Starter

At the end of last lesson we began to sketch the curve

$y = x^2 - 4x - 5$

Can you complete your sketch, remembering to label the roots, y-intercept and turning point clearly.

We'll check your sketch in a second.

Finding the Roots of an Equation

Today we are learning...

How to find the roots of an equation.

I will know if I have been successful if...

I know to set the equation equal to zero.

I know to factorise a quadratic expression into 2 brackets.

I can solve to find the roots of the equation.

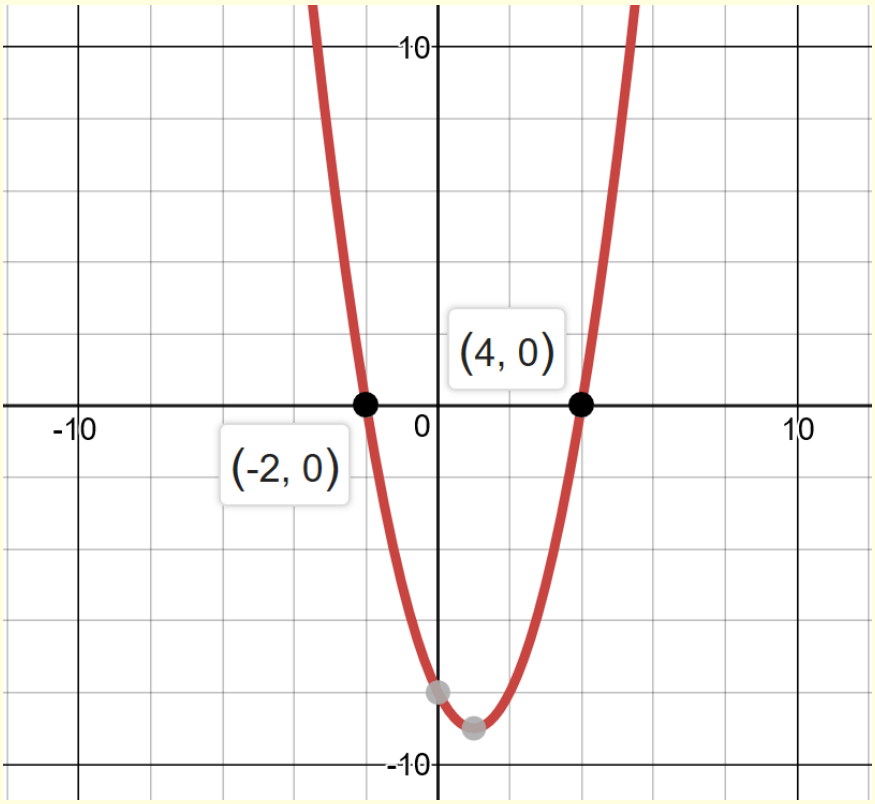
Don't worry about copying this bit down.

Here are the curves we've sketched so far in class and the coordinates of the roots they had.

Equation of Curve	Coordinates of Roots
$y = x^2 + 5x + 6$	(-3, 0) and (-2, 0)
$y = x^2 - 2x - 8$	(-2, 0) and (4, 0)
$y = x^2 - 4x - 5$	(-1, 0) and (5, 0)

What do you notice about the y coordinates?

The y coordinates of the roots are always zero.



Find the coordinates of the roots of $y = x^2 + 11x + 24$

Copy this one down.

How to find the roots of an equation.

Copy this down.

Step 1 - Set the equation equal to 0. Remember y = 0.

Step 2 - Factorise the expression.

Step 3 - Figure out the values that would make the brackets 0.

Step 4 - Write down the coordinates of the roots.

Following our steps lets find the roots of the equation

$y = x^2 - 3x - 18$

Step 1 - Set the equation equal to 0. Remember y = 0.

Step 2 - Factorise the expression.

Step 3 - Figure out the values that would make the brackets 0.

Step 4 - Write down the coordinates of the roots.

Let's check our answer on desmos now...

Following our steps lets find the roots of the equation

$y = x^2 + 5x - 14$

Step 1 - Set the equation equal to 0. Remember y = 0.

Step 2 - Factorise the expression.

Step 3 - Figure out the values that would make the brackets 0.

Step 4 - Write down the coordinates of the roots.

Let's check our answer on desmos now...

Using the four steps, find the roots of these equations...

(a) $x^2 + 5x + 4 = 0$

(b) $x^2 + 19x + 90 = 0$

(d) $x^2 - 12x + 20 = 0$

(e) $x^2 - 10x + 24 = 0$

(g) $x^2 + 2x - 15 = 0$

(h) $x^2 - 3x - 18 = 0$

Step 1 - Set the equation equal to 0. Remember y = 0.

Step 2 - Factorise the expression.

Step 3 - Figure out the values that would make the brackets 0.

