Graphing Quadratics

Sunday, 18 February 2018 6:46 pm

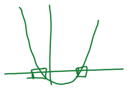
Work to be completed by the end of the lesson:

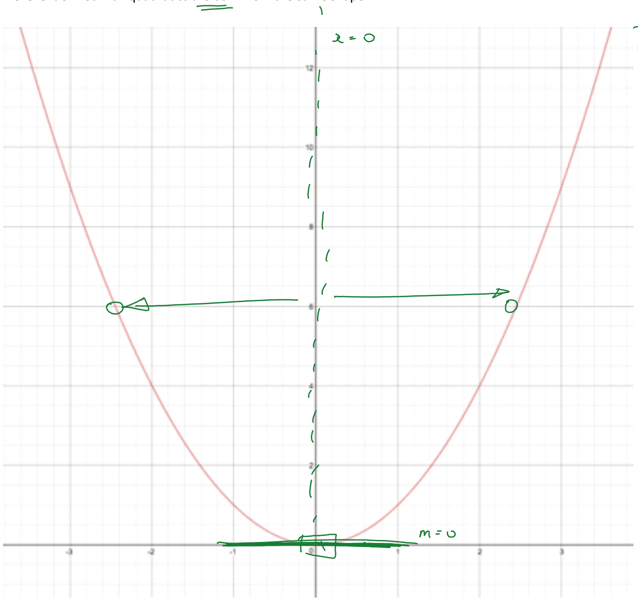
Graphing quadratics using Transformations	MM Ex. 3D	1acdf 2bd 3abeghi

RECAP:

In the previous lesson we looked at solving quadratics.
When we solve a quadratic we are finding where a quadratic crosses the x-axis.
Believe it or not ... all quadratics are born from the same shape:

$x^2 + 3x - 2 = 0$





$\boxed{y = x^2}$

All quadratics have an axis of symmetry
They are **even** functions
They have a turning point (max or min)

We have already seen that quadratics can be written in a number of different ways:

$ax^2 + bx + c = 0$

This one equation can be written in lots of different ways, but they are all the same equation.

$x^2 + 5x - 2 = 0$

B.F.T.

