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Functions

More Transformations of Functions

We continue with our exploration of functions and focus on horizontal translations and reflections. We highlight the power of using function notation to generalise our observations from specific cases to general cases.

 Lesson Outcomes

By the end of this lesson, you should be able to:

- Use function notation to summarise different transformations of functions

 Curriculum Links

LO 2: Functions and Algebra

- 12.2.1 (a) Demonstrate the ability to work with various types of functions and relations
(b) Demonstrate knowledge of the formal definition of a function

 Lesson Notes

Horizontal Translations

Examine the table showing how four points of the function $f(x) = x^2$ have been translated three units to the right.

Original point		Translated point	
x	y	x	y
0	0	3	0
2	4	5	4
3	9	6	9
-2	4	1	4

Use function notation to re-write the y values on the table

Original point		Translated point	
x	y	x	y
0	$f(0)$	3	$f(3-3)$
2		5	
3		6	
-3		1	

Now use the values in the table to write an equation for the translated function $g(x)$ in terms of $f(x)$:

In general we can say that for a horizontal translation:

The function $g(x) = f(x + a)$
is a **horizontal translation** of the function $f(x)$ by a units.
The translation is **left** for $a > 0$ and
right for $a < 0$

Reflections

When we reflect something we flip it so that it creates a mirror image. A reflection about a line takes each point of the shape to its mirror image with respect to the line. Note that the line of reflection is the perpendicular bisector of the line joining the original point and the reflected point.



Functions

In general, for a reflection about the x -axis:

The function $g(x) = -f(x)$
is a **reflection** of the function $f(x)$ about the x -axis.

In general, for a reflection about the y -axis:

The function $g(x) = f(-x)$
is a **reflection** of the function $f(x)$ about the y -axis.

 Task

Confirm that the reflection of $f(x) = 3x + 2$
about the y -axis is given by $g(x) = f(-x)$