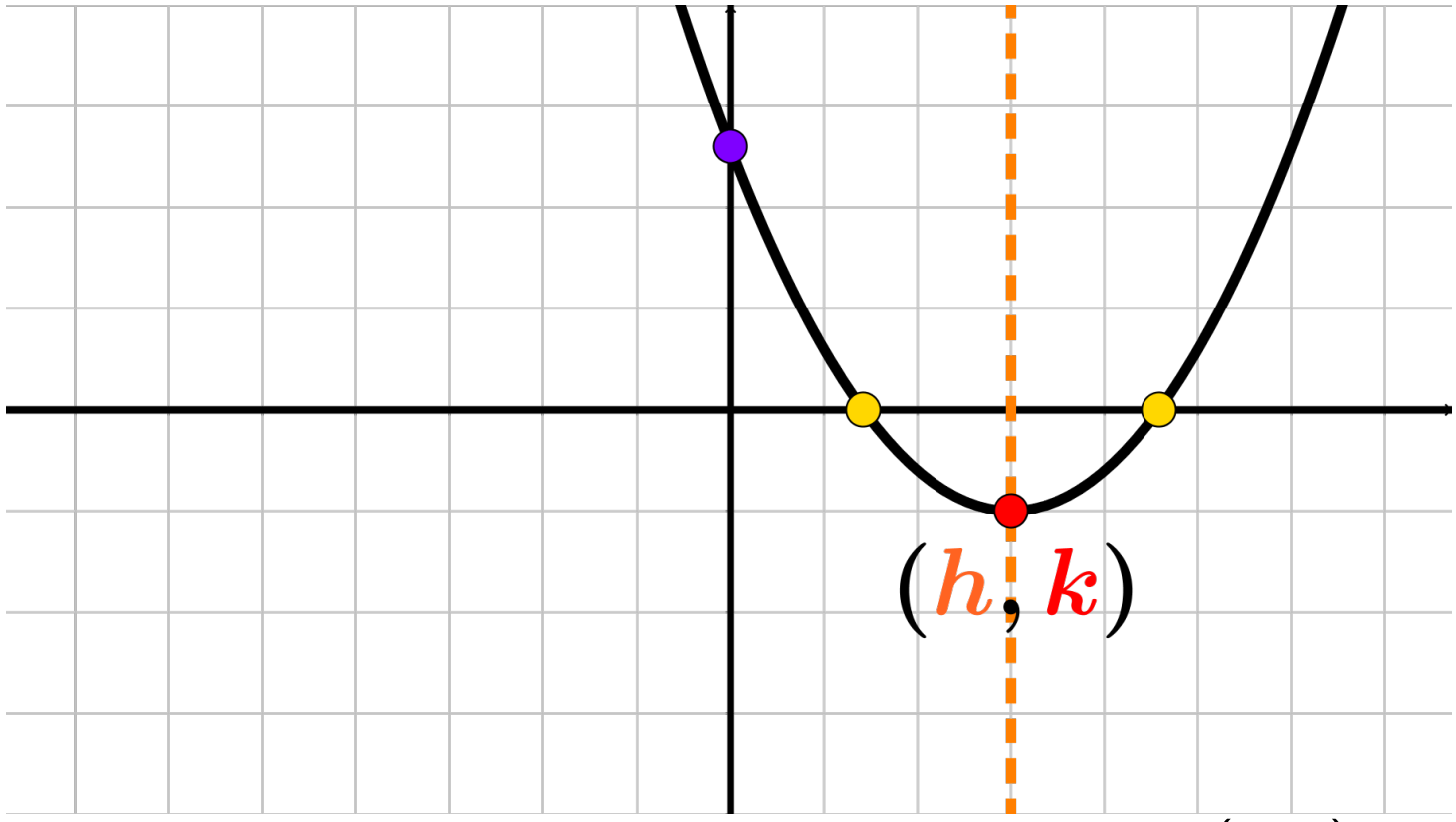

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The *line of symmetry* is the vertical line through the vertex $x = h$

Graphing Quadratic Equations with 2 variable

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Graphing the solutions to $y = f(x) = ax^2 + bx + c$

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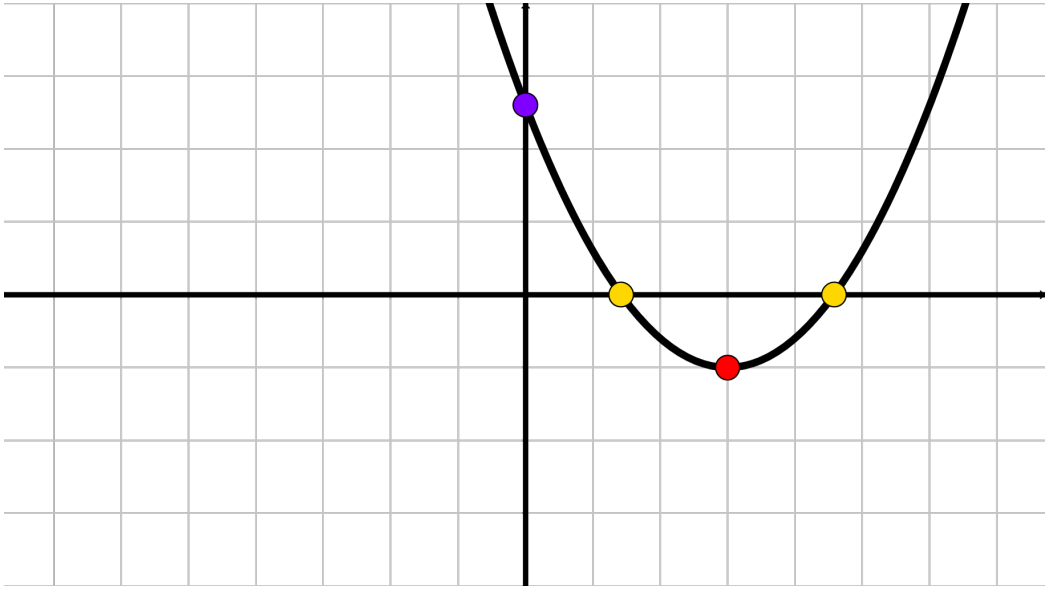
To graph a quadratic equation, we need to find our important points:



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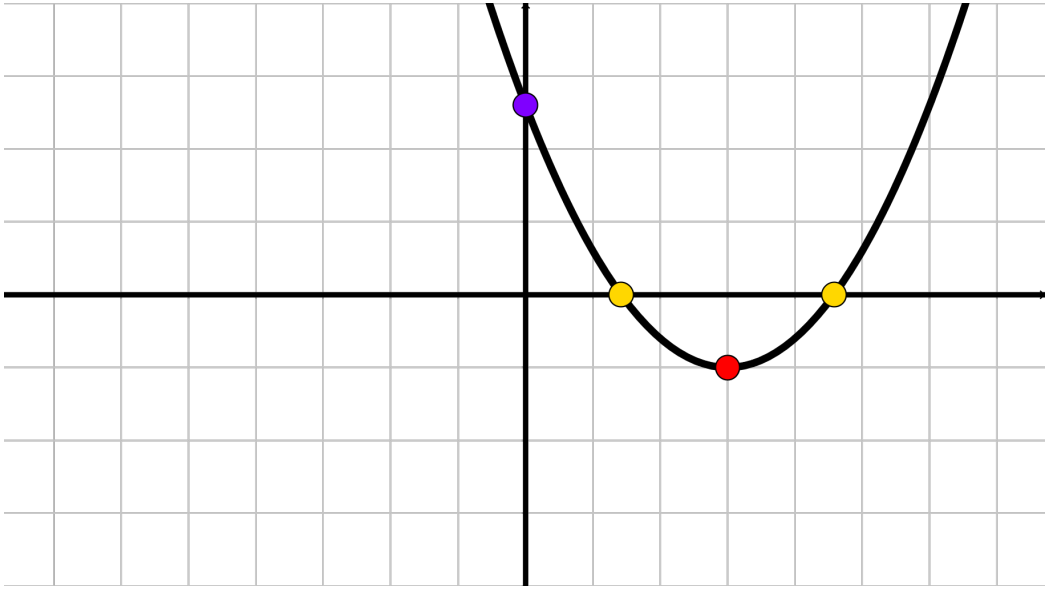

The $y-$intercept

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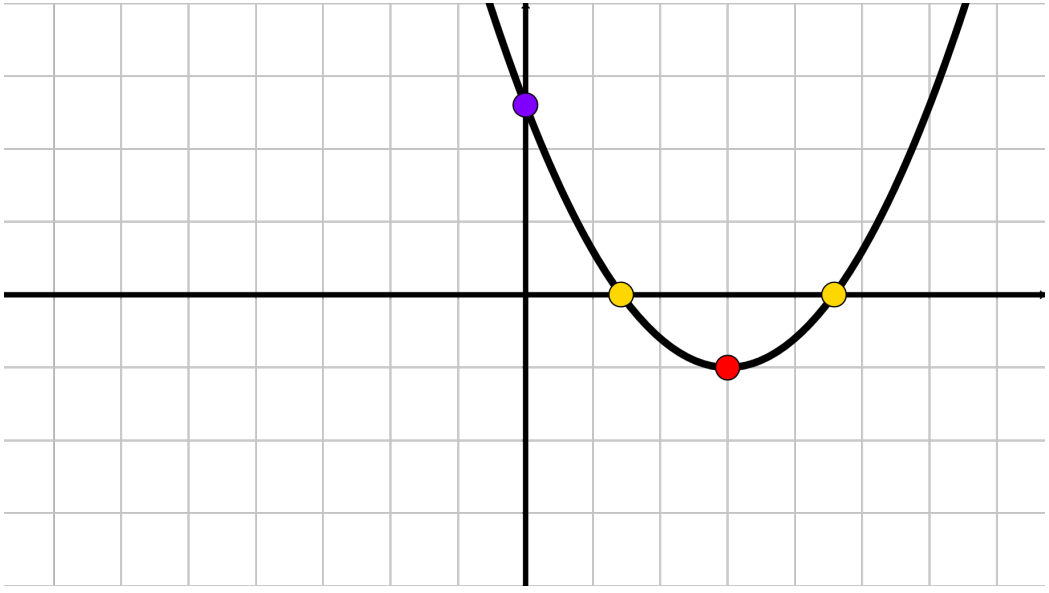

The $y-$intercept

The $x-$intercept(s)

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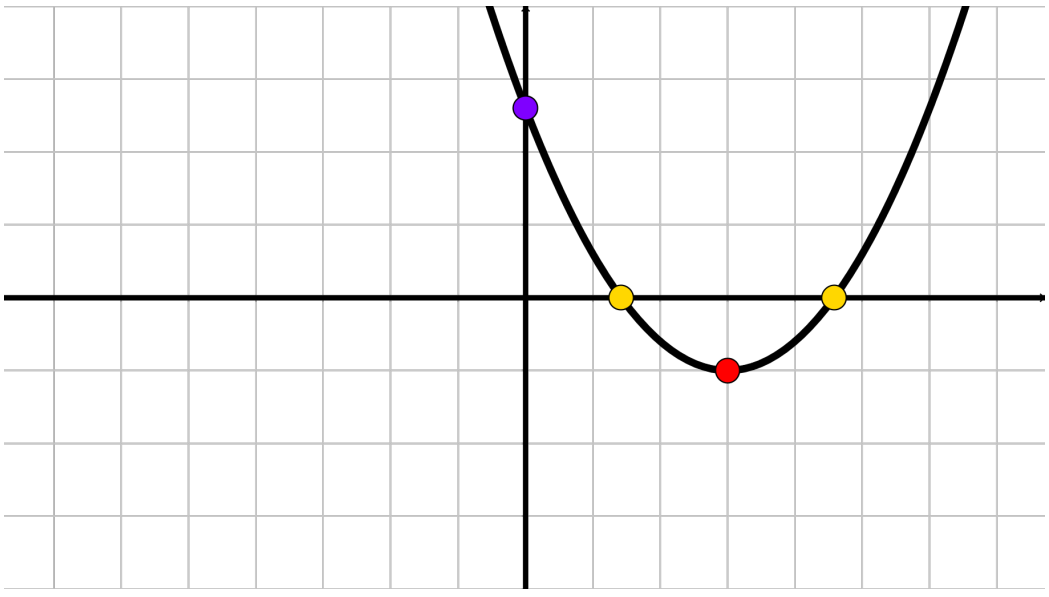

