

Starter

Sketch the graph of $y = x^2 - 8x + 15$. On your sketch clearly identify the **roots**, **axis of symmetry**, **turning point** and **y intercept**.

Finding the Equation of a Graph

Today we are learning...

How to find the equation of a given curve.

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

I know the general equation of a curve.

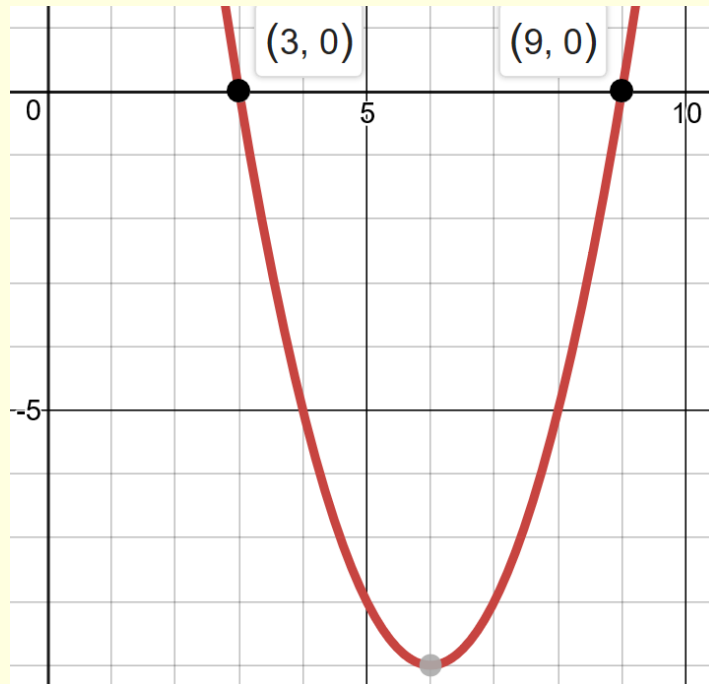
I can give the equation of a curve given just the roots.

I can give the equation of a curve given just the turning point.



Finding the Equation given the Roots

What is the equation of the curve?



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.

Finding the Equation given the Roots

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

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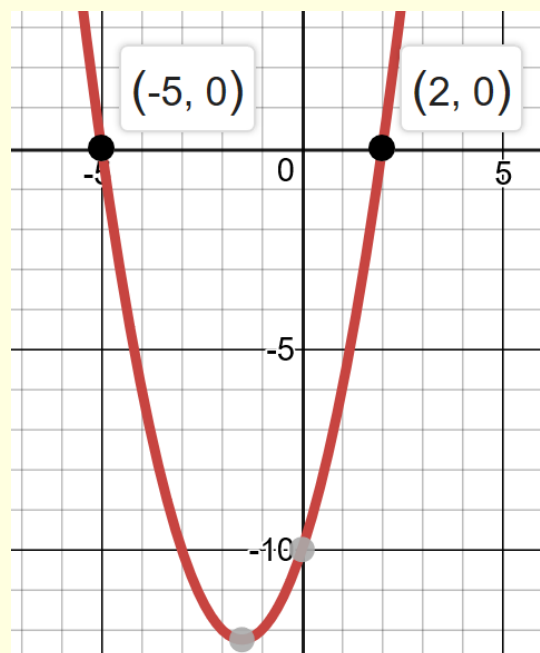
Step 4 - Write down the coordinates of the roots.

Step 4 - $(3, 0)$ and $(9, 0)$

Step 3 -

Finding the Equation given the Roots

What is the equation of the curve?



Finding the Equation given the Roots

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.

Step 4 - $(-5, 0)$ and $(2, 0)$

Step 3 -

Find the Equation of the Curve with these roots...

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.

1) $(4, 0)$ and $(6, 0)$

4) $(-5, 0)$ and $(-13, 0)$

2) $(7, 0)$ and $(11, 0)$

5) $(-2, 0)$ and $(2, 0)$

3) $(-3, 0)$ and $(4, 0)$

6) $(-14, 0)$ and $(13, 0)$

Find the Equation of the Curve with these roots...

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.