Step 4 - Write down the coordinates of the roots.

Answers to come on the next slide.

Answers

a) (-1, 0) and (-4, 0) b) (-9, 0) and (-10, 0) c) (-5, 0) and (-6, 0)

d) (2, 0) and (10, 0) e) (4, 0) and (6, 0) f) (5, 0) and (10, 0)

g) (-5 0) and (3, 0) h) (6, 0) and (-3, 0) i) (10, 0) and (-3, 0)

Starter

Find the roots of the curve $y = x^2 - 12x + 32$

Follow the steps from yesterday to help you!

Finding the Turning Point

Today we are learning...

How to find the coordinates of the turning point of a curve.

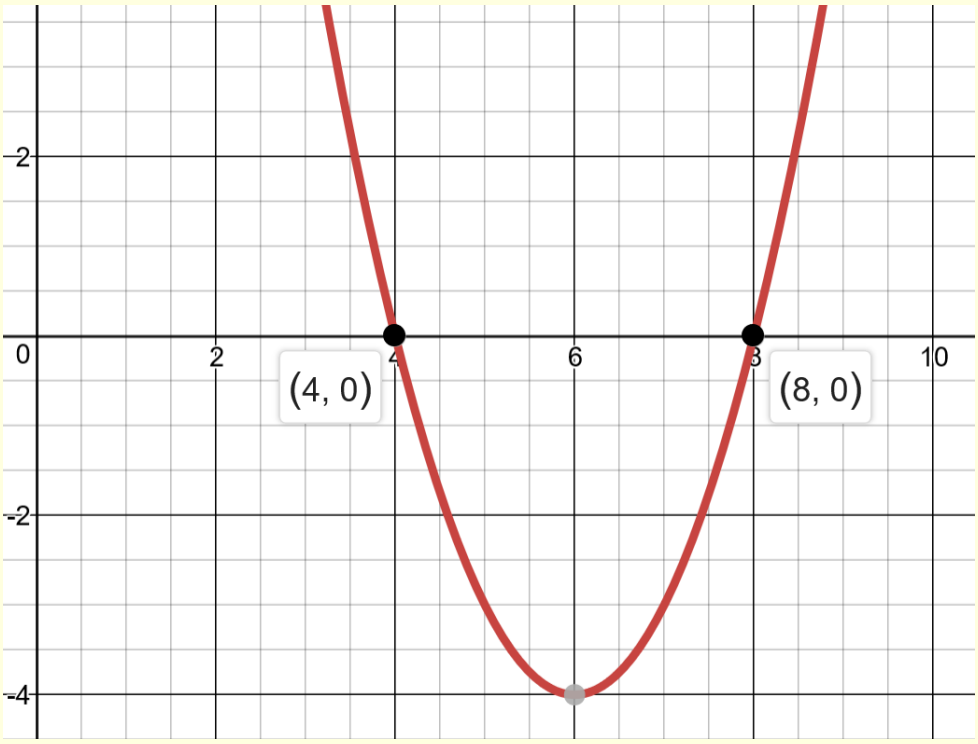
I will know if I have been successful if...

I can find the equation of the axis of symmetry.

I can substitute this back into the equation of the curve.

I can find the coordinates of the turning point.