The $y-$intercept

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The vertex

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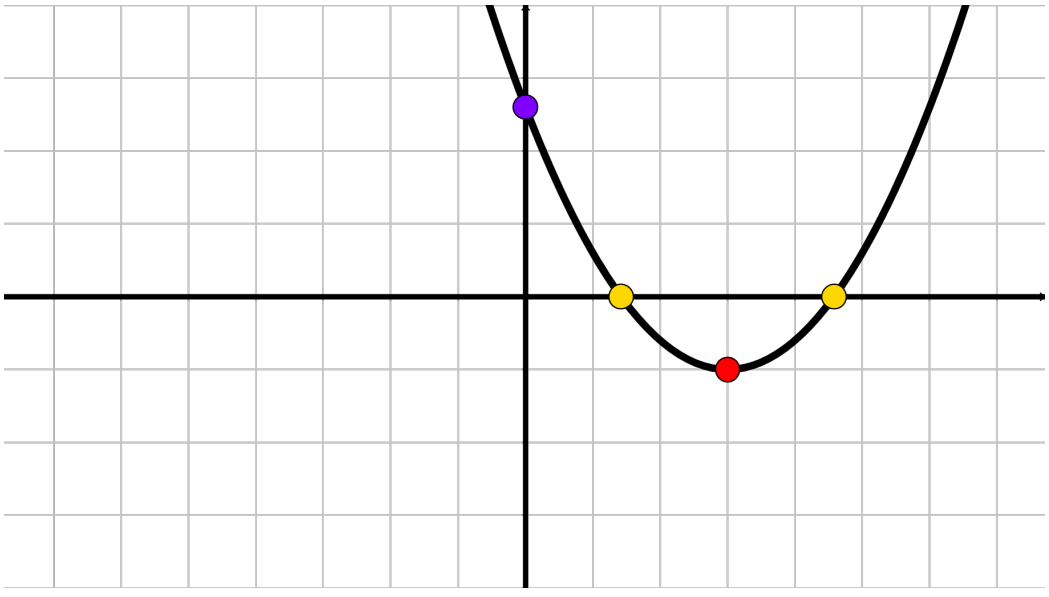

The $y-$intercept: ▸ Like with lines the $y-$intercept happens when $x = 0$

The $x-$intercept(s)

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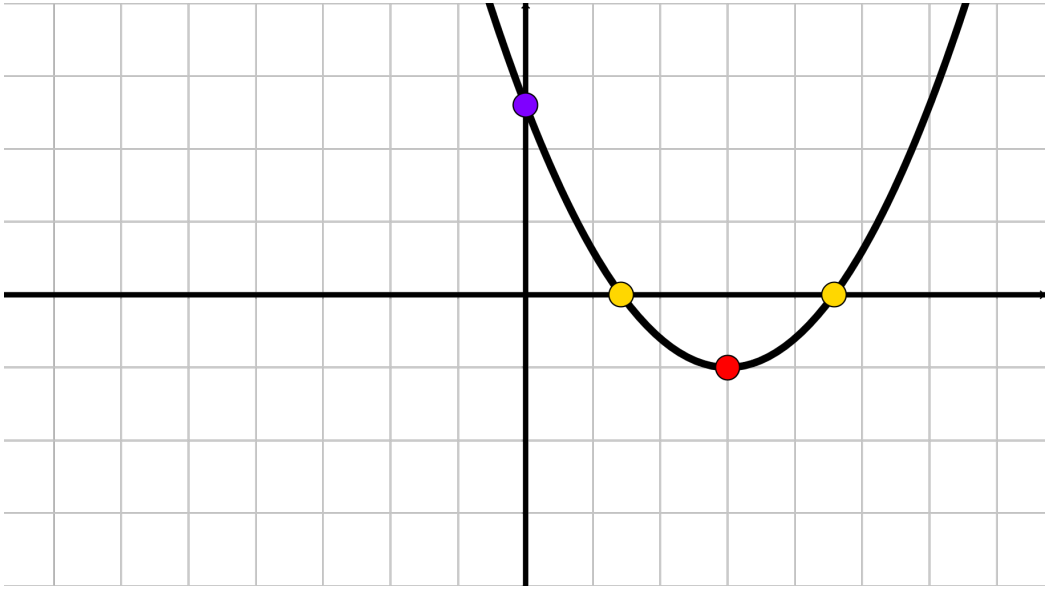

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If $x = 0$

The $x-$intercept(s)

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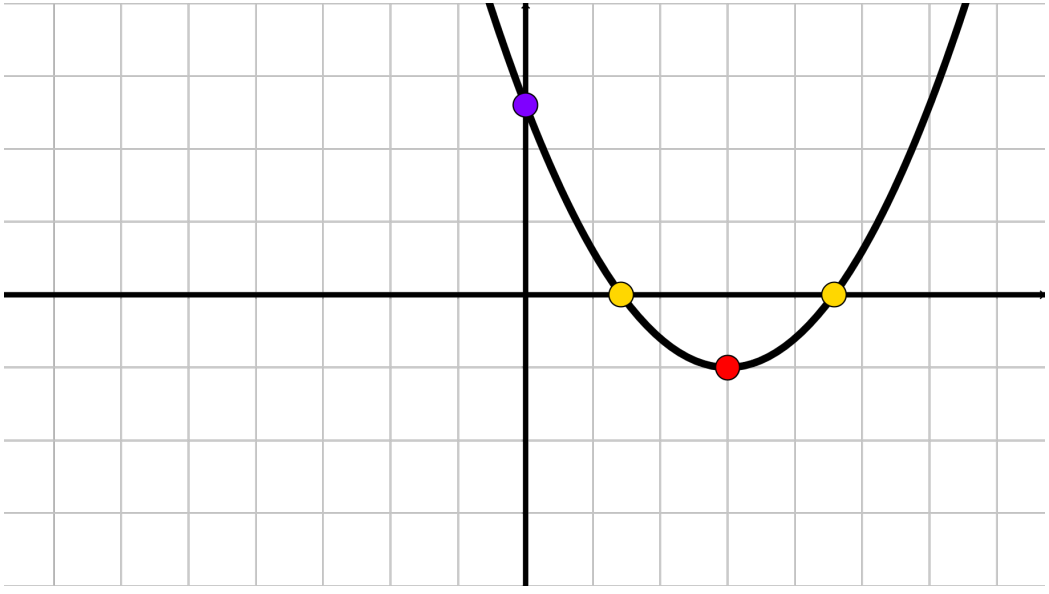

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If $x = 0$, $y = a \cdot 0^2 + b \cdot 0 + c$

The $x-$intercept(s)

