Graphing Quadratic Equations with 2 variable

Graphing Quadratic Equations with 2 variable

Once we learned about solving linear equations with 1 variable, we learned about solving linear equations with 2 variables.

Graphing Quadratic Equations with 2 variable

Once we learned about solving linear equations with 1 variable, we learned about solving linear equations with 2 variables.

We saw: equations in 2 variables have many solutions, that we graphed.

Graphing Quadratic Equations with 2 variable

Once we learned about solving linear equations with 1 variable, we learned about solving linear equations with 2 variables.

We saw: equations in 2 variables have many solutions, that we graphed.

Similarly, we will need to graph the solutions to quadratic equations:

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

Graphing Quadratic Equations with 2 variable

Once we learned about solving linear equations with 1 variable, we learned about solving linear equations with 2 variables.

We saw: equations in 2 variables have many solutions, that we graphed.

Similarly, we will need to graph the solutions to quadratic equations:

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

While we have not looked at graphing quadratics in this form, we have graphed quadratics in the form:

Graphing Quadratic Equations with 2 variable

Once we learned about solving linear equations with 1 variable, we learned about solving linear equations with 2 variables.

We saw: equations in 2 variables have many solutions, that we graphed.

Similarly, we will need to graph the solutions to quadratic equations:

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

While we have not looked at graphing quadratics in this form, we have graphed quadratics in the form:

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

Graphing Quadratic Equations with 2 variable

Once we learned about solving linear equations with 1 variable, we learned about solving linear equations with 2 variables.

We saw: equations in 2 variables have many solutions, that we graphed.

Similarly, we will need to graph the solutions to quadratic equations:

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

While we have not looked at graphing quadratics in this form, we have graphed quadratics in the form:

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

This is slightly different from the form we want.

Graphing Quadratic Equations with 2 variable

Once we learned about solving linear equations with 1 variable, we learned about solving linear equations with 2 variables.

We saw: equations in 2 variables have many solutions, that we graphed.

Similarly, we will need to graph the solutions to quadratic equations:

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

While we have not looked at graphing quadratics in this form, we have graphed quadratics in the form:

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

This is slightly different from the form we want.

But we learned before how to get to the form $a(x - h)^2 + k$

Graphing Quadratic Equations with 2 variable

Once we learned about solving linear equations with 1 variable, we learned about solving linear equations with 2 variables.

We saw: equations in 2 variables have many solutions, that we graphed.

Similarly, we will need to graph the solutions to quadratic equations:

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

While we have not looked at graphing quadratics in this form, we have graphed quadratics in the form:

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

This is slightly different from the form we want.

But we learned before how to get to the form $a(x - h)^2 + k$

Here are some examples: ▸ Example 1   ▸ Example 2

Graphing Quadratic Equations with 2 variable

Once we learned about solving linear equations with 1 variable, we learned about solving linear equations with 2 variables.

We saw: equations in 2 variables have many solutions, that we graphed.

Similarly, we will need to graph the solutions to quadratic equations:

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

While we have not looked at graphing quadratics in this form, we have graphed quadratics in the form:

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

This is slightly different from the form we want.

But we learned before how to get to the form $a(x - h)^2 + k$

Here are some examples: ▸ Example 1   ▸ Example 2

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

Graphing Quadratic Equations with 2 variable

Once we learned about solving linear equations with 1 variable, we learned about solving linear equations with 2 variables.

We saw: equations in 2 variables have many solutions, that we graphed.

Similarly, we will need to graph the solutions to quadratic equations:

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

While we have not looked at graphing quadratics in this form, we have graphed quadratics in the form:

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

This is slightly different from the form we want.

But we learned before how to get to the form $a(x - h)^2 + k$

Here are some examples: ▸ Example 1   ▸ Example 2

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

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

$y = x^2$

Graphing Quadratic Equations with 2 variable
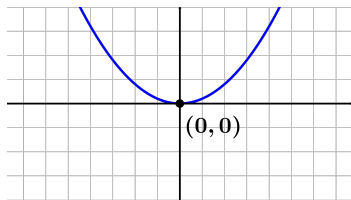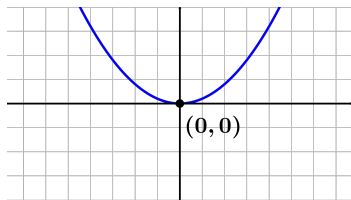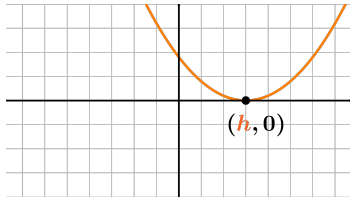
Let's graph: $y = a(x - h)^2 + k$

$(0, 0)$

$y = x^2$

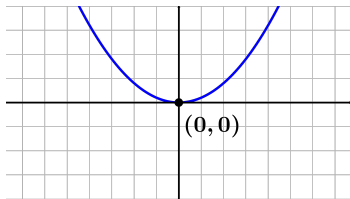# Graphing Quadratic Equations with 2 variable