The Axis of Symmetry

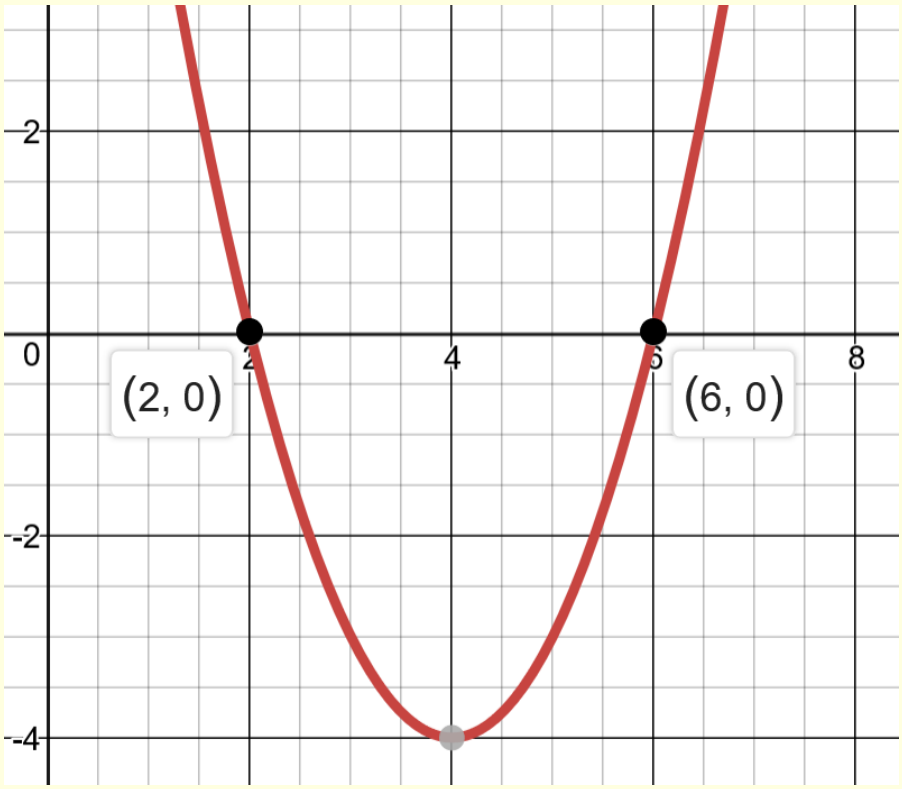


The Axis of Symmetry

The axis of symmetry is exactly half way between the roots.

It is a vertical line so it's equation starts with x = ___

What is the equation of the axis of symmetry here?



Axis of Symmetry

Write 1 - 5 down the side of your margin.

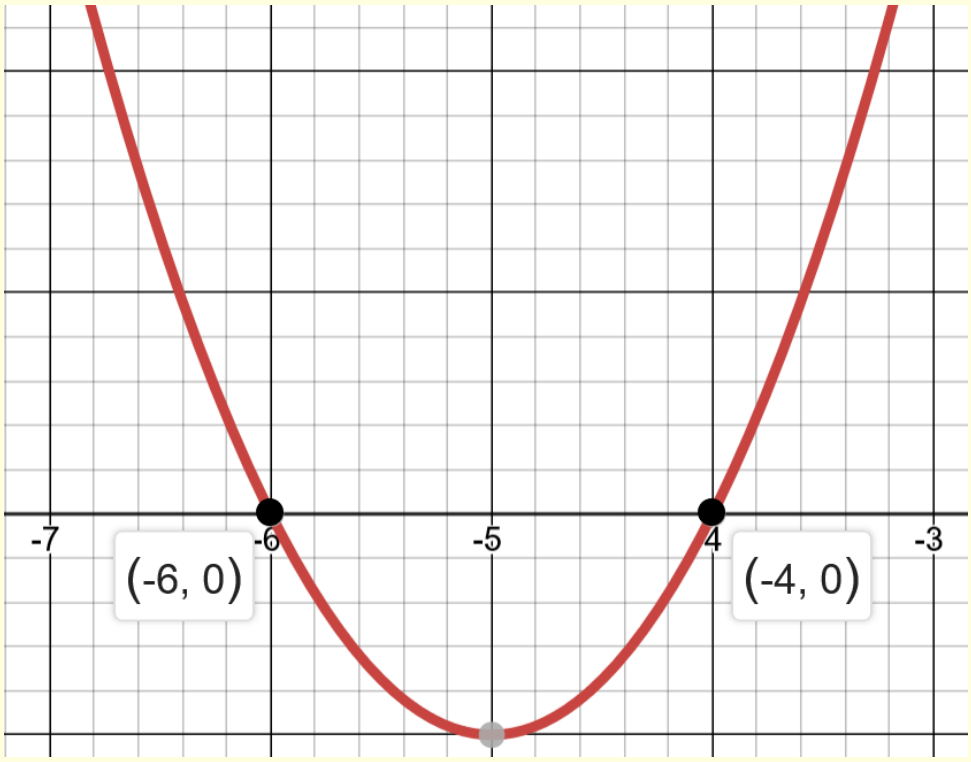
You are about to see 5 curves with the coordinates of the roots given to you.

Write down the equation of the axis of symmetry.