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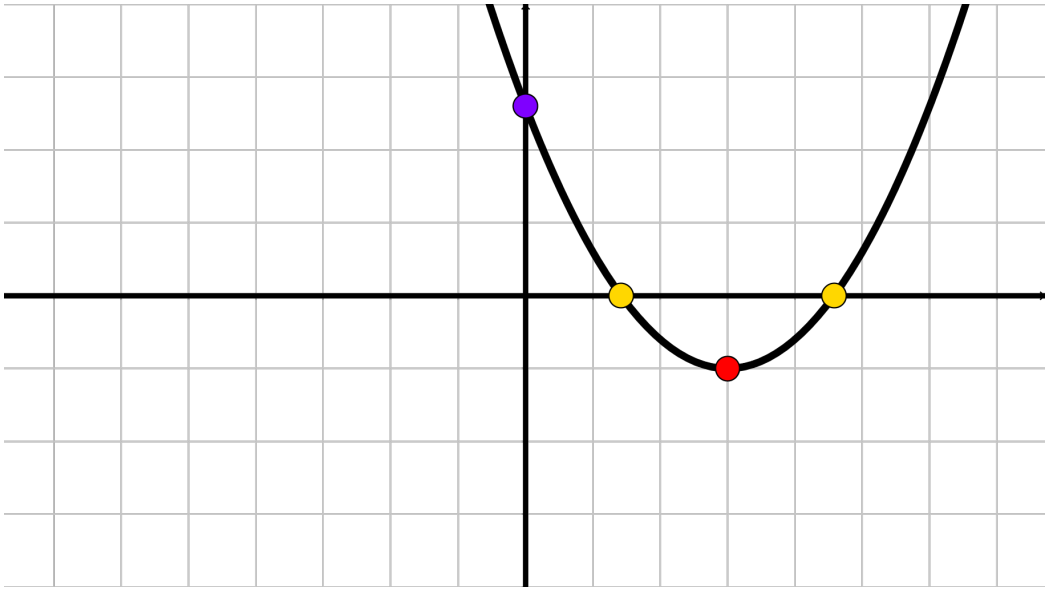

The $y-$intercept: Like with lines the $y-$intercept happens when $x = 0$

If $x = 0$, $y = a \cdot 0^2 + b \cdot 0 + c = c$

The $x-$intercept(s)

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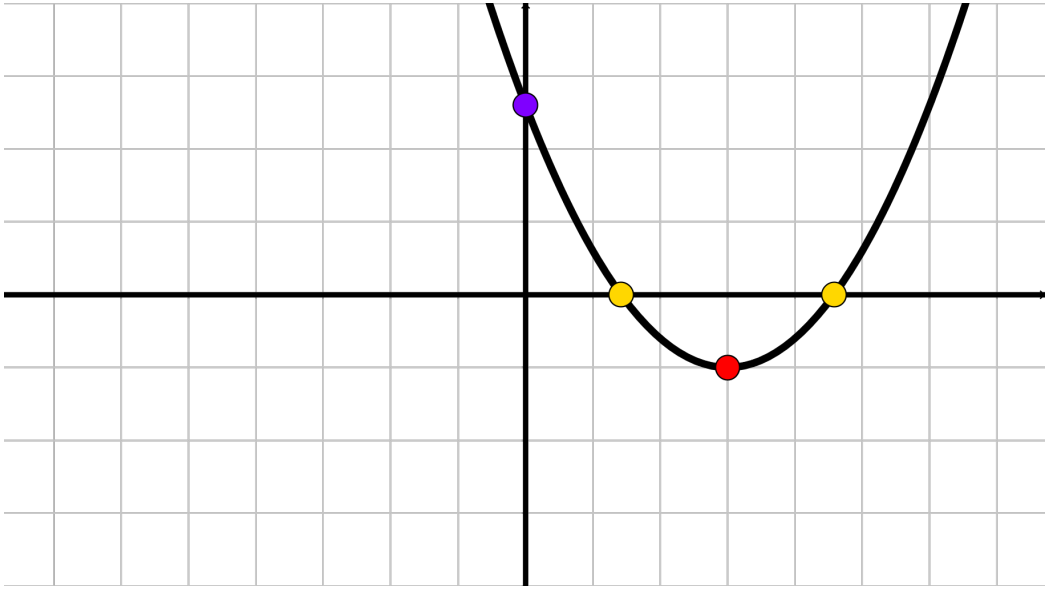
Graphing Quadratic Equations with 2 variable

Graphing the solutions to $y = f(x) = ax^2 + bx + c$

To graph a quadratic equation, we need to find our important points:



The $y-$intercept: ▸ Like with lines the $y-$intercept happens when $x = 0$

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The $x-$intercept(s)

The vertex

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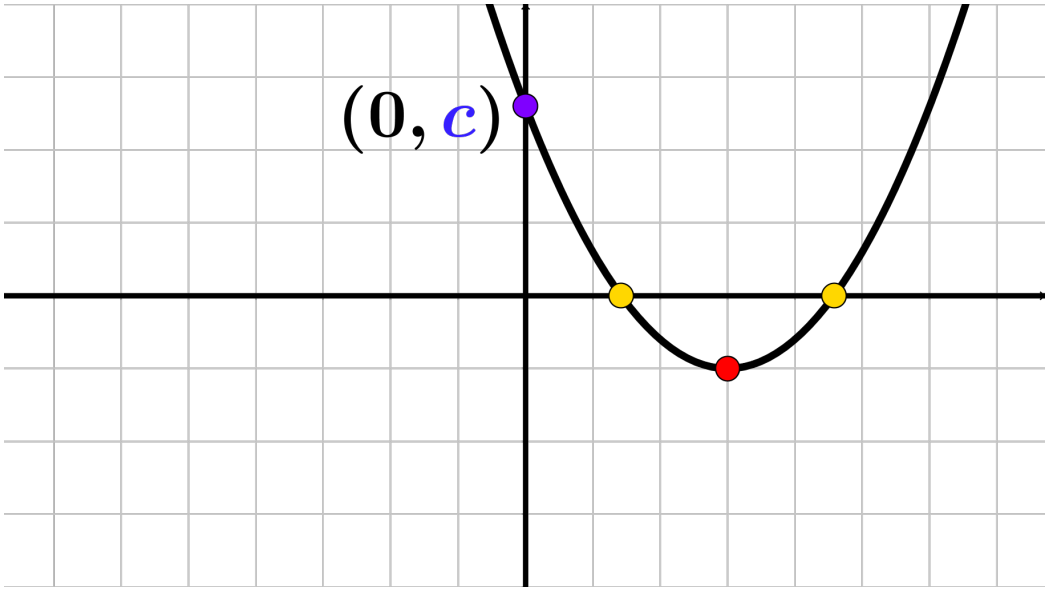

