



The graph of $y^2 = x$

Year 11
Mathematical Methods

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Learning Objectives

By the end of the lesson, I hope that you understand and can apply the following to a range of questions from the Year 11 Mathematical Methods course.

- Be able to sketch the graph of $y^2 = x$
- Be able to transform the graphs of $y^2 = x$



RECAP

So far, in these videos, we have been looking at the plethora of graphs which we will need to know about in order to do well in Mathematical Methods Units 1 and 2.

We have already looked at:

- Rectangular hyperbolas, and
- The truncus

Now it's time to look at the graph of $y^2 = x$.

Thoughts: Have you noticed how the equation has been written? Why?



Table of value for the graph $y^2 = x$

I don't, at the moment, know what this graph will look like. So, I'm going to resort to the old fashion way of creating a table of values and then plotting some points!

y	-4	-3	-2	-1	0	1	2	3	4
x	16	9	4	1	0	1	4	9	16

$$y^2 = x$$
$$x = y^2$$

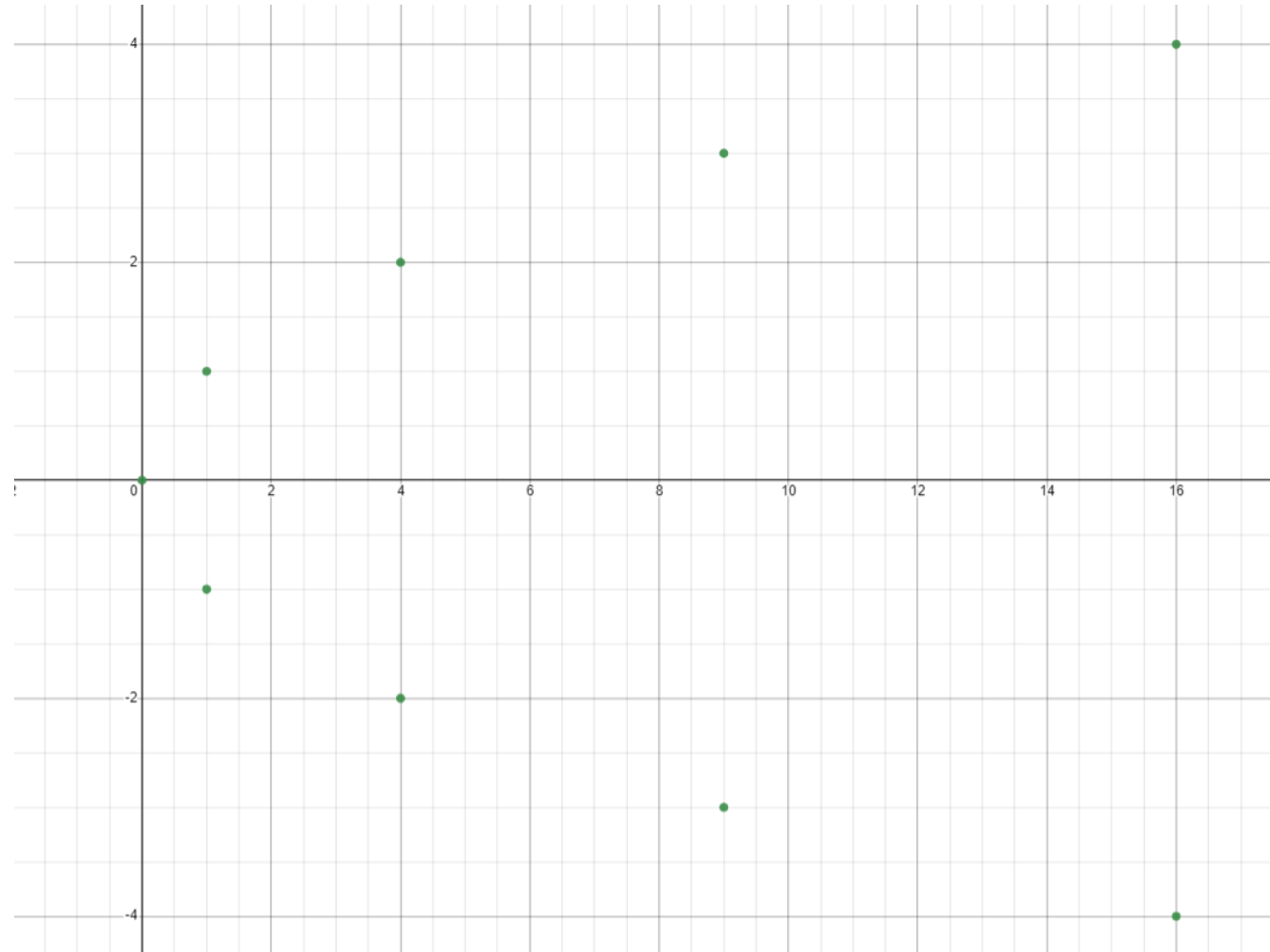


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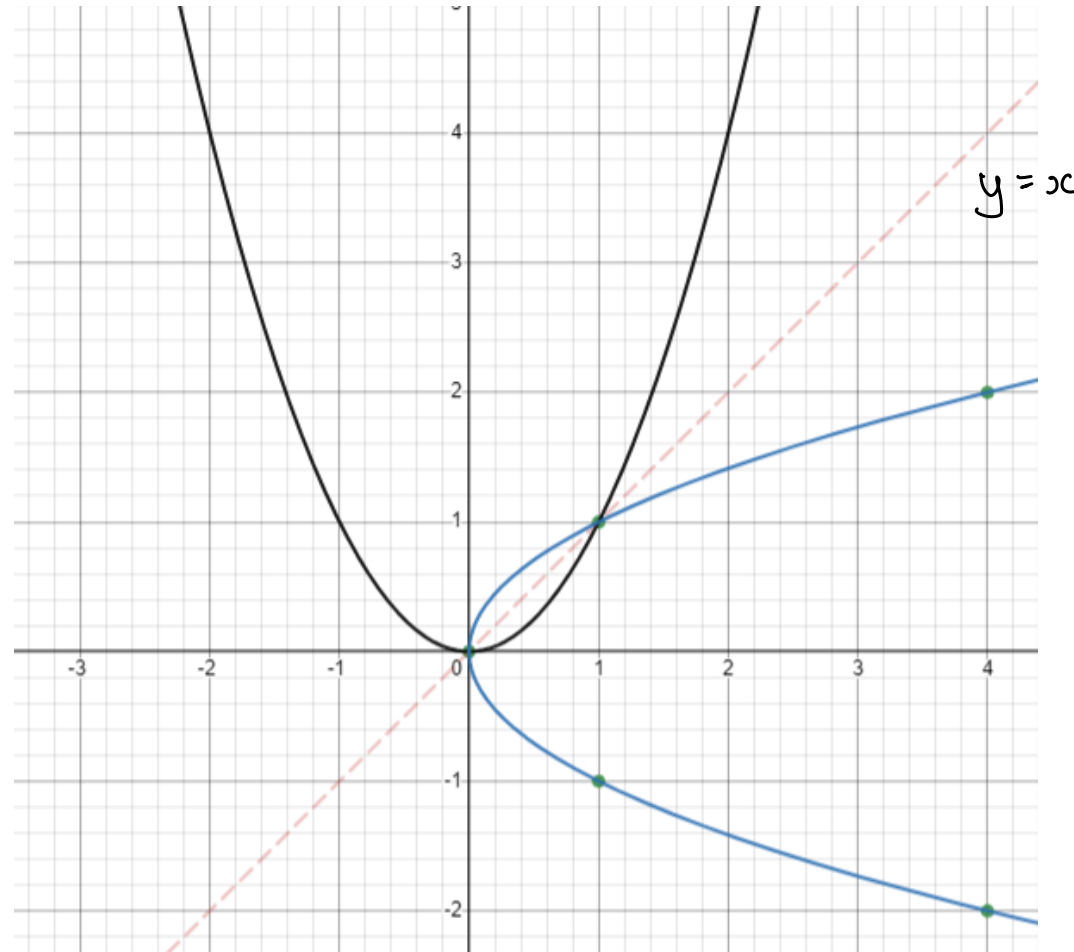
y	-4	-3	-2	-1	0	1	2	3	4
x	16	9	4	1	0	1	4	9	16