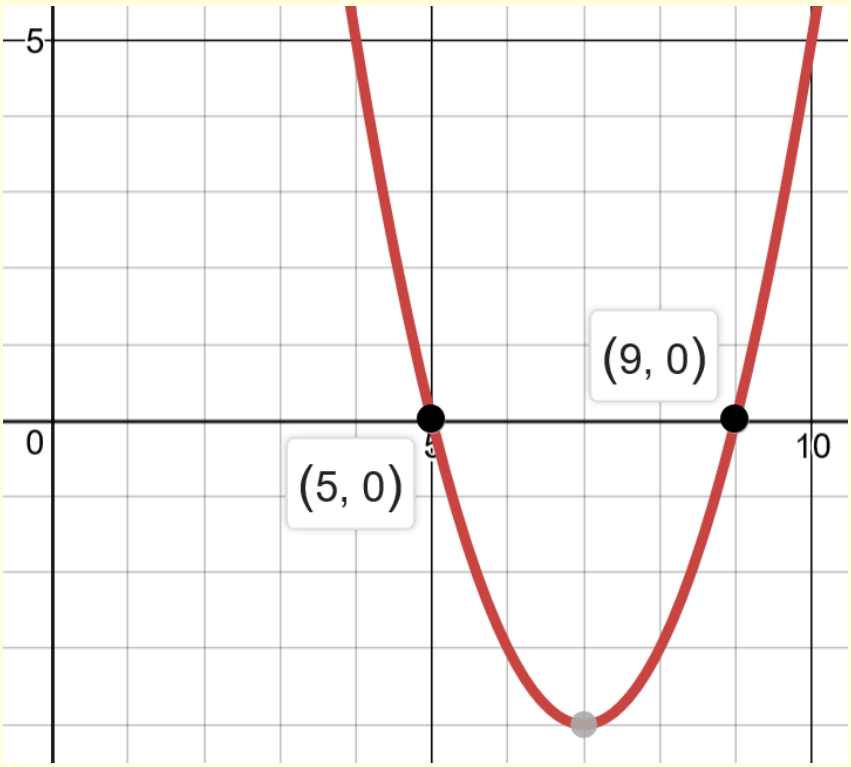
Remember it starts with x = ___

We'll check our answers at the end.

