Function Parameters

- Every "family" has a basic or parent function - the simplest form of that function.

  Eg: $y = x$

- We can transform a function by changing certain values called parameters.

- We consider four parameters: a, b, h & k.

  add

  multiply

In a basic function,

$$a = 1$$

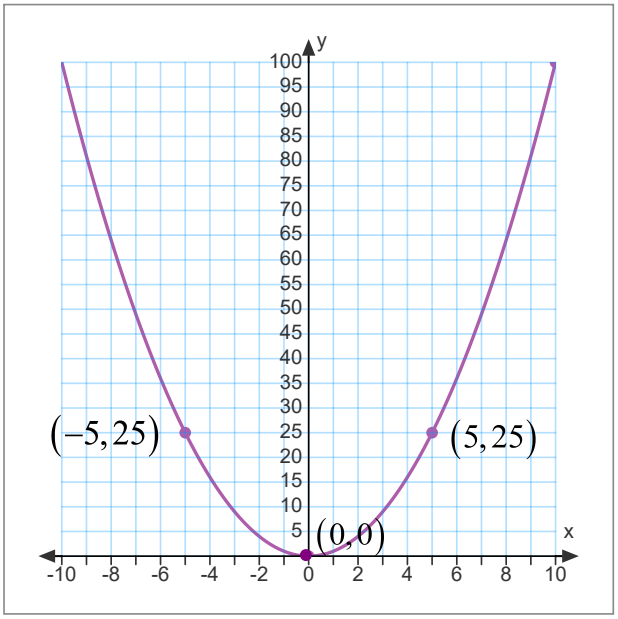
$$b = 1$$

$$h = 0$$

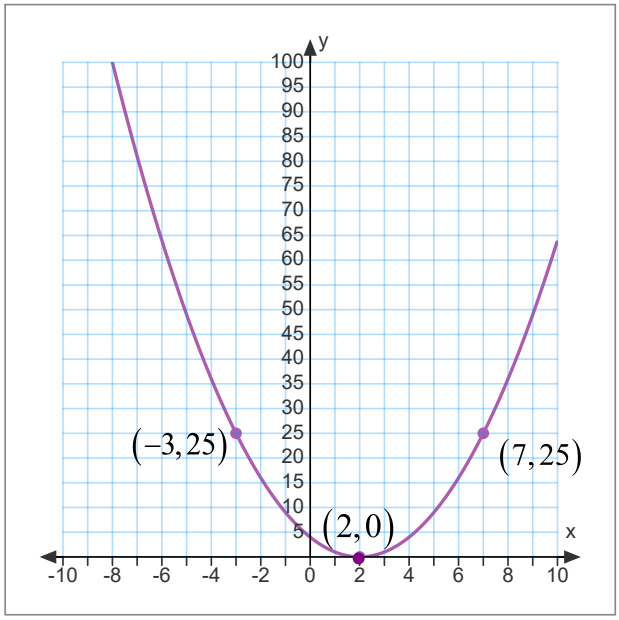
$$k = 0$$

Parameter h

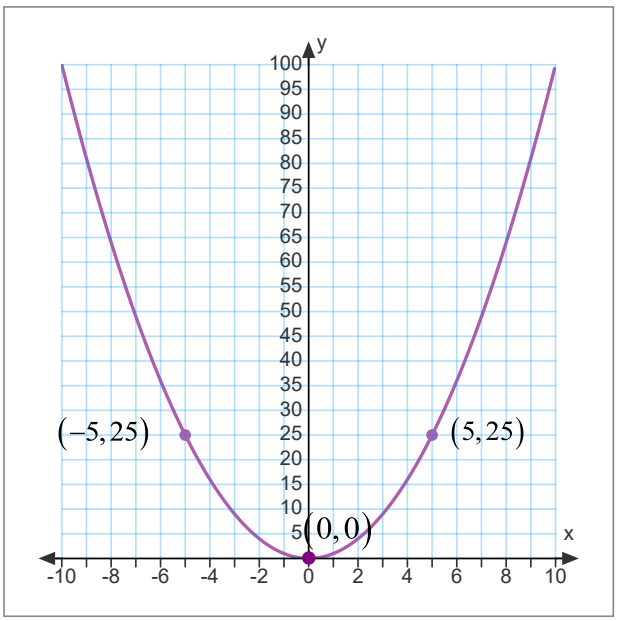