$x^2 + 5x = 2$

$x^2 - 2 = -5x$

$x(x + 5) = 2$

$x = \dfrac{2}{x + 5}$

$\boxed{x + 5 = \dfrac{2}{x}}$

$x = \dfrac{2}{x} - 5$

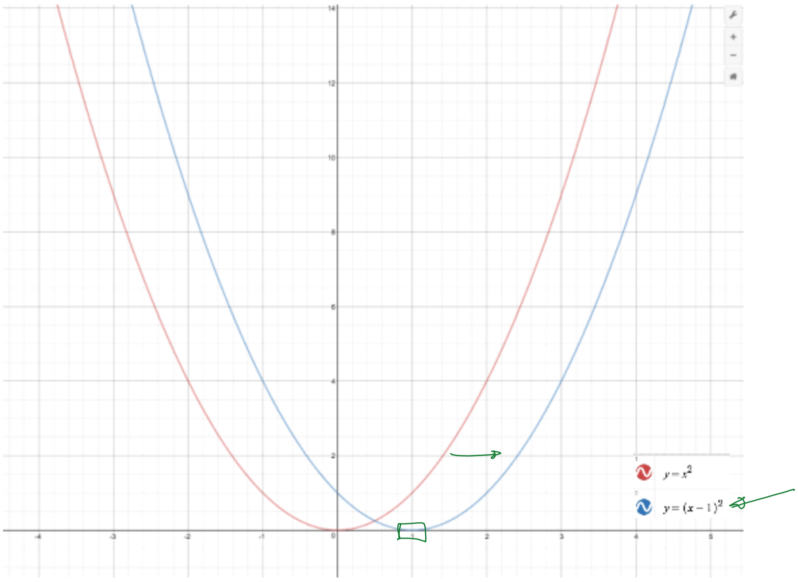
$x + 5 = \dfrac{2}{x}$ ✗ x

$x^2 + 5x = 2$

$x^2 + 5x - 2 = 0$

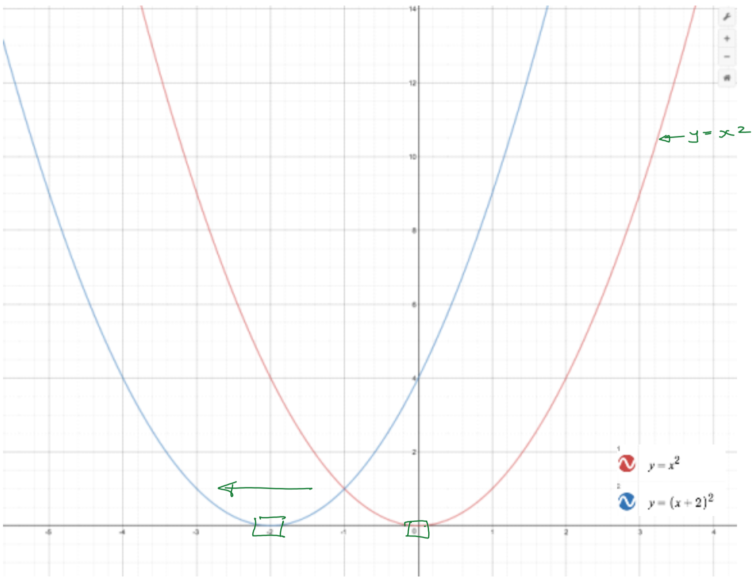
The above, simply shows the same quadratics expressed in different ways through algebra tricks.
It can be argued than NONE of them are particularly useful.
That's not true of all way of expressing quadratics ...

$y = x^2$



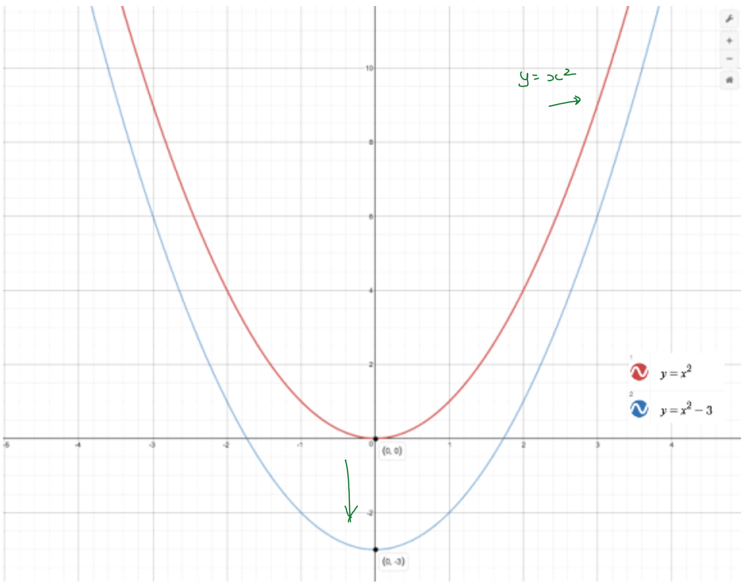
$y = (x-1)^2$

2 - S2

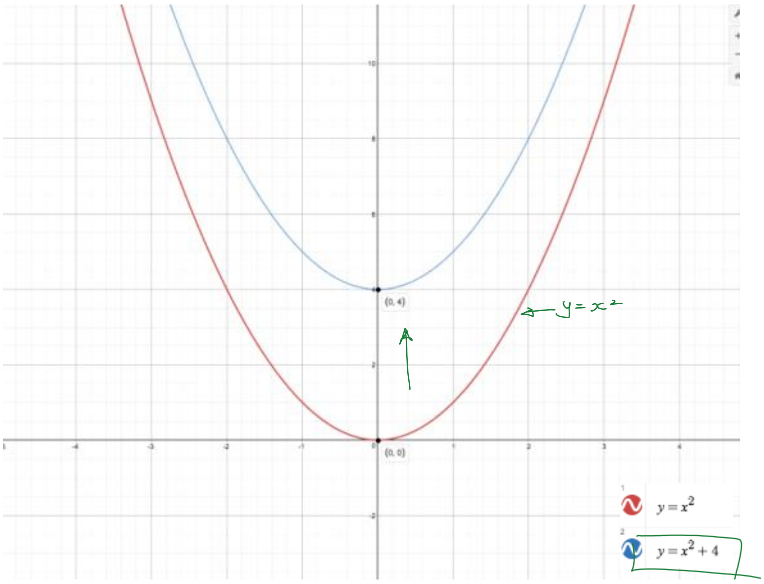


T.P.