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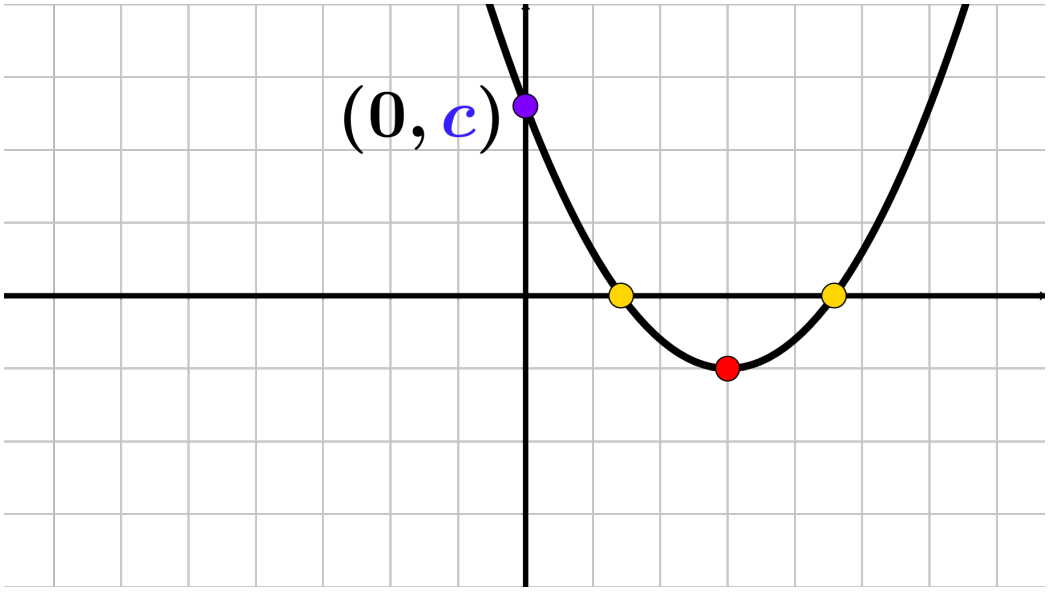

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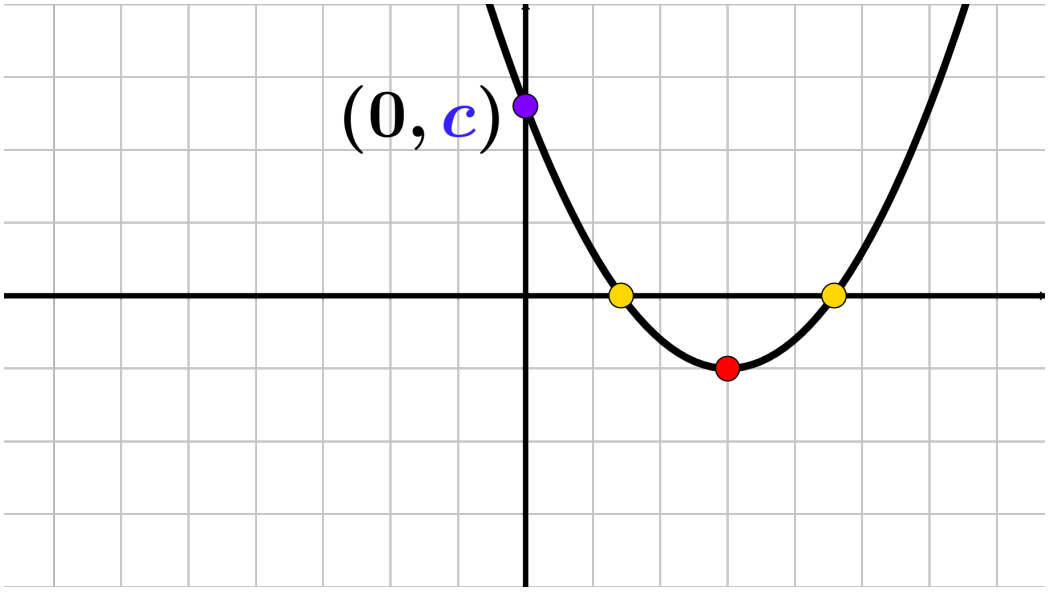

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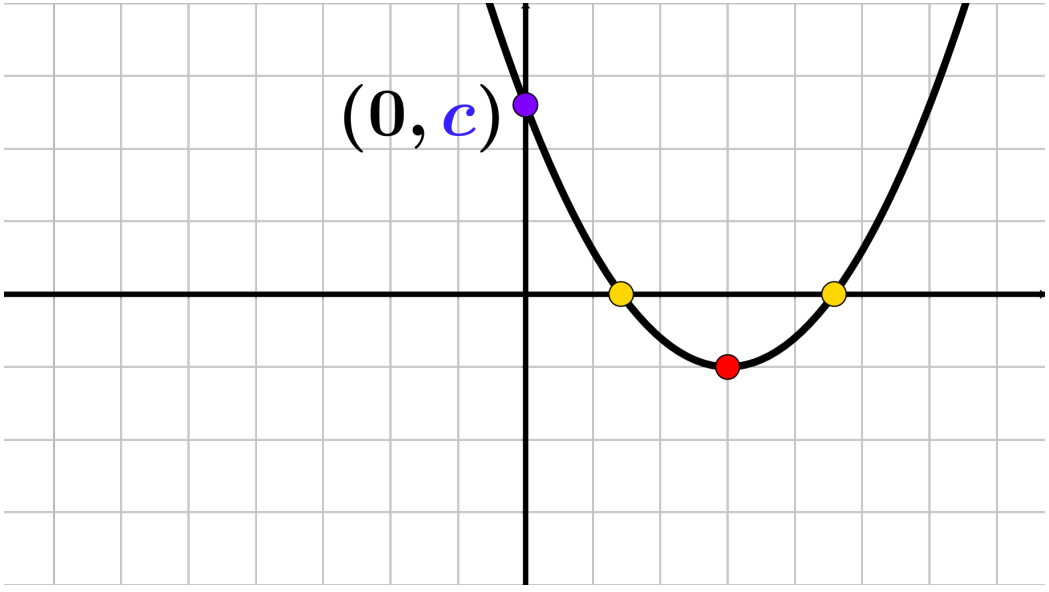

