

Graphing quadratics in polynomial form

Thursday, 22 February 2018 6:52 pm

Work to be completed by the end of the lesson:

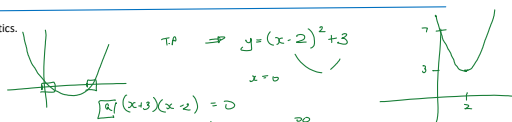
Graphing $ax^2 + bx + c$	MM Ex. 3F	1ac 2ac 3bcog 4abefgh
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RECAP:

We have been looking at the ideas behind factorising quadratics.

We can do this in a number of ways:

- Using the T-Method
- Completing the square
- Quadratic formula
- Cross-method



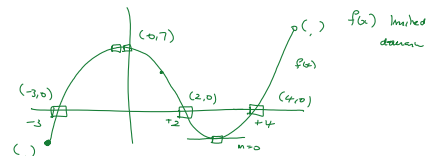
The reason for doing the algebra is to allow us to sketch the quadratic.

To be able to sketch any graph, be it a quadratic, or cubic or even a straight line ... we need to ensure we always mark on the graphs the following things:

When drawing graphs (at any point in Methods), you must always ensure to label the following:

- x-axis intercept(s) in co-ordinate form
- y-axis intercept(s) in co-ordinate form
- Turning points (maxima and minima)
- Endpoints (when the domain is limited)
- Equations of any asymptotes
- At least one co-ordinate value

This is what you will be doing this lesson.



Sketching quadratics

When you sketch something ... in Mathematical language you are drawing a diagram which isn't perfect.

You are NOT creating a work of art.

You are drawing a (semi) perfect drawing of a graph.

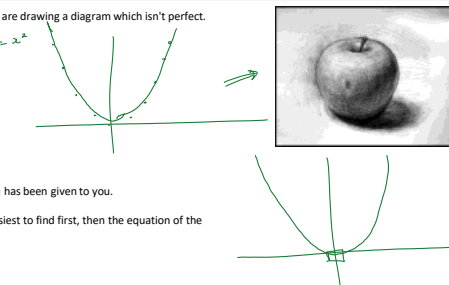
When you sketch a graph you always follow the same steps:

- Find the y-axis intercept
- Find the x-axis intercept
- Find the equation of the axis of symmetry
- Find the co-ordinates of the turning point

The order above is NOT prescriptive.

You tend to change the order depending on how the question has been given to you.

In Turning Point Form you might find the turning point the easiest to find first, then the equation of the axis of symmetry, then the intercepts.



Example:

Find the x- and y-axis intercepts and the turning point, and hence sketch the graph of $y = x^2 + 2x - 8$

In this form it's easy to see the y-axis intercept is: -8

Complete the square (to find the turning point):

$$y = (x+1)^2 - 9$$

$$TP = (-1, -9)$$

Find the x-axis intercepts:

$$y=0 \quad 0 = x^2 + 2x - 8$$

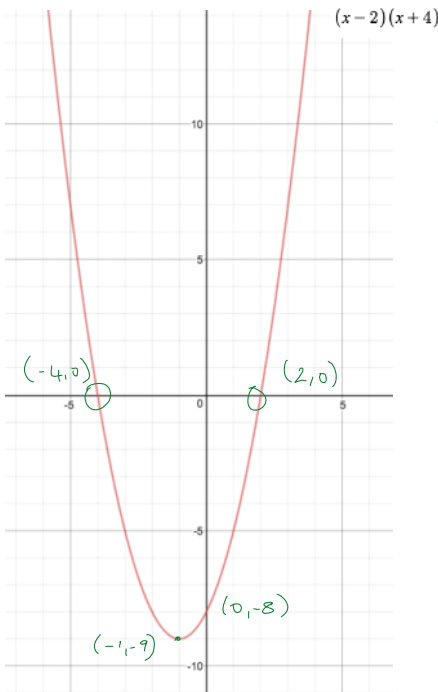
$$\begin{aligned} (x+1)^2 - 9 &= 0 \\ (x+1)^2 &= 9 \\ x+1 &= \pm 3 \end{aligned}$$

$$\begin{aligned} x &= 0 \\ y &= x^2 + 2x - 8 \end{aligned}$$

$$\begin{aligned} y &= (x+1)^2 - 1 - 8 \\ &= (x+1)^2 - 9 \end{aligned}$$

$$\begin{aligned} x &= -1 \pm 3 \\ x_1 &= -1 + 3 & x_2 &= -1 - 3 \\ x_1 &= 2 & x_2 &= -4 \end{aligned}$$

Sketching the graph you would have something looking like:



Don't be tricked!

Remember, in Mathematics we can be given information in reverse!
You need to be able to apply the understanding in both ways.

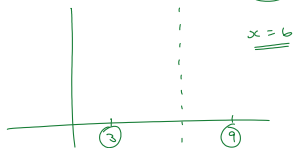
Sketch

Don't be tricked!

Remember, in Mathematics we can be given information in reverse!
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Example: A parabola has x-axis intercepts at 3 and 9. State the x-coordinate of the vertex.

y = ...

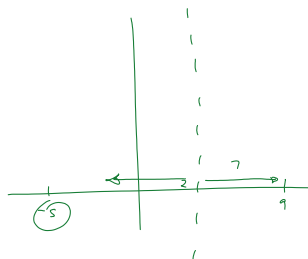


$$\frac{3+9}{2} = 6$$

$$\Rightarrow a(x-3)(x-9) = 0$$

Skills
Understanding

Example: A parabola has a vertex at (2, -10) and one of the x-axis intercepts at 9. Find the other x-axis intercept.



$$x = -5$$