1) $y = x^2 - 10x + 24$

4) $y = x^2 + 18x + 65$

2) $y = x^2 - 18x + 77$

5) $y = x^2 - 4$

3) $y = x^2 - x - 12$

6) $y = x^2 + x - 182$



Starter

A parabola has roots at $(4, 0)$ and $(-3, 0)$. What is the equation of the curve?

Finding the Equation of a Curve Given the Turning Point

Today we are learning...

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

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

I can find the value of a and b .

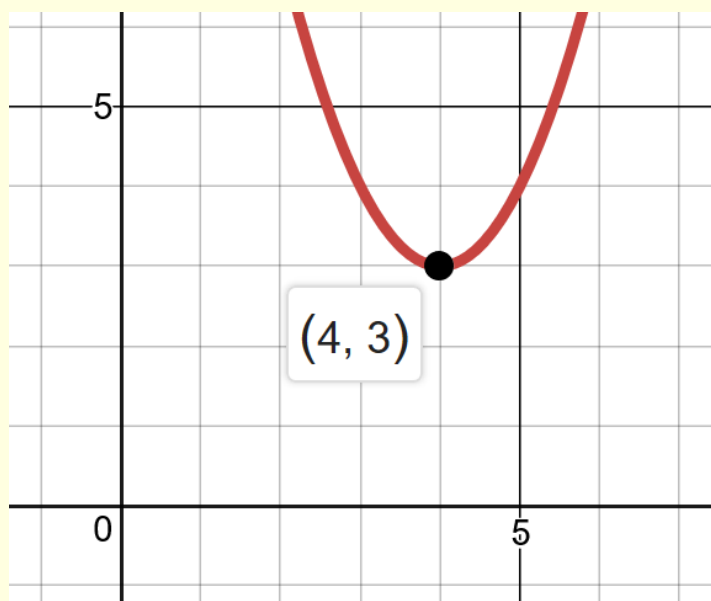
I can substitute it into the general equation.

I can expand the brackets to find the equation.



Case 2 - Finding the Equation of the Parabola Given the Turning Point

What is the equation of the curve?



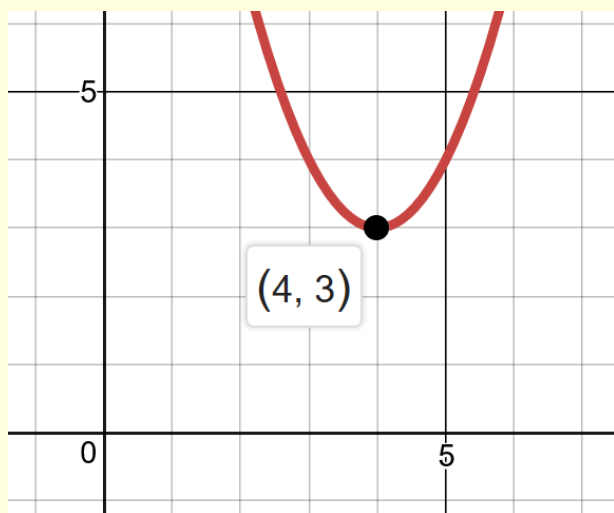
Note

Given the coordinates of the turning point (a, b) the equation of the curve is

$$y = (x - a)^2 + b$$

Case 2 - Finding the Equation of the Parabola Given the Turning Point

What is the equation of the curve?

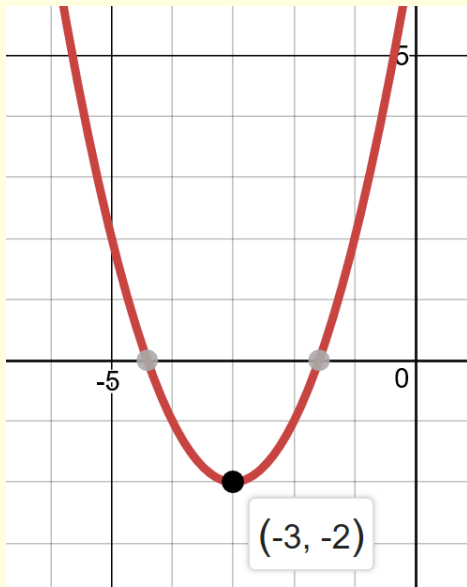


$$(a, b) = (\underline{\quad}, \underline{\quad})$$

$$y = (x - a)^2 + b$$

Case 2 - Finding the Equation of the Parabola Given the Turning Point

What is the equation of the curve?