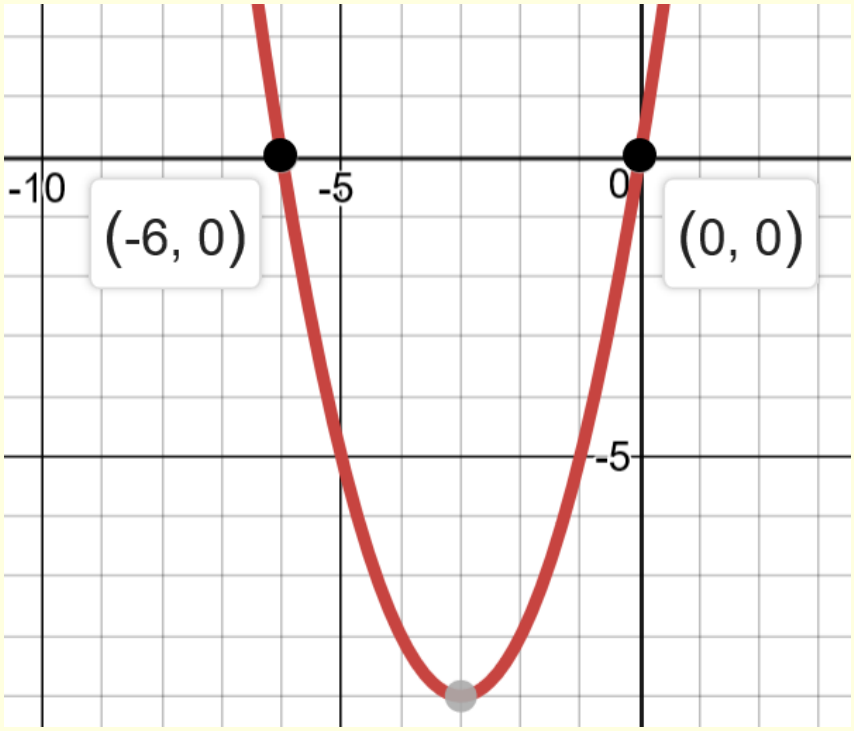
Curve 1



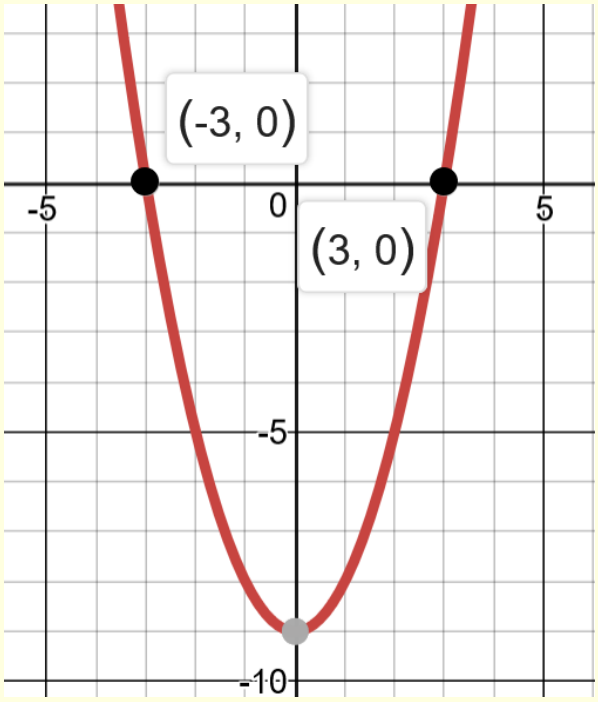
Curve 2



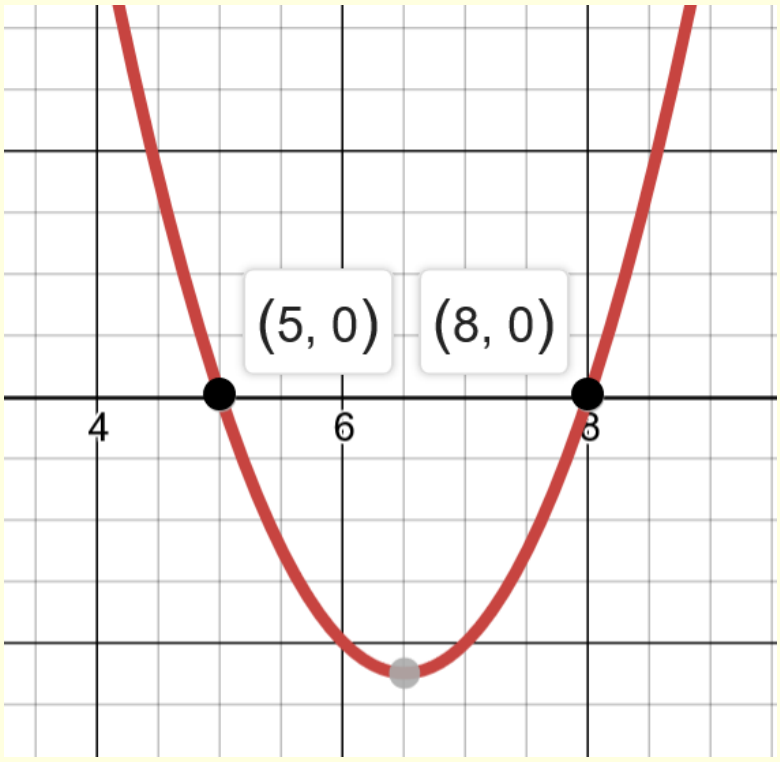
Curve 3