$y = (x+2)^2$



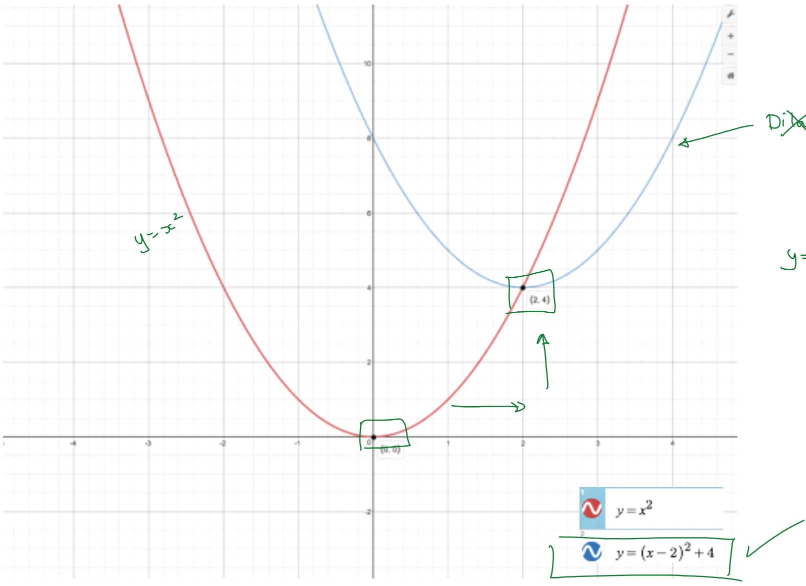
$y = x^2 \boxed{-3}$



$y = x^2 + 4$

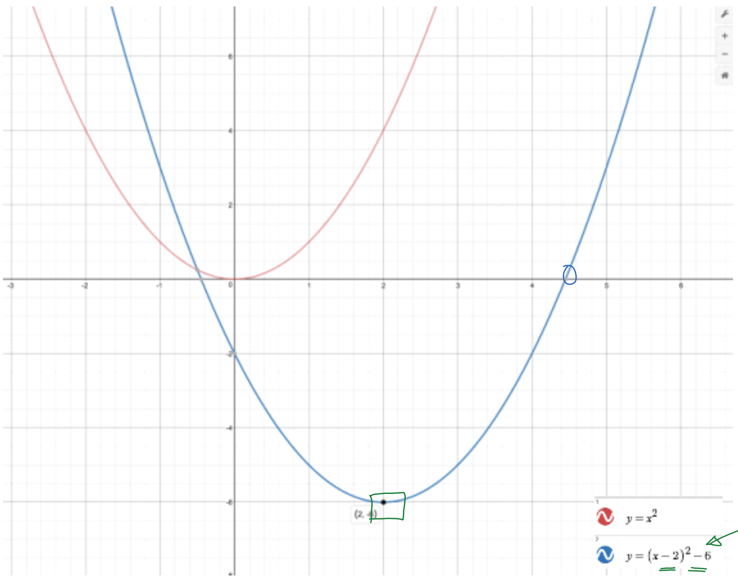
$y = a(x - h)^2 + c$

Dilation!



Dilation

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

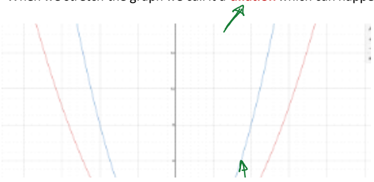


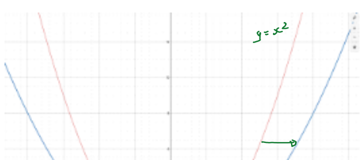
T.P. Form!