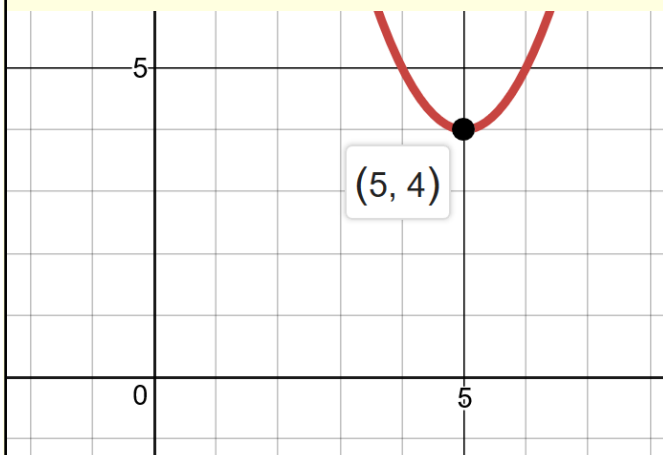


$$(a, b) = (_, _)$$

$$y = (x - a)^2 + b$$

Case 2 - Finding the Equation of the Parabola Given the Turning Point

What is the equation of the curve?



$$(a, b) = (_, _)$$

$$y = (x - a)^2 + b$$

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Find the Equation of the Curve with these turning points...

1) (4, 6)

6) (6, -12)

2) (3, 5)

7) (-3, -8)

3) (-2, 5)

8) (-9, -11)

4) (-9, 10)

9) (0, 0)

5) (3, -4)

10) (-0.5, 0.5)

Find the Equation of the Curve with these turning points...

1) $y = x^2 - 8x + 22$

6) $y = x^2 - 12x + 24$

2) $y = x^2 - 6x + 14$

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

3) $y = x^2 + 4x + 9$

8) $y = x^2 + 18x + 70$

4) $y = x^2 + 18x + 91$

9) $y = x^2$

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

10) $y = x^2 + x + 0.75$



Starter

- 1) Find the equation of the curve with roots (4, 0) and (-3, 0)
- 2) Find the equation of the curve with turning point (5, 7)
- 3) Find the roots of the equation $y = x^2 + 5x - 9$

The Quadratic Equation

Today we are learning...

How to use the quadratic equation to find roots of an equation.

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

I know what the quadratic formula looks like.

I can find the values of a, b and c.

I can substitute these into the formula and evaluate.



From the starter...

3) Find the roots of the equation $y = x^2 + 5x - 9$

We needed to find two numbers that multiplied to give us -9 and added together to give us 5.

There are two numbers that will do this for us, there just not nice whole numbers that we are used to and so we can't factorise like normal.

The Quadratic Formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

in $ax^2 + bx + c$

3) Find the roots of the equation $y = x^2 + 5x - 9$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

(We can check our answer in Desmos)

Let's try another one...

Find the roots of the equation $y = x^2 + 6x + 3$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Last one!

Find the roots of the equation $y = x^2 - 4x - 3$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Practice

Using the quadratic formula, find the roots of the equation.

1) $y = x^2 + 7x + 4$

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

2) $y = x^2 + 8x - 3$

5) $y = x^2 - x - 9$

3) $y = x^2 - 10x - 4$

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

Answers

Using the quadratic formula, find the roots of the equation.

- 1) $(-6.372, 0)$ and $(-0.628, 0)$ 4) $(0.536, 0)$ and $(7.464, 0)$
2) $(-8.359, 0)$ and $(0.359, 0)$ 5) $(-2.541, 0)$ and $(3.541, 0)$
3) $(-0.385, 0)$ and $(10.385, 0)$ 6) $(2.158, 0)$ and $(-1.158, 0)$

The Discriminant

Today we are learning...

What the discriminant is and why we use it.

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

I can identify the discriminant.

I can calculate the discriminant.

I can interpret the value of the discriminant to identify how many roots an equation has.