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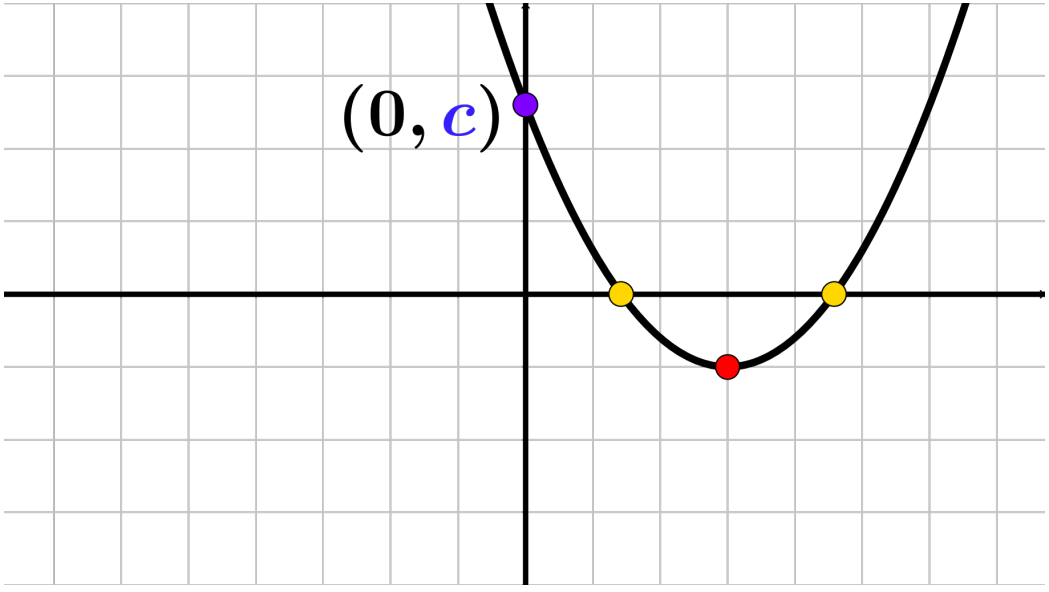

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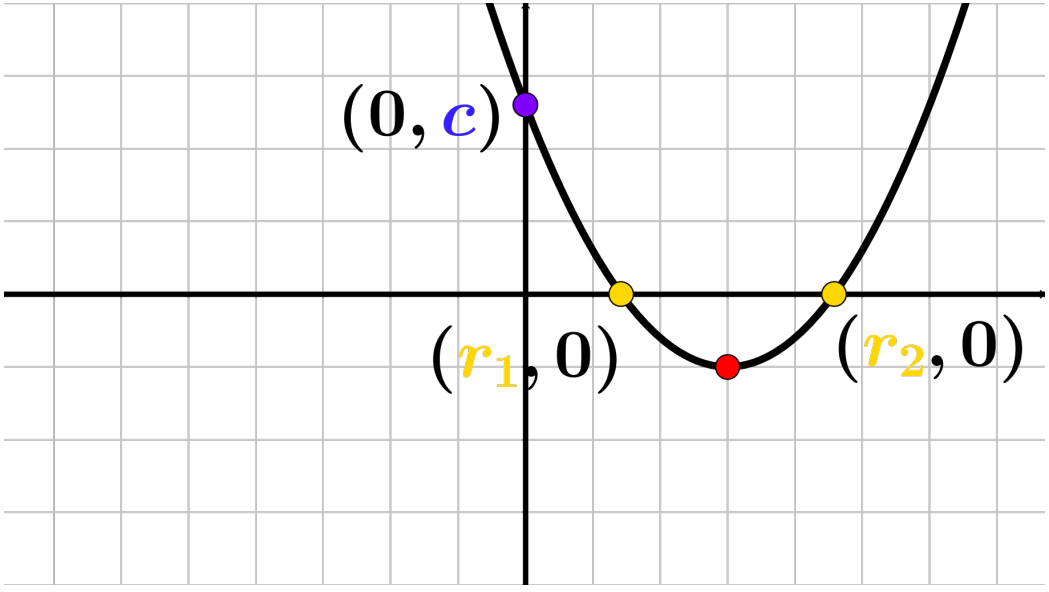

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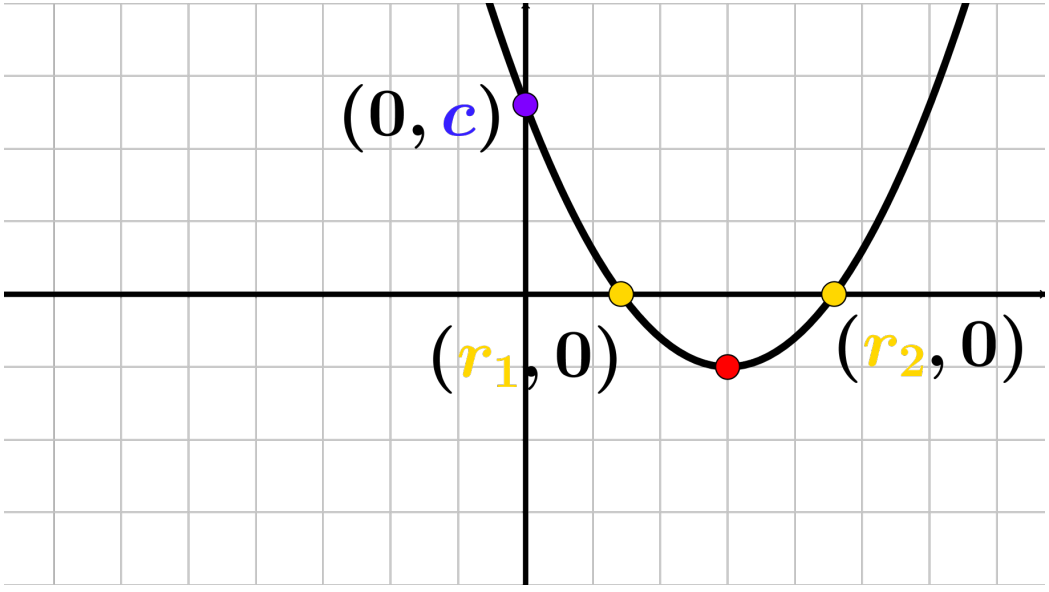