basic $y = x^2$ $(h = 0)$



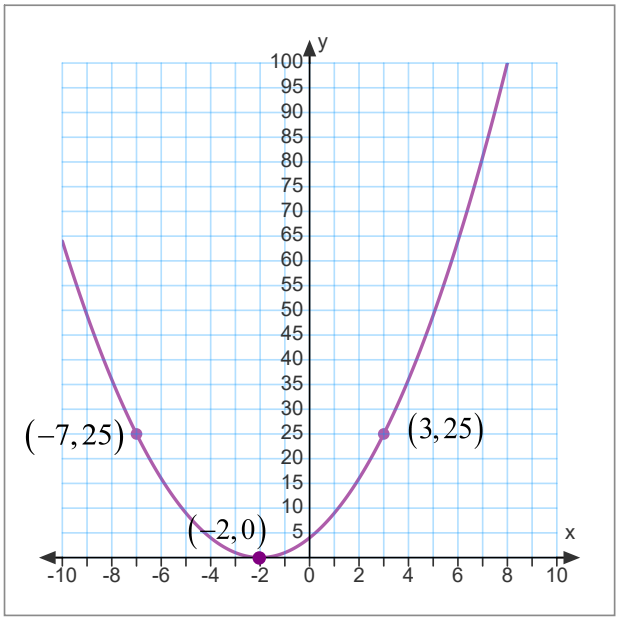
$y = (x-2)^2$ $(h = 2)$



$y = x^2$



$y = (x+2)^2$ (h = -2)



Parameter h

Summary:

Parameter h causes a translation or shift of the function to the left or to the right h units.

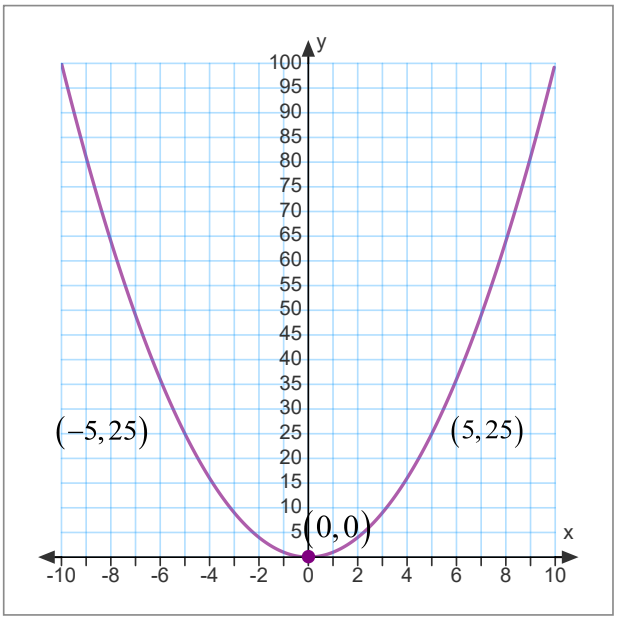
$h > 0$ shift to the right

$h < 0$ shift to the left

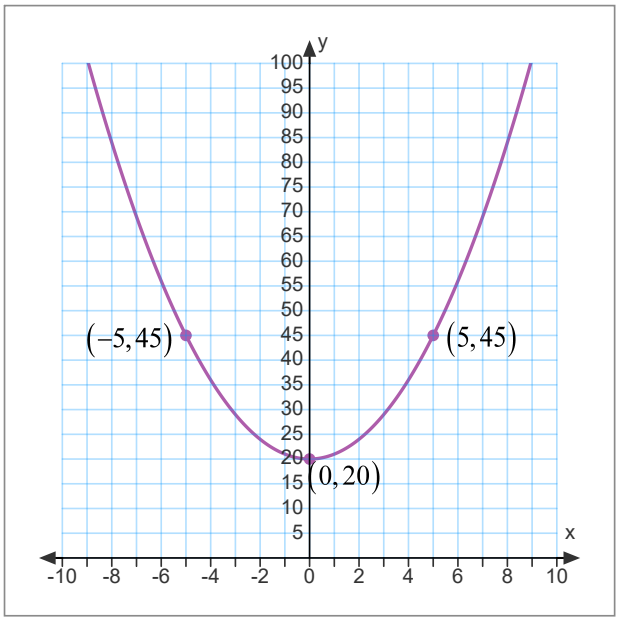
The rule or equation is written $(x - h)$.