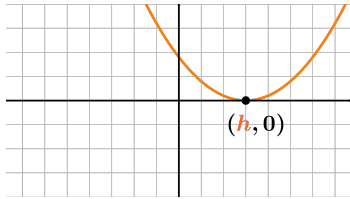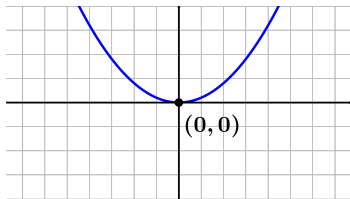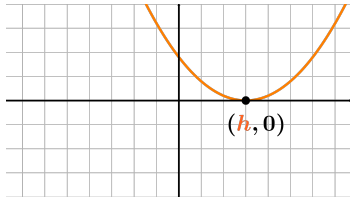Let's graph: $y = a(x - h)^2 + k$

$(0, 0)$

$y = x^2$

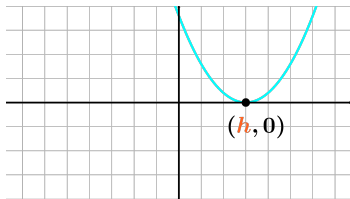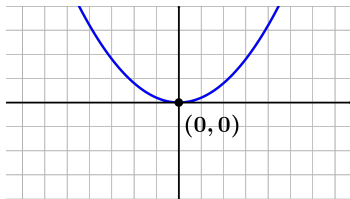$y = (x - h)^2$

Graphing Quadratic Equations with 2 variable

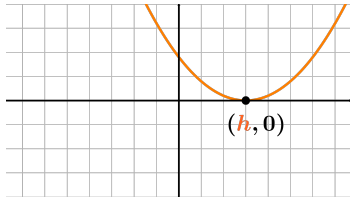Let's graph: $y = a(x - h)^2 + k$

$(0, 0)$

$y = x^2$

$(h, 0)$

$y = (x - h)^2$

Graphing Quadratic Equations with 2 variable

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

$y = x^2$

$(0,0)$

$y = (x - h)^2$

$(h, 0)$

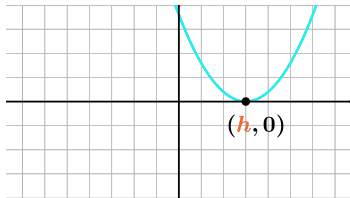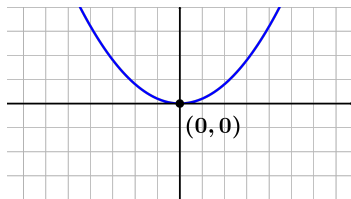$y = a(x - h)^2$

Graphing Quadratic Equations with 2 variable

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

$(0, 0)$

$y = x^2$

$(h, 0)$

$y = (x - h)^2$

$(h, 0)$

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

Graphing Quadratic Equations with 2 variable

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

$y = x^2$

$(0, 0)$

$y = (x - h)^2$

$(h, 0)$
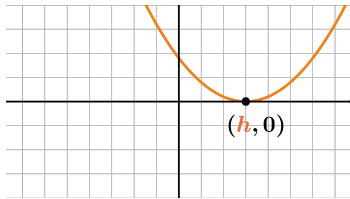

$y = a(x - h)^2$

$(h, 0)$

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

Graphing Quadratic Equations with 2 variable

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

$y = x^2$

$(0, 0)$

$y = (x - h)^2$

$(h, 0)$

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

$(h, 0)$

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

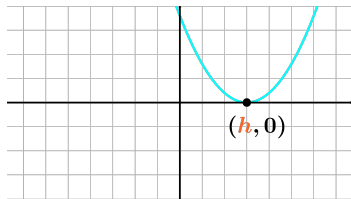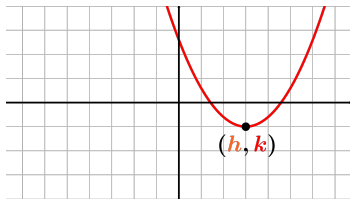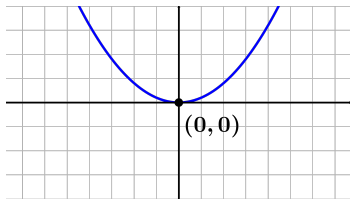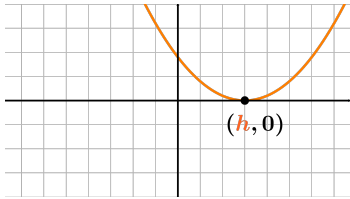(h, k)
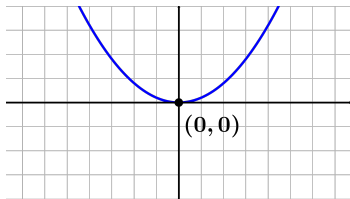
Graphing Quadratic Equations with 2 variable
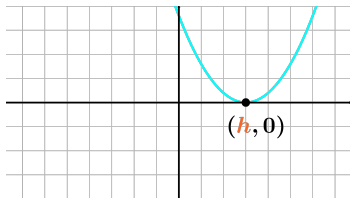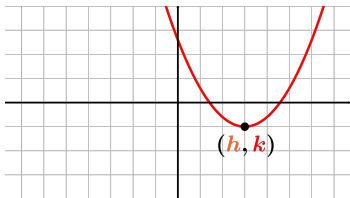
Let's graph: $y = a(x - h)^2 + k$