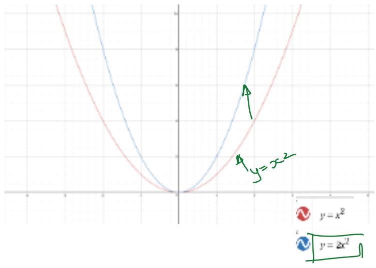
The above are called **transformations.**

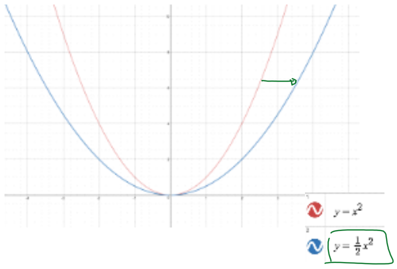
When we move horizontally or vertically we call then **translations**.

When we stretch the graph we call it a **dilation** which can happen from the x-axis and the y-axis









Completing the Square/Turning Point form

The process of doing this is coming soon ... it's a great way to find the minimum (or maximum) of the graph.
By looking at the graphs above, we can see there seems to be a format to the way a quadratic can be written and hence finding it's minimum or maximum

$y = x^2 + 4x - 6$

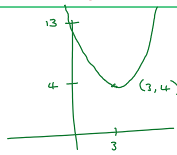
$y = a(x-b)^2 + c$

$$\boxed{y = a(x \pm k) \pm h}$$

Examples of how to read the turning point from Turning Point Form

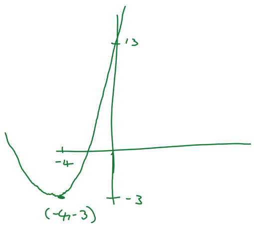
E.g. $y = (x-3)^2 + 4$

y-axis $x = 0$



E.g. $y = (x+4)^2 - 3$

$x = 0$

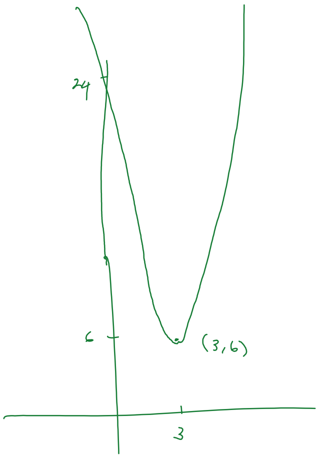


E.g. $y = 2(x-3)^2 + 6$

$x = 0$

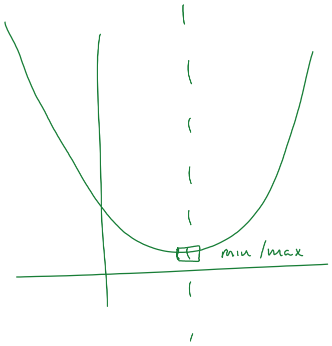
$18 + 6 = 24$

Dilation



Axis of Symmetry

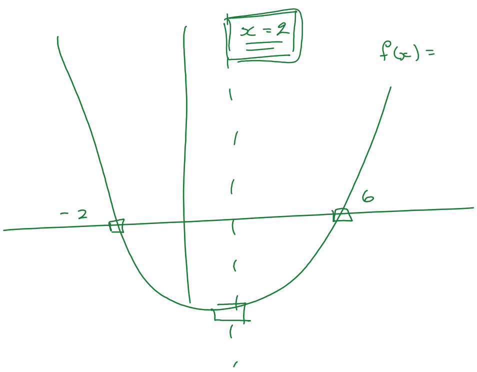
We already know that a quadratic has a line of symmetry down the centre.
The x-value happens to coincide with the mid-point of the two solutions to the quadratic equation.
When we find the x-value, we can find the y-value and hence the maximum or minimum of the quadratic



$y = 2(x+3)^2 - 6$

$(-3, -6)$

axis of symmetry $\Rightarrow$ $x = -3$



$f(x) =$

$\frac{-2+6}{2} = (2)$