Vertex is at (0,0) and axis of symmetry is $y = 0$



A reflection in the line $y = x$

We see that the graph of $y^2 = x$ is simply a reflection of the graph of $y = x^2$ in the line $y = x$.



y	-4	-3	-2	-1	0	1	2	3	4
x	16	9	4	1	0	1	4	9	16

$$y = x^2$$
$$x = y^2$$
$$y^2 = x$$



Transform away!

This whole section of the course seem to deal with not only knowing what the graphs look like, but how we can transform them using:

- Dilations
- Reflection
- Translations

So, what does happen when we transform the graph of $y^2 = x$.

If we look at the general transformation, we see the following is true:

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

Horizontal translation

Vertical translation

Dilation factor

$$y^2 = x$$

$$y = \pm \sqrt{x}$$

$$y = \pm \sqrt{x}$$



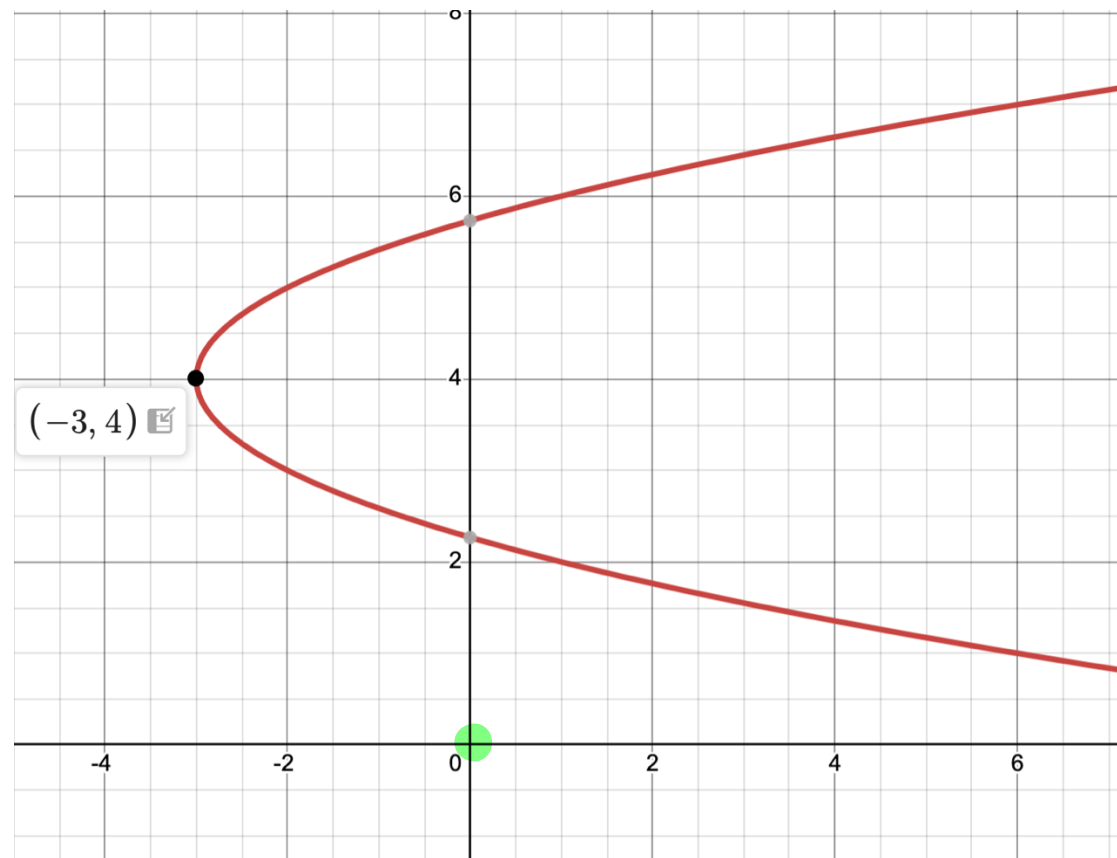
Example 1

Sketch the graph of:

a $(y - 4)^2 = x + 3$

b $y^2 + 2y = 2x + 3$

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T



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

$$(y - 4)^2 = 1(x + 3)$$

$$(y - 4)^2 = 1(x - (-3))$$

$$4 \uparrow$$

$$3 \leftarrow$$

$$a^2 = 1$$

$$a = \pm 1$$

$$\therefore a = \underline{\underline{1}}$$



Example 1

Sketch the graph of:

a $(y - 4)^2 = x + 3$

b $y^2 + 2y = 2x + 3$

$$y^2 + 2y$$

$$(y + 1)^2 - 1$$

$$\therefore (y + 1)^2 - 1 = 2x + 3$$

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

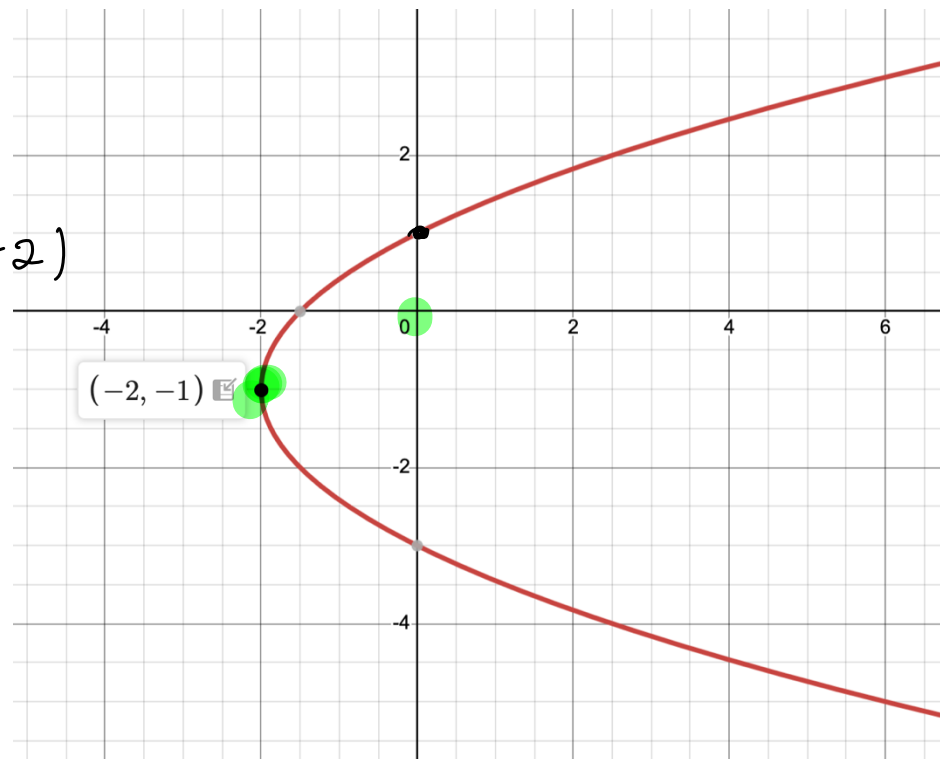
$$\therefore (y + 1)^2 = 2(x + 2)$$



$$a^2 = 2$$

$$a = \pm \sqrt{2}$$

$$\therefore a = \underline{\underline{\sqrt{2}}}$$



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



Learning Objectives: Revisited

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