

## Graphs of Related Functions

$y = f(-x)$       Reflection in y axis

$y = -f(x)$       Reflection in x axis

$y = f(x+3)$        $\leftarrow 3$

$y = f(x-3)$        $\rightarrow 3$

$y = f(x)+3$        $\uparrow 3$

$y = f(x)-3$        $\downarrow 3$

$y = 3f(x)$       Stretch vertical scale factor 3

$y = f(3x)$       Stretch horizontal scale factor  $\frac{1}{3}$

## Graphs of Related Sin Functions

$$y = \sin(-x) \quad \text{Reflection in y axis}$$

$$y = -\sin x \quad \text{Reflection in x axis}$$

$$y = \sin(x + 45) \leftarrow 45^\circ$$

$$y = \sin(x - 45) \rightarrow 45^\circ$$

$$y = \sin x + 2 \quad \uparrow 2$$

$$y = \sin x - 2 \quad \downarrow 2$$

$$y = 3\sin x \quad \text{Stretch vertical scale factor 3}$$

$$y = \sin(3x) \quad \text{Stretch horizontal scale factor } \frac{1}{3}$$

## Graphs of Related Functions

Original Equation =  $f(x)$

	Vertical	Horizontal
Translation in +ve direction	$f(x) + 2$	$f(x - 2)$
Translation in -ve direction	$f(x) - 2$	$f(x + 2)$
Stretch to make larger	$3f(x)$	$f\left(\frac{1}{3}x\right)$
Stretch to make smaller (i.e. squash)	$\frac{1}{3}f(x)$	$f(3x)$
Reflection	$-f(x)$	$f(-x)$

## Graphs of Related Sin Functions

Original Equation =  $\sin x$

	Vertical	Horizontal
Translation in +ve direction	$\sin x + 2$	$\sin(x - 2)$
Translation in -ve direction	$\sin x - 2$	$\sin(x + 2)$
Stretch to make larger	$3\sin x$	$\sin\left(\frac{1}{3}x\right)$
Stretch to make smaller (i.e. squash)	$\frac{1}{3}\sin x$	$\sin(3x)$
Reflection	$-\sin x$	$\sin(-x)$