Parameter k

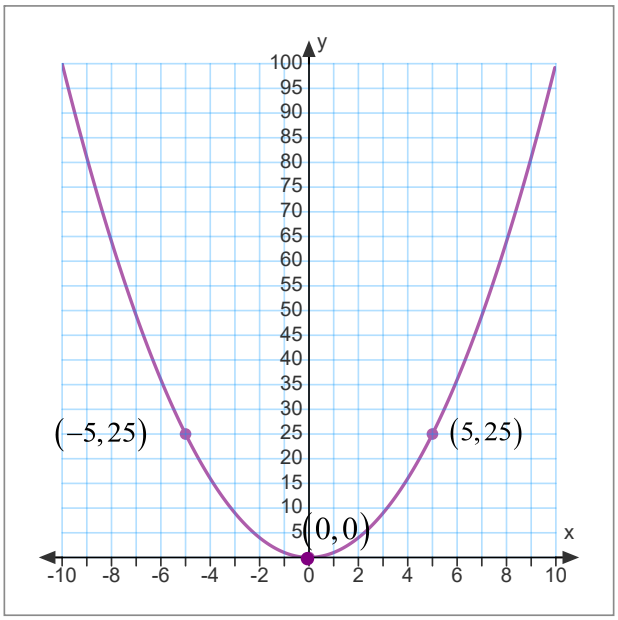
$y = x^2$ $(k = 0)$



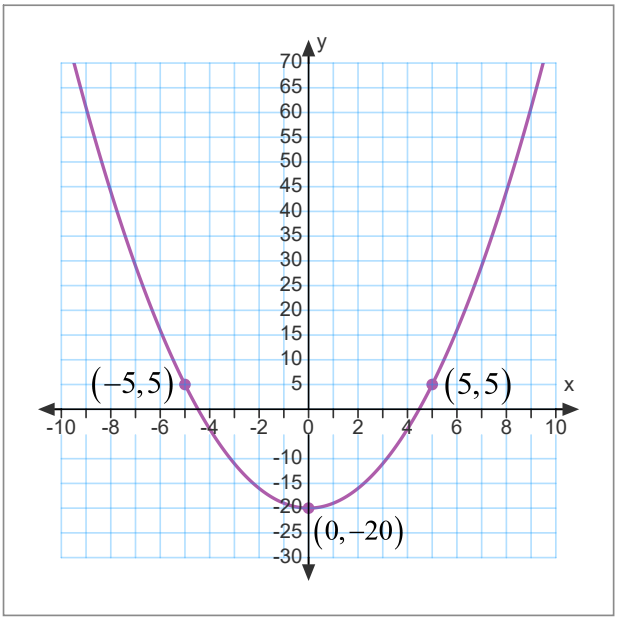
$y = x^2 + 20$ $(k = 20)$



$y = x^2$ $(k = 0)$



$y = x^2 - 20$ $(k = -20)$



Parameter k

Summary:

Parameter k causes a translation or shift of the function up or down k units.