$y = x^2$

$y = (x - h)^2$

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

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

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

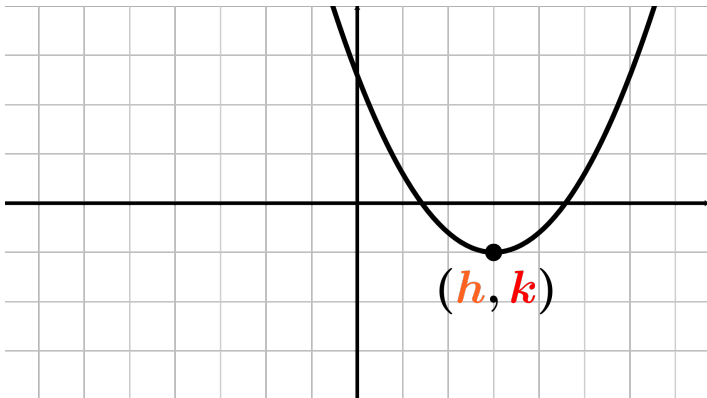# Graphing Quadratic Equations with 2 variable

Graphing Quadratic Equations with 2 variable

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

Graphing Quadratic Equations with 2 variable

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

Graphing Quadratic Equations with 2 variable

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

$(\boldsymbol{h}, \boldsymbol{k})$

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

Graphing Quadratic Equations with 2 variable
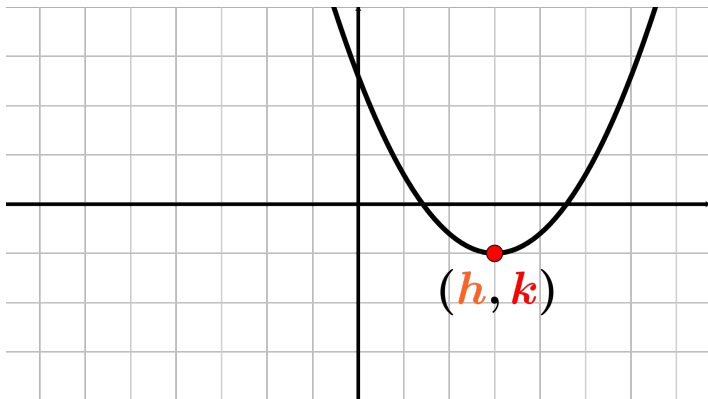
Let's graph: $y = a\,(x - h)^2 + k$

(h, k)

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

What other interesting points are on this graph?
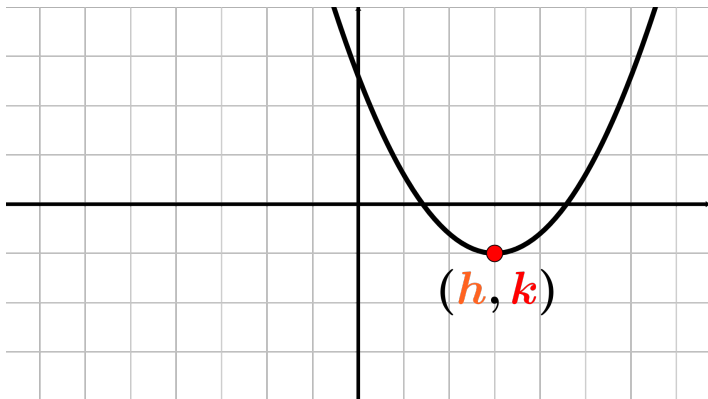
Graphing Quadratic Equations with 2 variable

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

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

What other interesting points are on this graph?

This graph has 2 $x-$intercepts

Graphing Quadratic Equations with 2 variable

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

$(\boldsymbol{h}, \boldsymbol{k})$

Using the graph, we see that the vertex is at the point (h, k)
What other interesting points are on this graph?
This graph has 2 $x-$intercepts
And a $y-$intercept

Graphing Quadratic Equations with 2 variable

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

$$(\boldsymbol{h}, \boldsymbol{k})$$
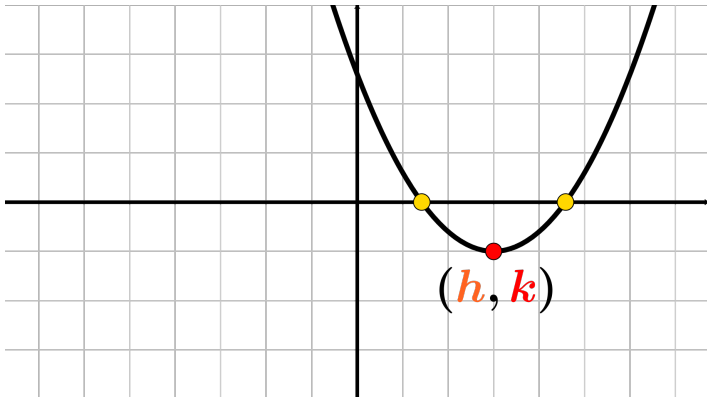
Using the graph, we see that the vertex is at the point (h, k)
What other interesting points are on this graph?
This graph has 2 $x-$intercepts
And a $y-$intercept
Similar to the basic graph $y = x^2$ this graph is symmetric