Curve 4



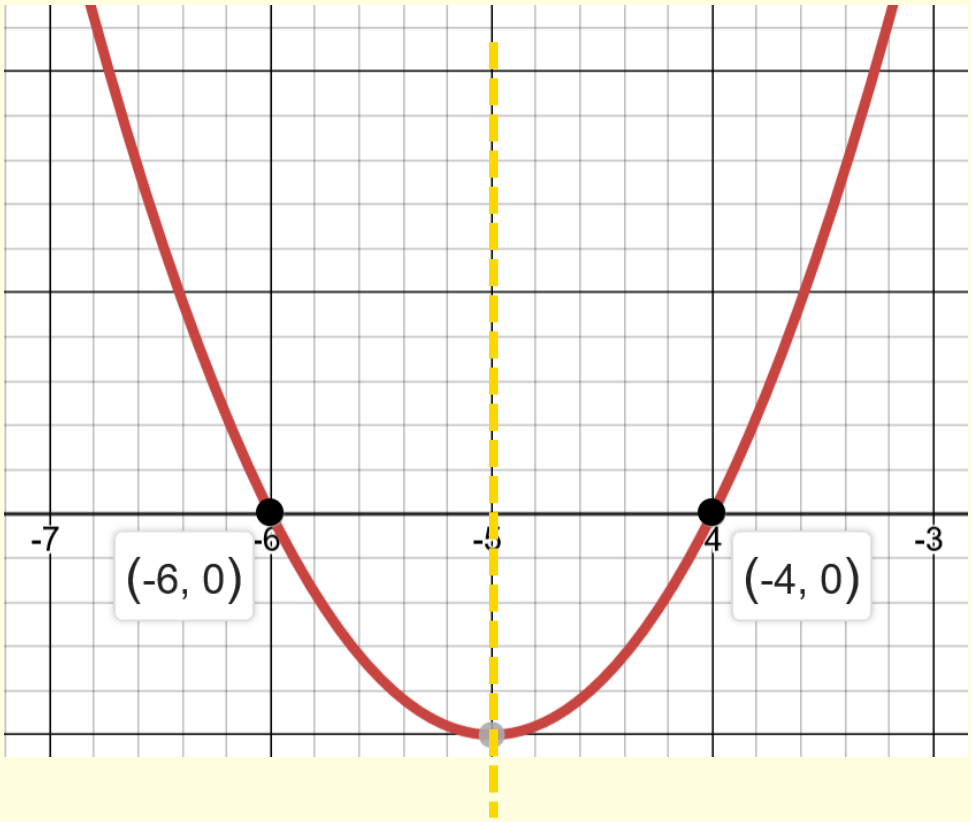
Curve 5



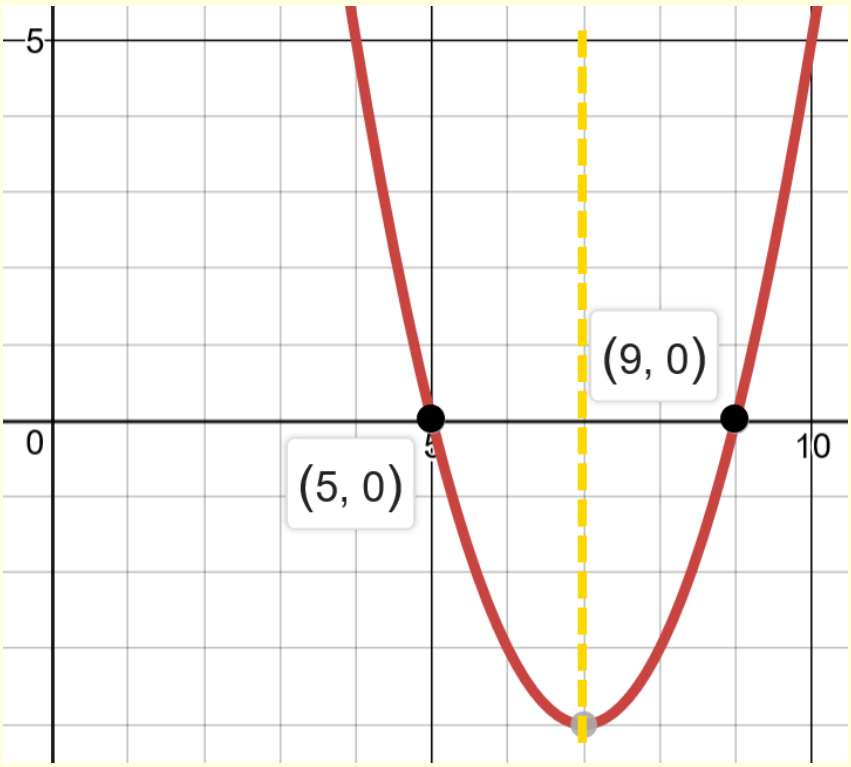
The Answers!

Give yourself a score out of 5.