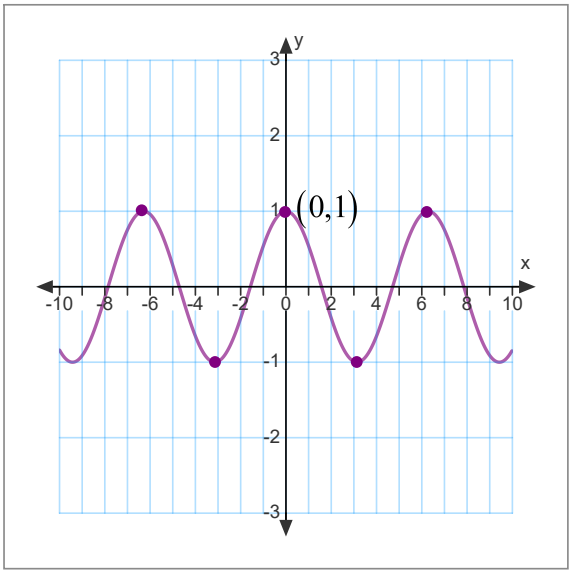
$k > 0$ shift up

$k < 0$ shift down

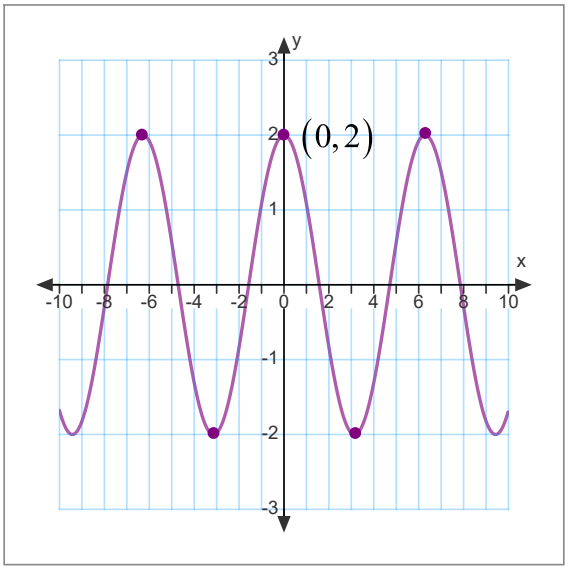
Parameter a

In a basic function $a = 1$.