Graphing Quadratic Equations with 2 variable

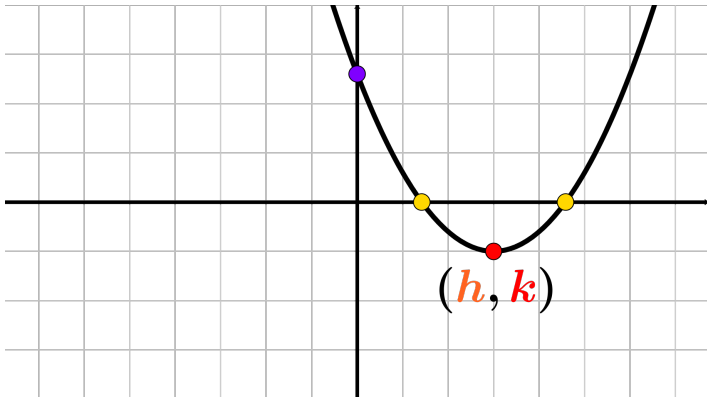Let's graph: $y = a(x - h)^2 + k$

$(\boldsymbol{h}, \boldsymbol{k})$

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

What other interesting points are on this graph?

This graph has 2 $x-$intercepts

And a $y-$intercept

Similar to the basic graph $y = x^2$ this graph is symmetric

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

Graphing Quadratic Equations with 2 variable

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

(h, k)

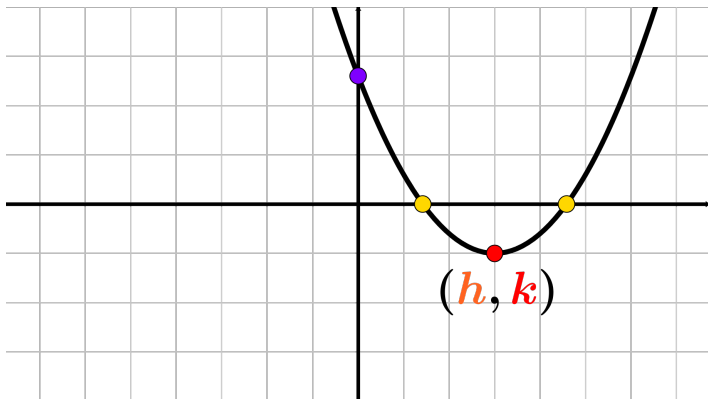Using the graph, we see that the vertex is at the point (h, k)

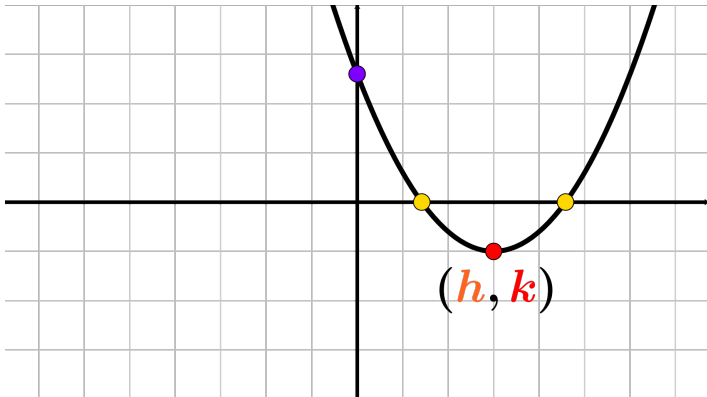What other interesting points are on this graph?

This graph has 2 $x-$intercepts

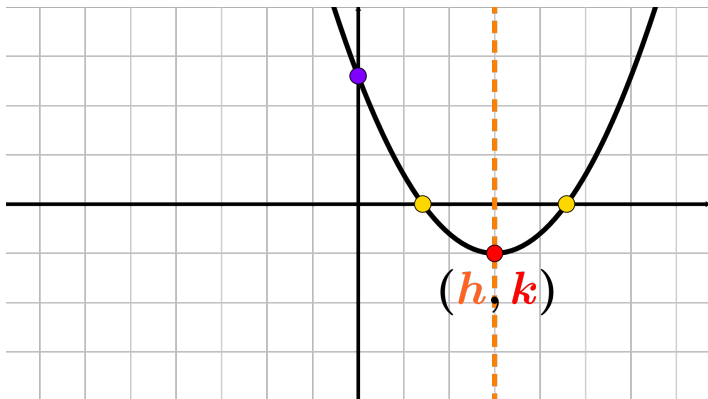And a $y-$intercept

Similar to the basic graph $y = x^2$ this graph is symmetric

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

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

Graphing Quadratic Equations with 2 variable

Graphing Quadratic Equations with 2 variable

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

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:

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:
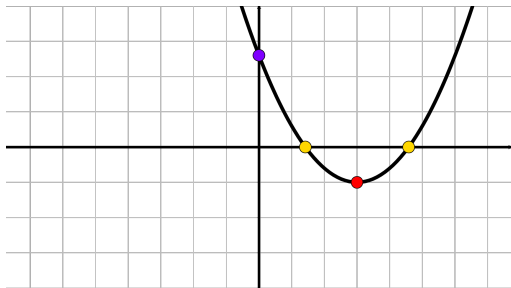
The $y-$intercept