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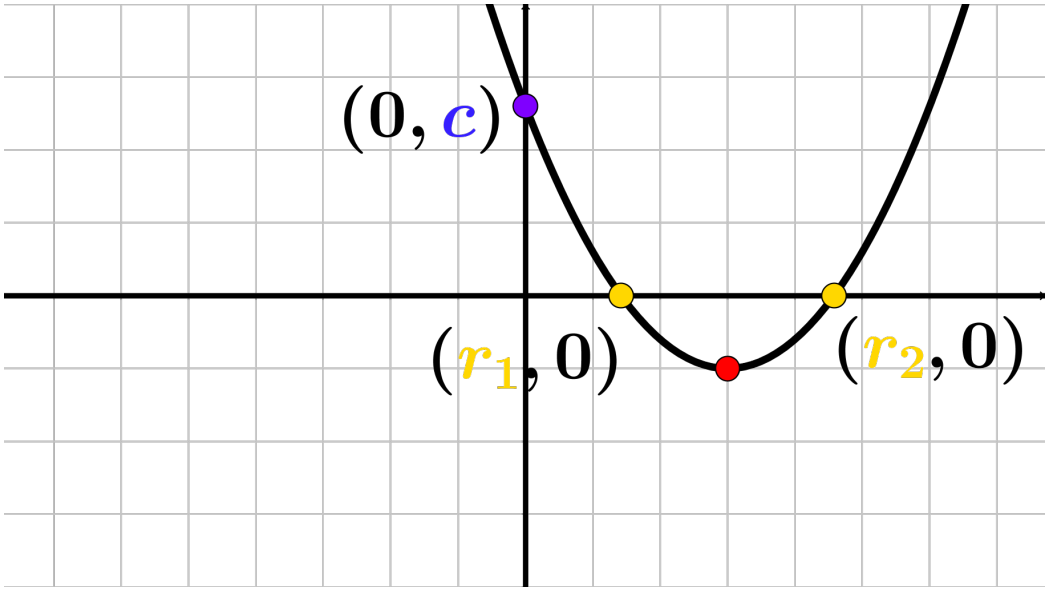

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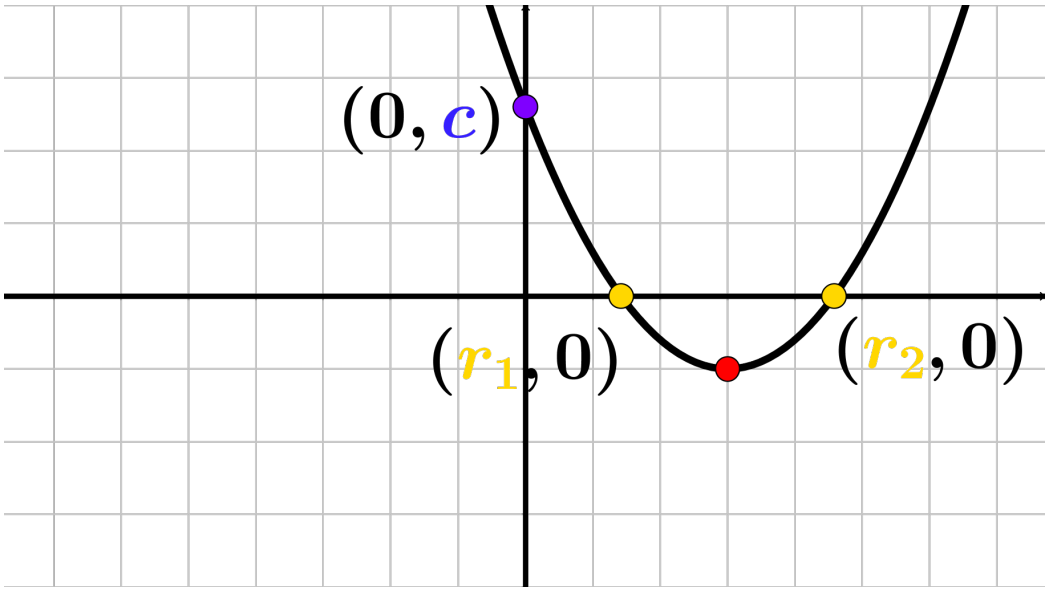

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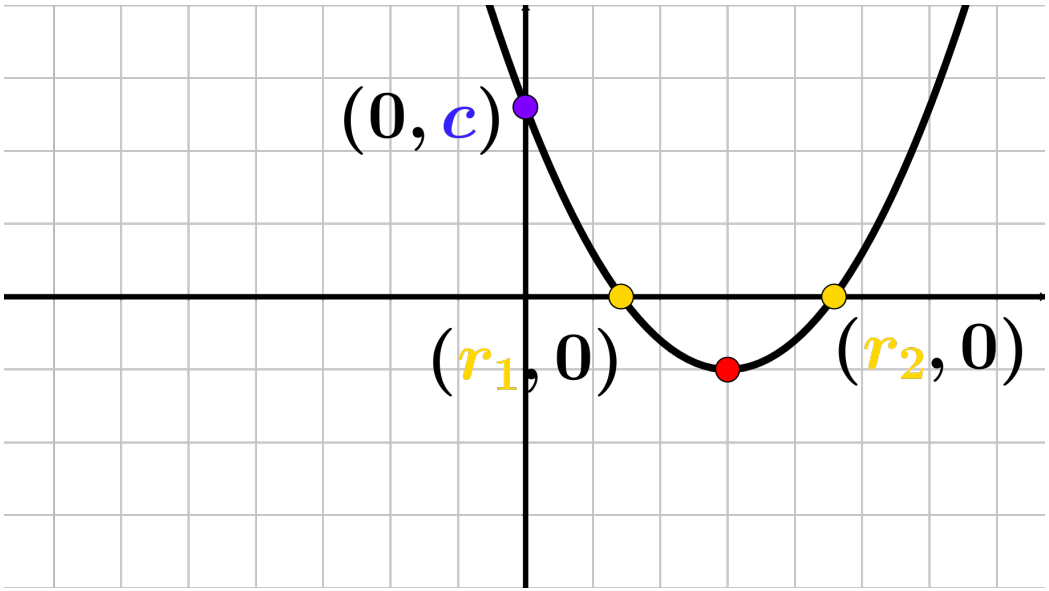