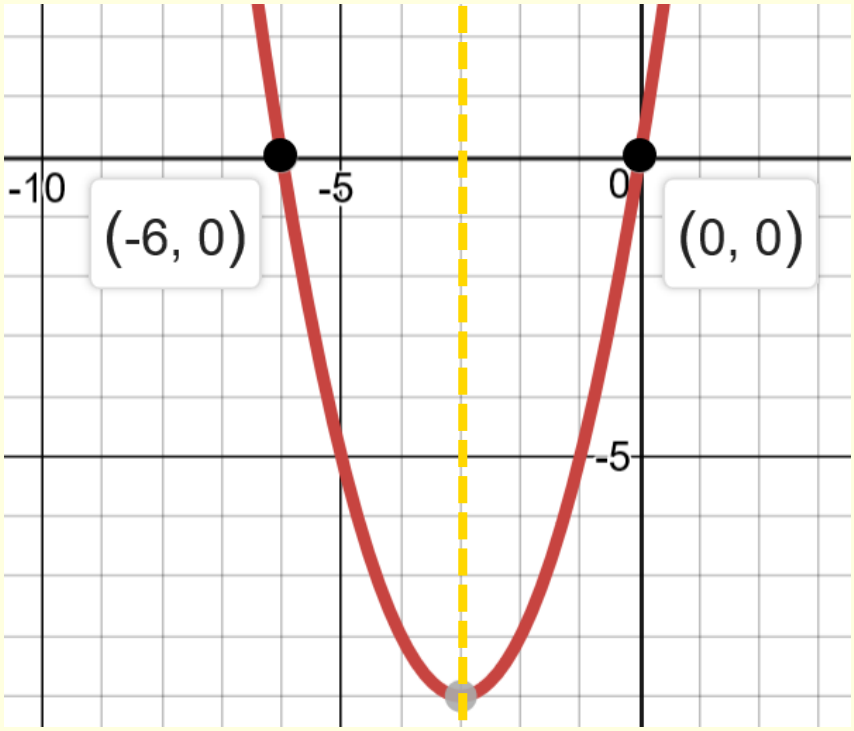
Curve 1 x = -5



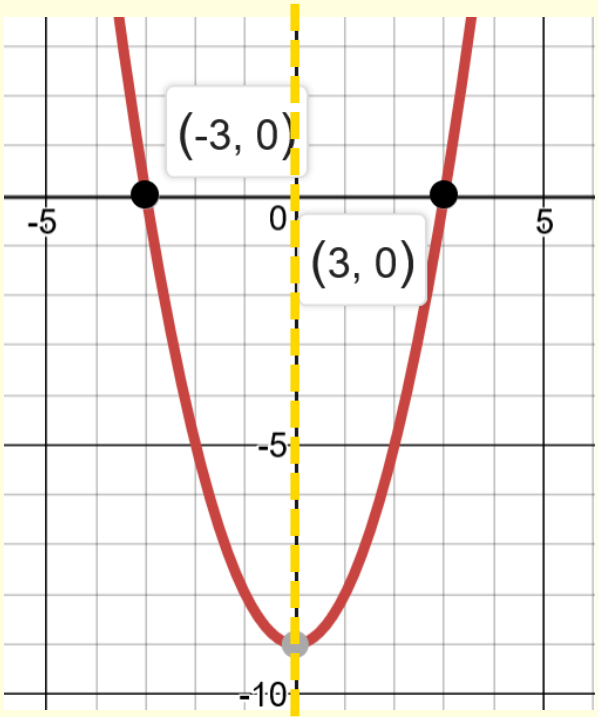
Curve 2 x = 7



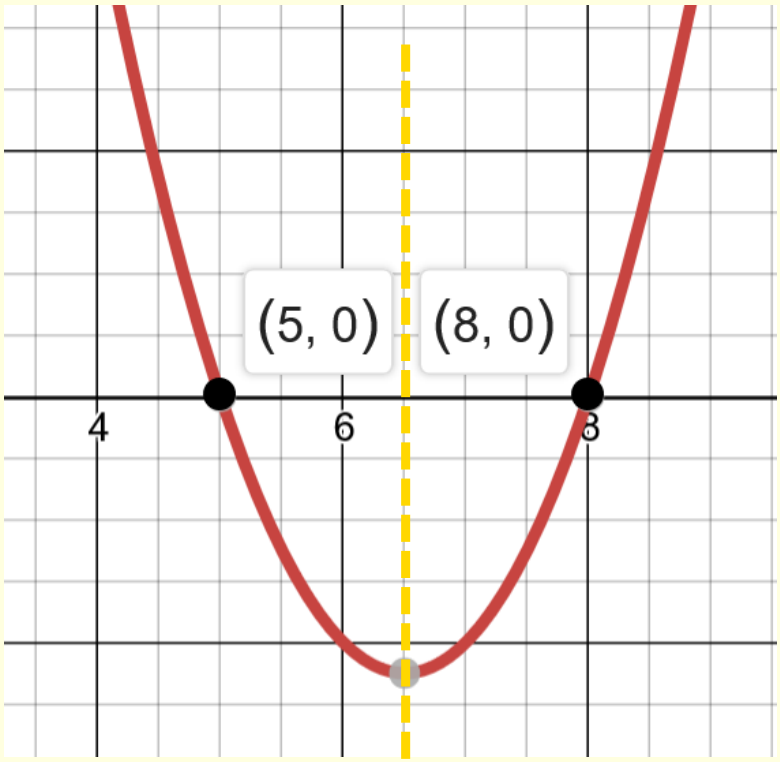
Curve 3 x = -3



Curve 4 x = 0



Curve 5 x = 6.5



Axis of Symmetry

To find the equation of the axis of symmetry we...

Step 1 - Find the coordinates of the roots if not already given.

Step 2 - Find the midpoint between the roots (halfway!)

Step 3 - Write down the axis of symmetry.

It's equation starts with x = ___

Practice

For each of the following find the **coordinates of the roots** and **equation of the axis of symmetry**.

a) $y = x^2 + 11x + 30$

b) $y = x^2 + 2x - 15$

c) $y = x^2 + 14x + 40$

d) $y = x^2 + 3x - 28$

e) $y = x^2 - 15x + 56$

f) $y = x^2 - 9$

Answers

For each of the following find the **coordinates of the roots** and **equation of the axis of symmetry**.

a) $y = x^2 + 11x + 30$

(-6, 0) (-5, 0) $x = -5.5$

b) $y = x^2 + 2x - 15$

(-5, 0) (3, 0) $x = -1$

c) $y = x^2 + 14x + 40$

(-10, 0) (-4, 0) $x = -7$

d) $y = x^2 + 3x - 28$

(-7, 0) (4, 0) $x = -1.5$

e) $y = x^2 - 15x + 56$

(7, 0) (8, 0) $x = 7.5$

f) $y = x^2 - 9$

(3, 0) (-3, 0) $x = 0$

Starter

Find the roots and equation of the axis of symmetry of the curve

$y = x^2 - 14x + 33$

Follow the steps from yesterdays lesson to help you.

Turning Point

Today we are learning...

How to find the coordinates of the turning point.

I will know if I have been successful if...

I can find the coordinates of the roots.

I can find the equation of the axis of symmetry.

I can substitute this to find the coordinates of the turning point.

