GCSE Maths – Algebra

Translations and Reflections (Higher Only)

Worksheet

NOTES

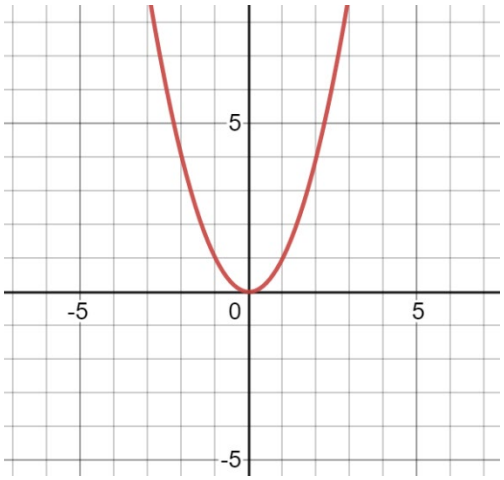
SOLUTIONS

This worksheet will show you how to work out different types of translations and reflections questions. Each section contains a worked example, a question with hints and then questions for you to work through on your own.

Section A

Worked Example

The graph shows the function $f(x) = x^2$.
Sketch the function $f(x) + 3$.

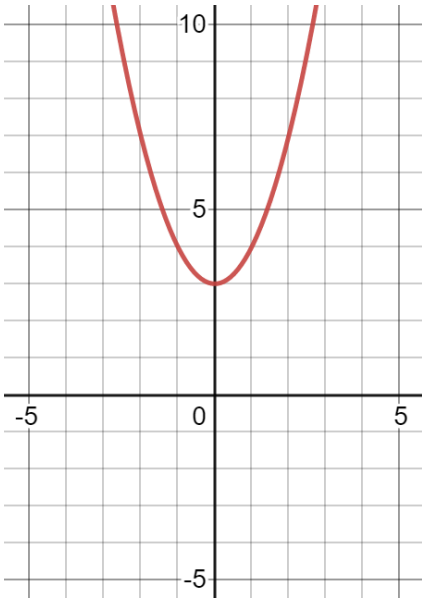


Step 1: Work out how the function will be translated.

Since the translation number $+3$ is outside the bracket, this is a translation in the vertical direction. The curve will be shifted upwards by 3 units.

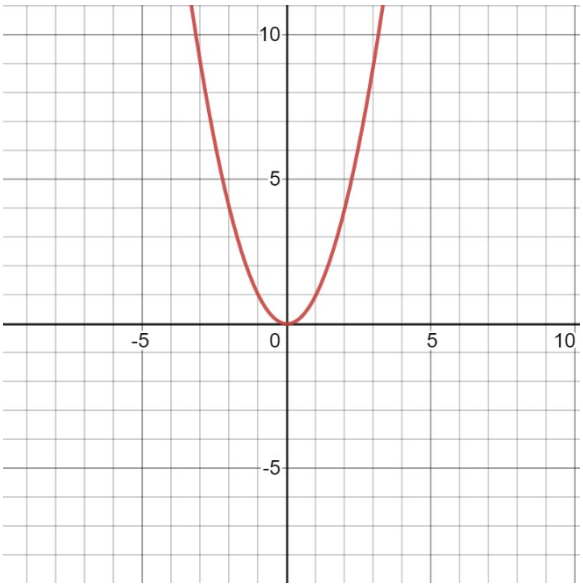
Step 2: Sketch the transformed curve.

Each coordinate is moved up 3 units. In particular, the y-intercept moves from position $(0,0)$ to position $(0,3)$.



Guided Example

The graph shows the function $f(x) = x^2$.
Sketch the function $f(x - 4)$.



Step 1: Work out how the function will be translated.

Step 2: Sketch the transformed curve.

Now it's your turn!
If you get stuck, look back at the worked and guided examples.