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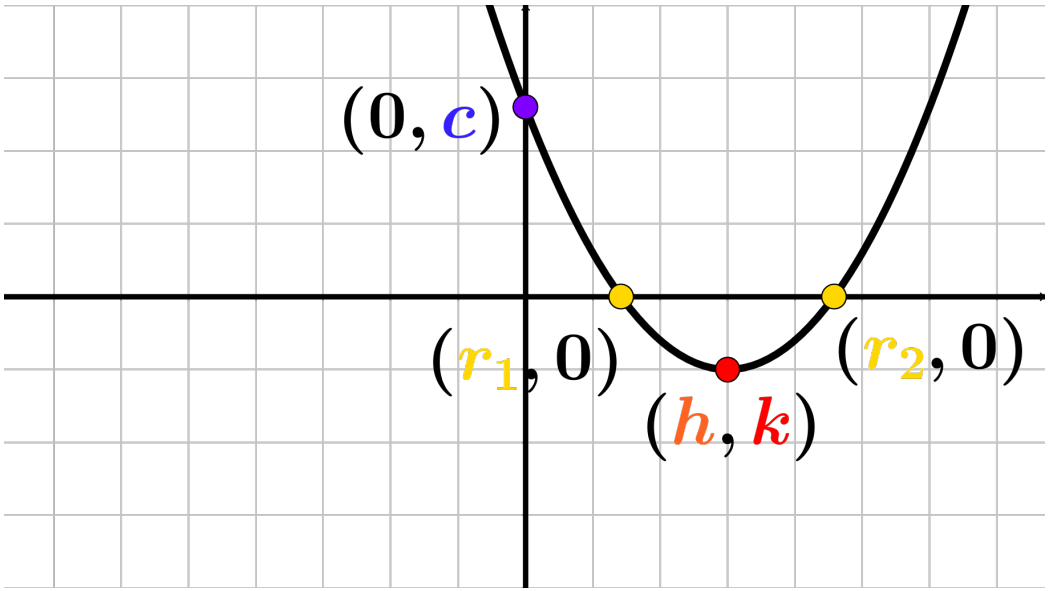

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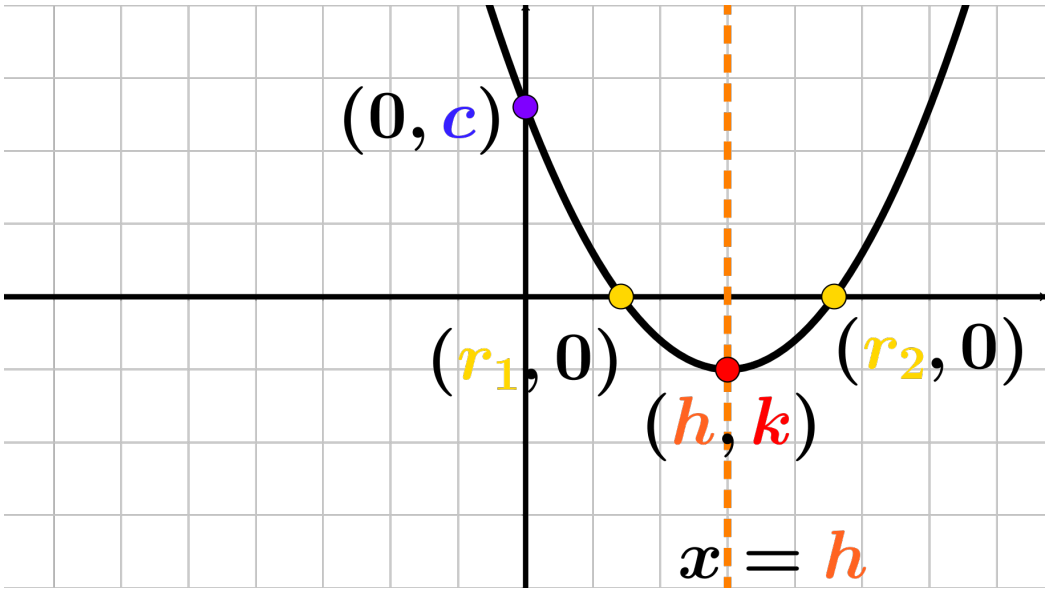

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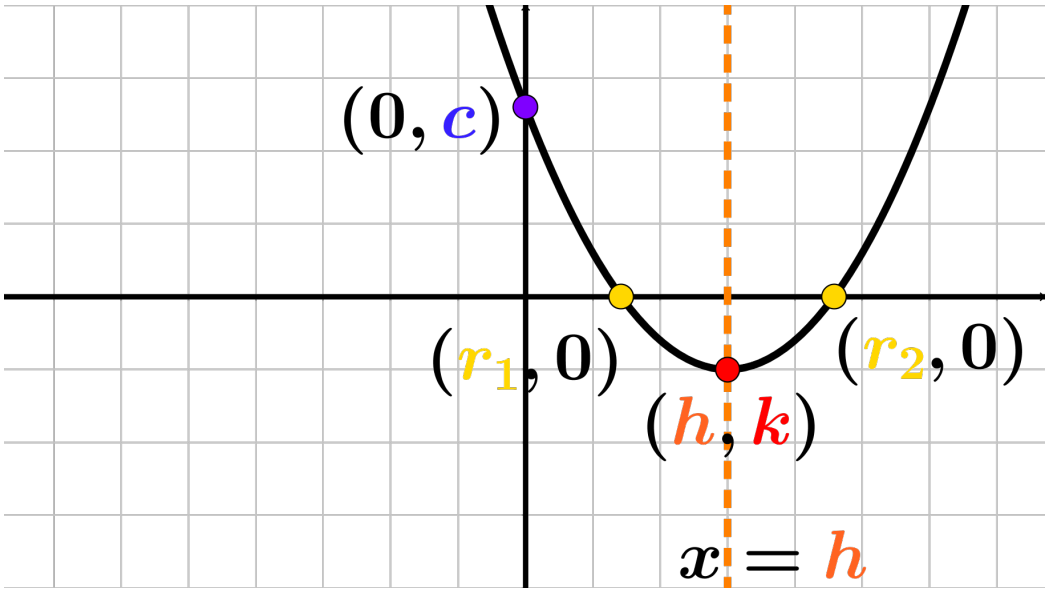

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Called: *The Line of Symmetry*

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