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

The $x-$intercept(s)
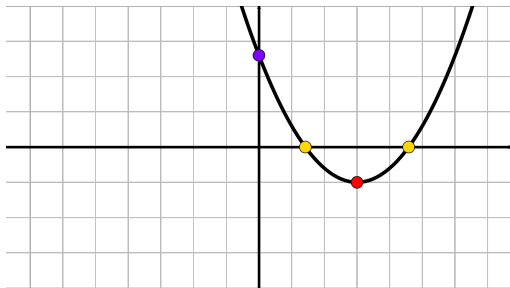
Graphing Quadratic Equations with 2 variable

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

The $x-$intercept(s)

The vertex

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: the $y-$intercept happens when $x = 0$

The $x-$intercept(s)

The vertex

Graphing Quadratic Equations with 2 variable

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

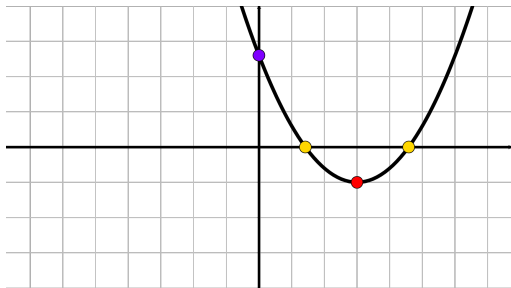To graph a quadratic equation, we need to find our important points:

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

If $x = 0$

The $x-$intercept(s)

The vertex

Graphing Quadratic Equations with 2 variable

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

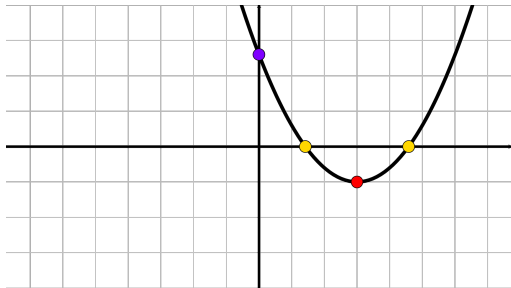To graph a quadratic equation, we need to find our important points:

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

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

The $x-$intercept(s)

The vertex

Graphing Quadratic Equations with 2 variable

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

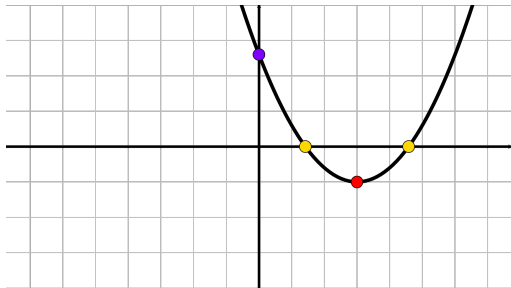To graph a quadratic equation, we need to find our important points:

The $y-$intercept: the $y-$intercept happens when $x = 0$
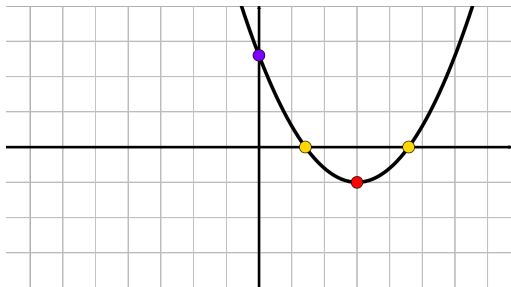
If $x = 0$, $y = a \cdot 0^2 + b \cdot 0 + c = c$

The $x-$intercept(s)

The vertex

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:
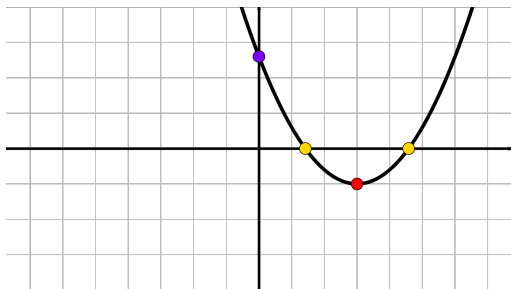

The $y-$intercept: the $y-$intercept happens when $x = 0$

If $x = 0$, $y = a \cdot 0^2 + b \cdot 0 + c = c$ $\Rightarrow$ $y-$int: $(0, c)$

The $x-$intercept(s)

The vertex

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:

$y-$int: $(0, c)$

$(0, c)$

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

If $x = 0$, $y = a \cdot 0^2 + b \cdot 0 + c = c$ $\Rightarrow$ $y-$int: $(0, c)$
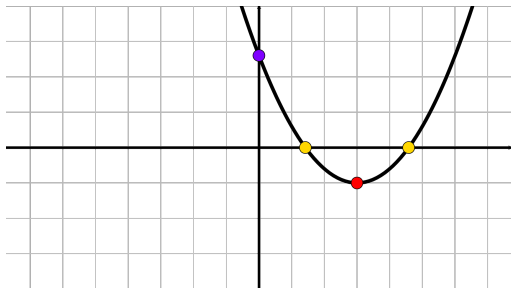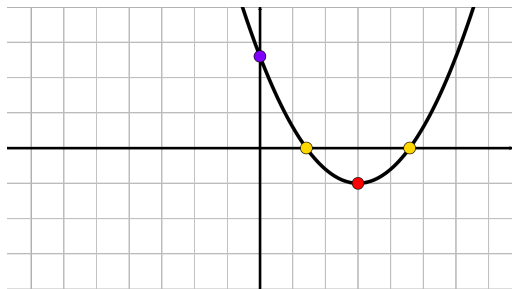
The $x-$intercept(s)