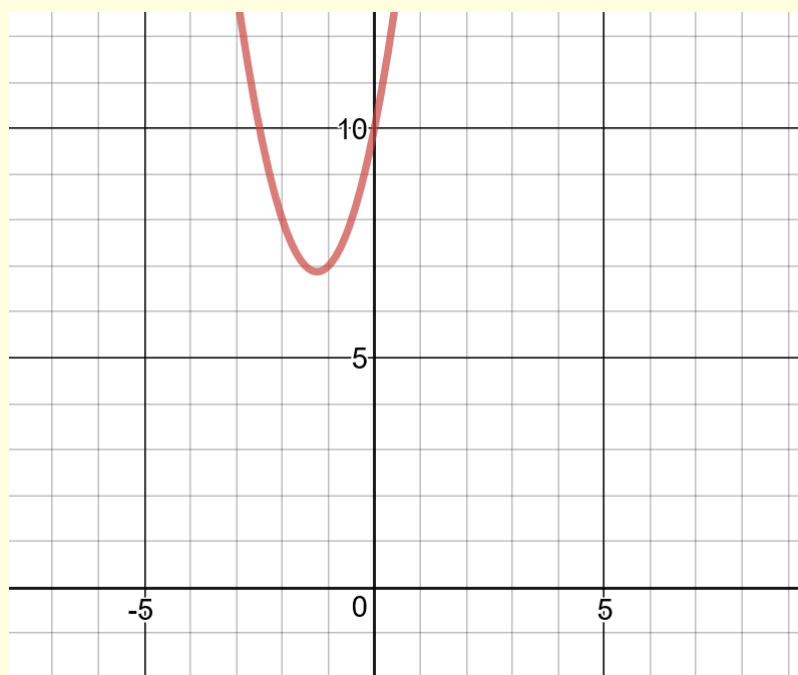


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Find the roots of $y = 2x^2 + 5x + 10$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Find the roots of $y = 2x^2 + 5x + 10$



The discriminant is given by the equation

$$\sqrt{b^2 - 4ac}$$

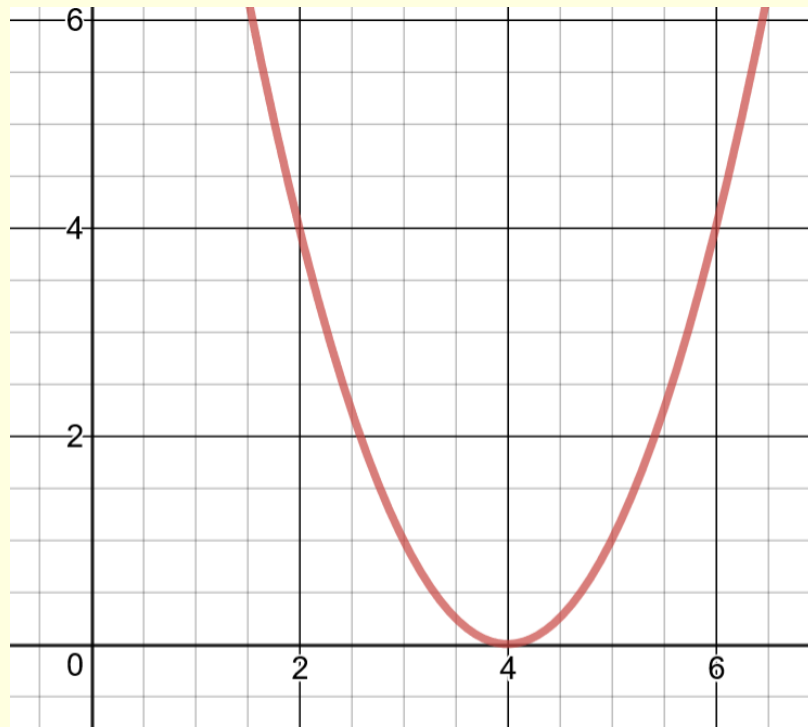
If $\sqrt{b^2 - 4ac} > 0$ the parabola has 2 roots.

If $\sqrt{b^2 - 4ac} = 0$ the parabola has 1 roots.

If $\sqrt{b^2 - 4ac} < 0$ the parabola has 0 roots.

How many roots does the equation $y = x^2 - 8x + 16$ have?

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How many roots does the equation $y = x^2 - 9x - 2$ have?

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