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

$y = \sin(-x)$ Reflection in y axis

$y = -\sin x$ Reflection in x axis

$y = \sin(x + 45)$ $\leftarrow$ 45°

$y = \sin(x - 45)$ $\rightarrow$ 45°

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

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

$y = 3\sin x$ Stretch vertical scale factor 3

$y = \sin(3x)$ 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	$3f(x)$	$f(\frac{1}{3}x)$
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 = $sinx$

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

$y = f(x)$ $y = f(4x + 8)$

Describe the geometrical transformation that maps the curve with equation $y = f(x)$ onto the curve with equation $y = f(4x + 8)$.

Describe the geometrical transformation that maps the curve with equation $y = f(4x + 8)$ onto the curve with equation $y = f(x)$.