The vertex

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:

$(0, c)$

$y-$int: $(0, c)$

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

If $x = 0$, $y = a \cdot 0^2 + b \cdot 0 + c = c$ $\Rightarrow$ $y-$int: $(0, c)$

The $x-$intercept(s):   the $x-$intercept happens when $y = 0$
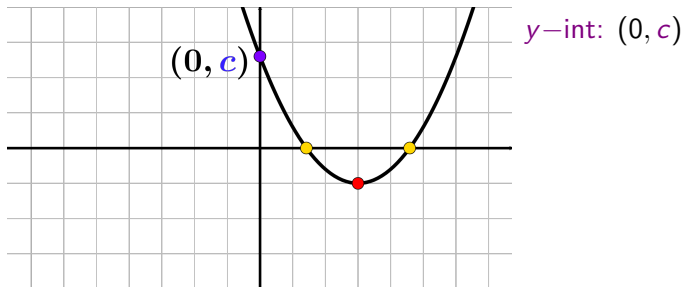
The vertex

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:

$(0, c)$

$y-$int: $(0, c)$

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

If $x = 0$, $y = a \cdot 0^2 + b \cdot 0 + c = c$ $\Rightarrow$ $y-$int: $(0, c)$

The $x-$intercept(s):   the $x-$intercept happens when $y = 0$

If $y = 0$
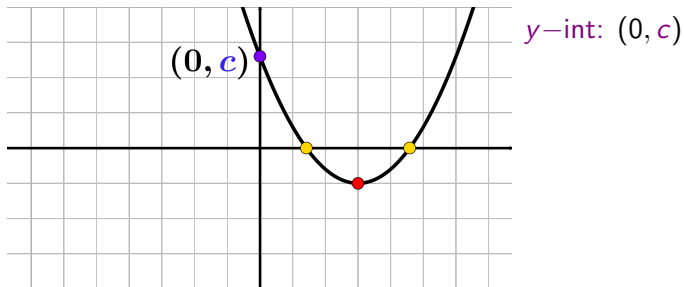
The vertex

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:

$(0, c)$

$y-$int: $(0, c)$

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

If $x = 0$, $y = a \cdot 0^2 + b \cdot 0 + c = c$ $\Rightarrow$ $y-$int: $(0, c)$

The $x-$intercept(s): the $x-$intercept happens when $y = 0$

If $y = 0$, $0 = ax^2 + bx + c$

The vertex

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:

$y-$int: $(0, c)$

$(0, c)$

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

If $x = 0$, $y = a \cdot 0^2 + b \cdot 0 + c = c$ $\Rightarrow$ $y-$int: $(0, c)$
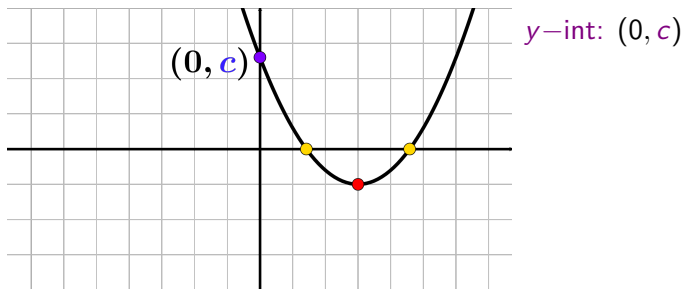
The $x-$intercept(s):   the $x-$intercept happens when $y = 0$

If $y = 0$, $0 = ax^2 + bx + c$

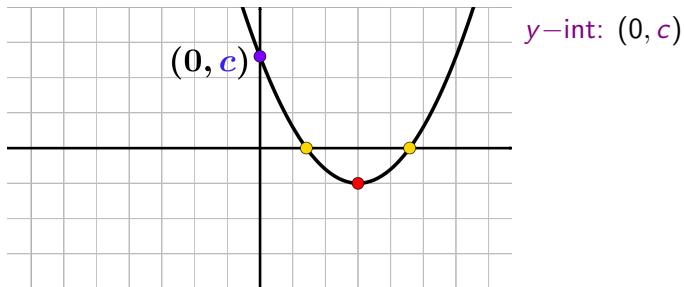We can solve this using the Quadratic Formula, $r_{1,2} = \frac{-(b) \pm \sqrt{(b)^2 - 4ac}}{2a}$

The vertex

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:

$y-$int: $(0, c)$
$x-$int: $(r_1, 0), (r_2, 0)$

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

If $x = 0$, $y = a \cdot 0^2 + b \cdot 0 + c = c$ $\Rightarrow$ $y-$int: $(0, c)$

The $x-$intercept(s): the $x-$intercept happens when $y = 0$

If $y = 0$, $0 = ax^2 + bx + c$

We can solve this using the Quadratic Formula, $r_{1,2} = \frac{-(b) \pm \sqrt{(b)^2 - 4ac}}{2a}$

The vertex

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:

$y-$int: $(0, c)$

$x-$int: $(r_1, 0), (r_2, 0)$

Note: We get 0, 1, or 2 $x-$int for each of the real roots.