1. A curve is described by the function $f(x) = x^2$.
   Sketch the following translations:

a) $f(x + 2)$

b) $f(x) - 1$

c) $f(x - 2) + 4$

2. A curve is described by the function $f(x) = x^2 + 2x + 1$.
Sketch the following translations:

a) $f(x + 3)$

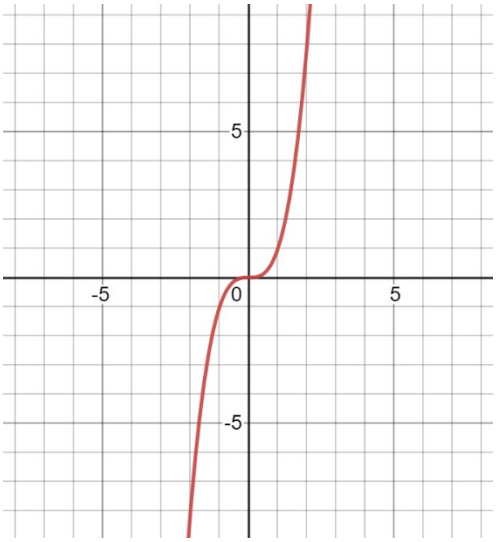
b) $f(x) - 2$

c) $f(x - 1) + 5$

Section B

Worked Example

A curve is given by the function $f(x) = x^3$.
The curve is reflected in the x-axis. Write the equation for the function of the reflection and sketch the new curve.



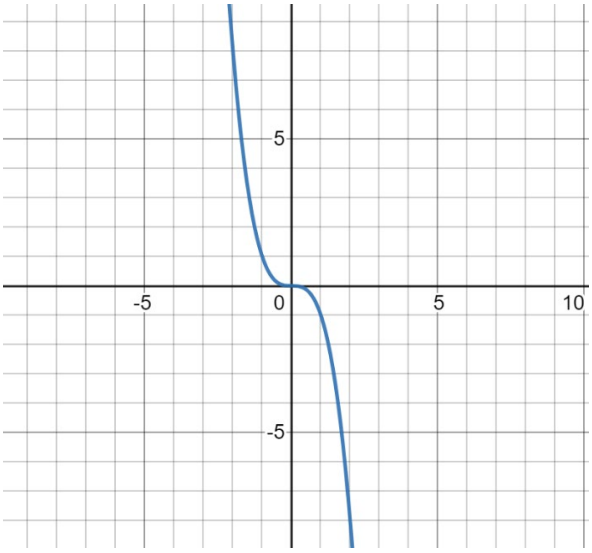
Step 1: Reflection involves introducing a negative sign to the equation for the function. Identify where the negative sign needs to be put in the function equation for the required reflection.

As this is a reflection in the x-axis, the negative sign will be put ***outside*** *the bracket.*

Therefore, the function is written as $-f(x) = -(x^3)$.

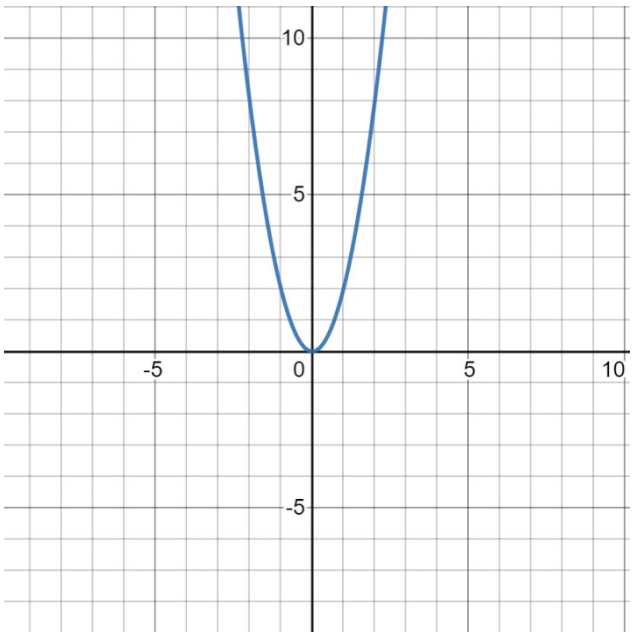
Step 2: Sketch the new curve.

Sketch the new curve by reflecting the given graph in the x-axis.



Guided Example

A curve is given by the function $f(x) = 2x^2$. The curve is reflected in the y-axis. Write the reflection and sketch the new curve.



Step 1: Reflection involves introducing a negative sign to the equation for the function. Identify where the negative sign needs to be put in the function equation for the required reflection.

Step 2: Sketch the new curve.

Now it's your turn!
If you get stuck, look back at the worked and guided examples.

3. A curve is described by the equation $f(x) = (x - 4)^3$. Sketch the curve and write the equation of the new function if the curve is reflected in:

a) the x-axis

b) the y-axis

c) both the x-axis and y-axis