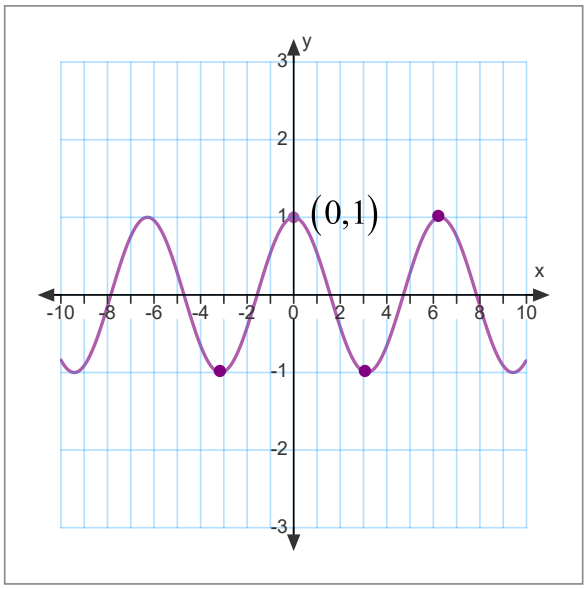
$y = \cos x$



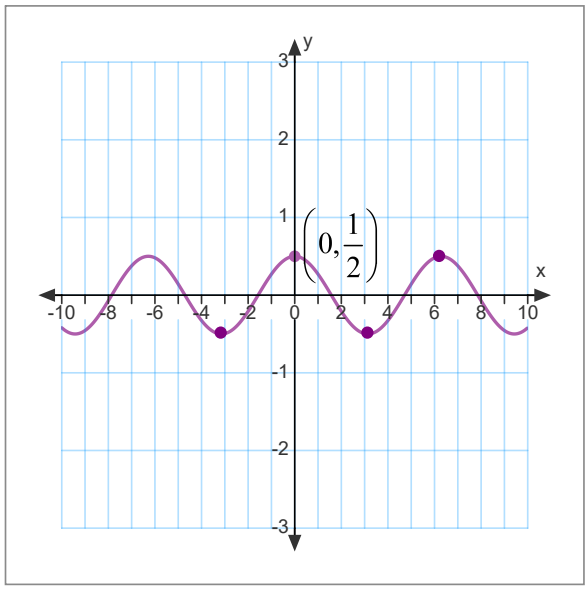
$y = 2\cos x$ $(a = 2)$



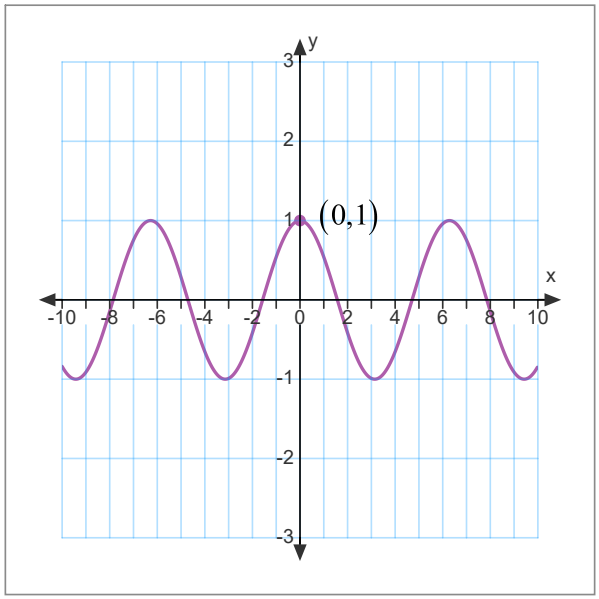
$y = \cos x$



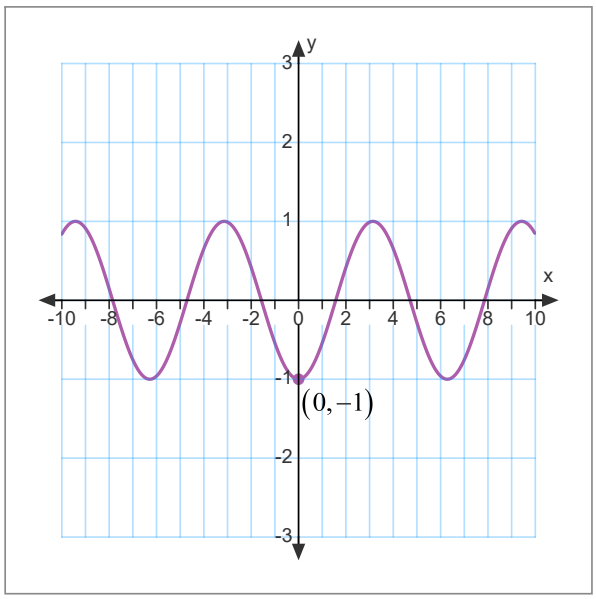
$y = \frac{1}{2}\cos x \quad \left(a = \frac{1}{2}\right)$