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

If $x = 0$, $y = a \cdot 0^2 + b \cdot 0 + c = c$ $\Rightarrow$ $y-$int: $(0, c)$

The $x-$intercept(s):   the $x-$intercept happens when $y = 0$
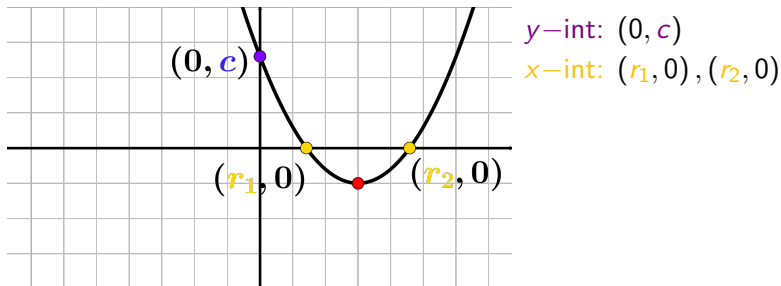
If $y = 0$, $0 = ax^2 + bx + c$

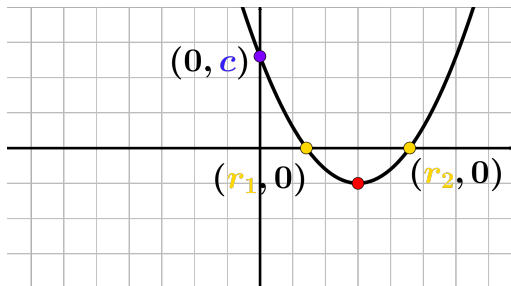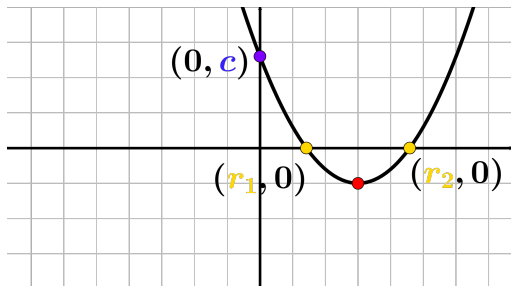We can solve this using the Quadratic Formula, $r_{1,2} = \dfrac{-(b) \pm \sqrt{(b)^2 - 4ac}}{2a}$

The vertex

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:

$(0, c)$

$(r_1, 0)$ $(r_2, 0)$

$y-$int: $(0, c)$

$x-$int: $(r_1, 0), (r_2, 0)$

Note: We get 0, 1, or 2 $x-$int for each of the real roots.

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

If $x = 0$, $y = a \cdot 0^2 + b \cdot 0 + c = c$ $\Rightarrow$ $y-$int: $(0, c)$

The $x-$intercept(s): the $x-$intercept happens when $y = 0$

If $y = 0$, $0 = ax^2 + bx + c$

We can solve this using the Quadratic Formula, $r_{1,2} = \frac{-(b) \pm \sqrt{(b)^2 - 4ac}}{2a}$

The vertex happens at the point (h, k)

when we built the Quadratic Formula that $h = \frac{-b}{2a}$

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:

$y-$int: $(0, c)$

$x-$int: $(r_1, 0), (r_2, 0)$

Note: We get 0, 1, or 2 $x-$int for each of the real roots.

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

If $x = 0$, $y = a \cdot 0^2 + b \cdot 0 + c = c$ $\Rightarrow$ $y-$int: $(0, c)$

The $x-$intercept(s): the $x-$intercept happens when $y = 0$

If $y = 0$, $0 = ax^2 + bx + c$

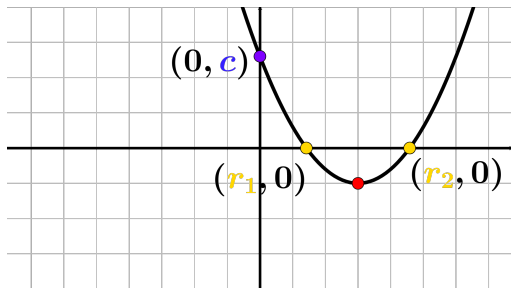We can solve this using the Quadratic Formula, $r_{1,2} = \frac{-(b) \pm \sqrt{(b)^2 - 4ac}}{2a}$

The vertex happens at the point (h, k)

when we built the Quadratic Formula that $h = \frac{-b}{2a}$

Once we know $x = h$ at the point, we can find k

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:

$y-$int: $(0, c)$

$x-$int: $(r_1, 0), (r_2, 0)$

Note: We get 0, 1, or 2 $x-$int for each of the real roots.