What have we done so far?

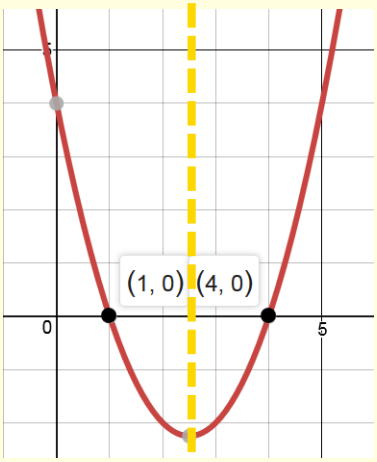
Our eventual aim is to sketch a curve without having to use a table of values.

So far we can find:

-The coordinates of the roots.

- The equation of the axis of symmetry.

What do we still need to find?



Using the example from the starter...

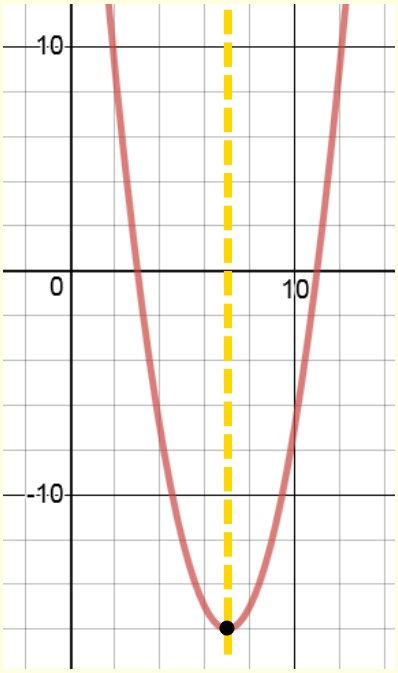
So far you have found that the roots have coordinates;

(3, 0) and (11, 0)

and the axis of symmetry is x = 7.

Using the example from the starter...

What do you notice about the turning point in relation to the axis of symmetry?



Using the example from the starter...

So far you have found that the roots have coordinates;

(3, 0) and (11, 0)

and the axis of symmetry is x = 7.

The equation of the curve is $y = x^2 - 14x + 33$

How to find the coordinate of the turning point.

Step 1 - If you don't have it find the equation of the axis of symmetry, in the form x = __

Step 2 - The equation of the axis of symmetry gives you the x coordinate of the turning point.

Step 3 - Substitute back into the original equation of the curve to find the y coordinate.

Let's try two together form the start.

Find the coordinates of the roots, axis of symmetry and coordinates of the turning point of the curve $y = x^2 - 12x + 35$

Let's try two together form the start.

Find the coordinates of the roots, axis of symmetry and coordinates of the turning point of the curve $y = x^2 + 2x - 24$

Two for you to have a go at now...

Find the coordinates of the roots, axis of symmetry and coordinates of the turning point of the curve $y = x^2 - 4x - 21$

Find the coordinates of the roots, axis of symmetry and coordinates of the turning point of the curve $y = x^2 - 6x - 16$

Answers

Find the coordinates of the roots, axis of symmetry and coordinates of the turning point of the curve $y = x^2 - 4x - 21$

Roots: (-3, 0) and (7, 0)

Turning Point: (2, -25)

Axis of Symmetry: x = 2

Find the coordinates of the roots, axis of symmetry and coordinates of the turning point of the curve $y = x^2 - 6x - 16$

Roots: (-2, 0) and (8, 0)

Turning Point: (3, -25)

Axis of Symmetry: x = 3

Starter

Find the **roots**, **axis of symmetry** and **turning point** for the graph with equation $y = x^2 + 2x - 35$

Y-Intercept

Today we are learning...

How to find the y-intercept of a parabola.

I will know if I have been successful if...

I can find the roots, axis of symmetry and turning point.

I know to substitute x = 0 into the original equation.

I can find the coordinates of the y intercept.

Going Back to the Starter

$y = x^2 + 2x - 35$

Roots: (5, 0) and (-7, 0)

Axis of Symmetry: x = -1

Turning Point: (-1, 36)

Y-Intercept:

How to find the Y-Intercept

Step 1 - The x coordinate is always 0.

Step 2 - The y coordinate is the number at the end of the equation.

Step 3 - Write out the coordinate.

Time to do the full process...

R

A

T

Y

$y = x^2 - 6x + 8$

Sketch the following parabolas...

R

A

T

Y

1) $y = x^2 - 6x - 7$

2) $y = x^2 - 8x + 15$

3) $y = x^2 - 9$

(Hint: Two numbers that multiply to give 9 and add to give us 0)

4) $y = x^2 + 8x$

(Hint: Two numbers that multiply to give us 0 and add to give us 8)

5) $y = x^2 + 6x + 5$