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

If $x = 0$, $y = a \cdot 0^2 + b \cdot 0 + c = c$ $\Rightarrow$ $y-$int: $(0, c)$

The $x-$intercept(s):   the $x-$intercept happens when $y = 0$

If $y = 0$, $0 = ax^2 + bx + c$

We can solve this using the Quadratic Formula, $r_{1,2} = \frac{-(b) \pm \sqrt{(b)^2 - 4ac}}{2a}$
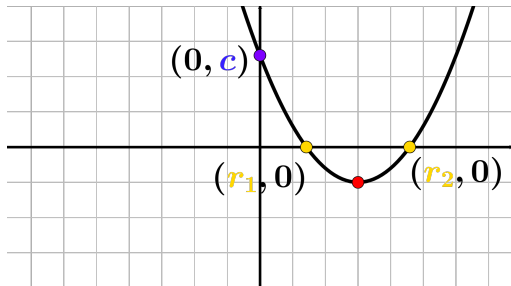
The vertex happens at the point (h, k)

          when we built the Quadratic Formula that $h = \frac{-b}{2a}$

Once we know $x = h$ at the point, we can find $k = f(h)$

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:

$y-$int: $(0, c)$

$x-$int: $(r_1, 0), (r_2, 0)$

Note: We get 0, 1, or 2 $x-$int for each of the real roots.

vertex: (h, k)

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

If $x = 0$, $y = a \cdot 0^2 + b \cdot 0 + c = c$ $\Rightarrow$ $y-$int: $(0, c)$

The $x-$intercept(s):   the $x-$intercept happens when $y = 0$

If $y = 0$, $0 = ax^2 + bx + c$

We can solve this using the Quadratic Formula, $r_{1,2} = \frac{-(b) \pm \sqrt{(b)^2 - 4ac}}{2a}$
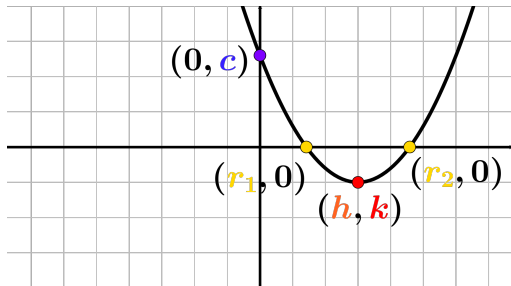
The vertex happens at the point (h, k)

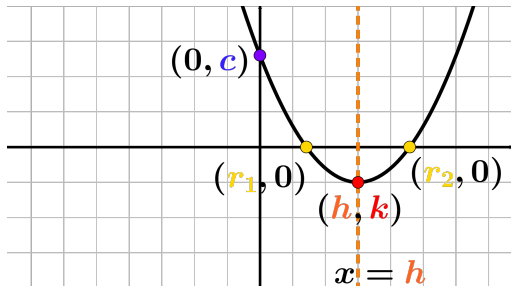   when we built the Quadratic Formula that $h = \frac{-b}{2a}$

Once we know $x = h$ at the point, we can find $k = f(h)$

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:

$y-$int: $(0, c)$

$x-$int: $(r_1, 0), (r_2, 0)$

Note: We get 0, 1, or 2 $x-$int for each of the real roots.

vertex: (h, k)

Note: The graph is symmetric across the line $x = h$

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

If $x = 0$, $y = a \cdot 0^2 + b \cdot 0 + c = c$ $\Rightarrow$ $y-$int: $(0, c)$

The $x-$intercept(s):   the $x-$intercept happens when $y = 0$

If $y = 0$, $0 = ax^2 + bx + c$

We can solve this using the Quadratic Formula, $r_{1,2} = \frac{-(b) \pm \sqrt{(b)^2 - 4ac}}{2a}$

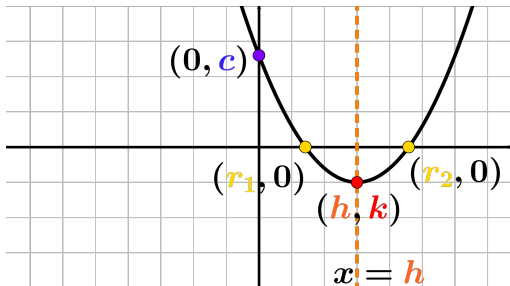The vertex happens at the point (h, k)

       when we built the Quadratic Formula that $h = \frac{-b}{2a}$

Once we know $x = h$ at the point, we can find $k = f(h)$

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:

$y-$int: $(0, c)$

$x-$int: $(r_1, 0), (r_2, 0)$

Note: We get 0, 1, or 2 $x-$int for each of the real roots.

vertex: (h, k)

Note: The graph is symmetric across the line $x = h$

Called: *The Line of Symmetry*

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

If $x = 0$, $y = a \cdot 0^2 + b \cdot 0 + c = c$ $\Rightarrow$ $y-$int: $(0, c)$

The $x-$intercept(s):   the $x-$intercept happens when $y = 0$

If $y = 0$, $0 = ax^2 + bx + c$

We can solve this using the Quadratic Formula, $r_{1,2} = \frac{-(b) \pm \sqrt{(b)^2 - 4ac}}{2a}$

The vertex happens at the point (h, k)

          when we built the Quadratic Formula that $h = \frac{-b}{2a}$

Once we know $x = h$ at the point, we can find $k = f(h)$