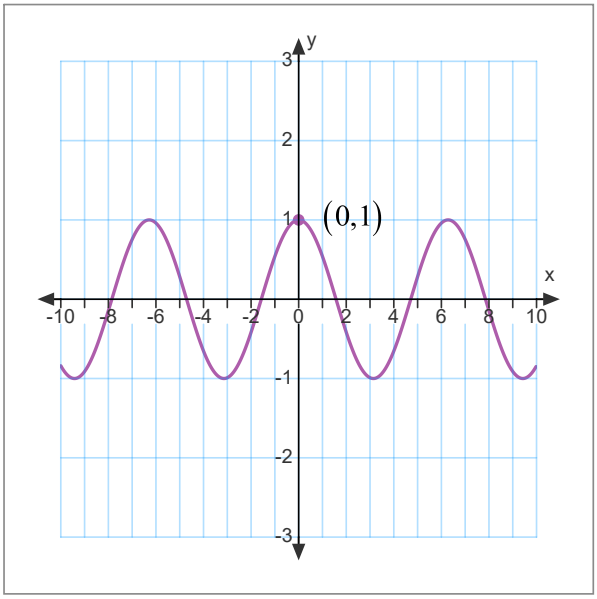
$y = \cos x$



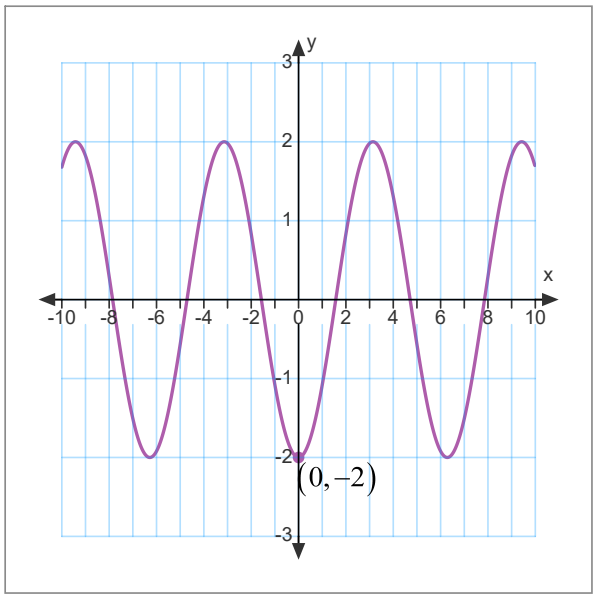
$y = -\cos x$



$y = \cos x$



$y = -2\cos x$



Parameter a (basic function $a = 1$.)

Parameter a affects a function's relationship with the x-axis.

not looking at sign looking @ size ⇒ 2 or -2 mean the same thing

$|a| > 1$ the function moves away from the x-axis. (vertical stretch)

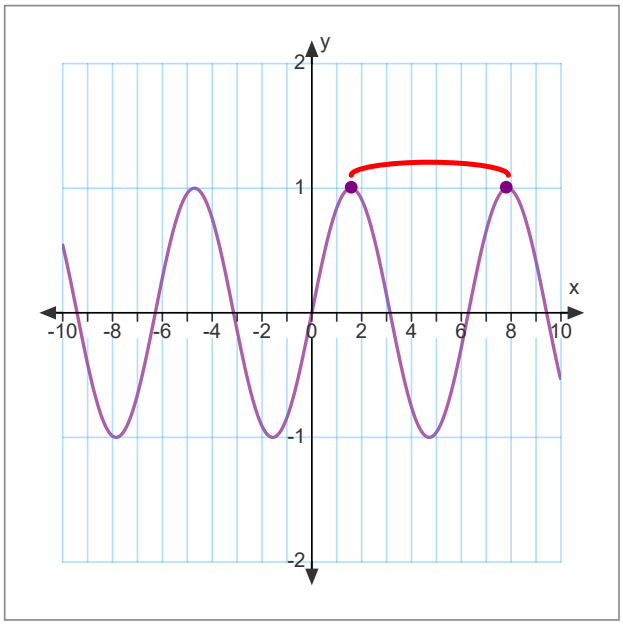
0.5 or -0.5

$|a| < 1$ the function moves towards the x-axis. (vertical compression)

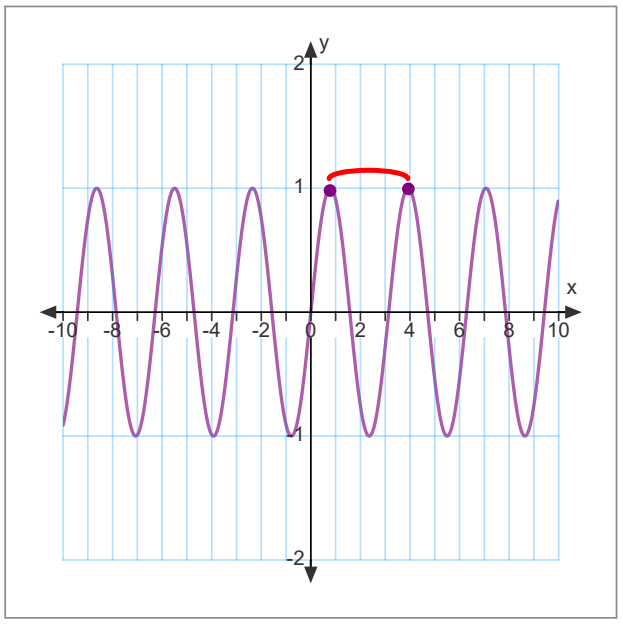
$a < 0$ the function is reflected about the x-axis.

Parameter b (basic function $b = 1$)

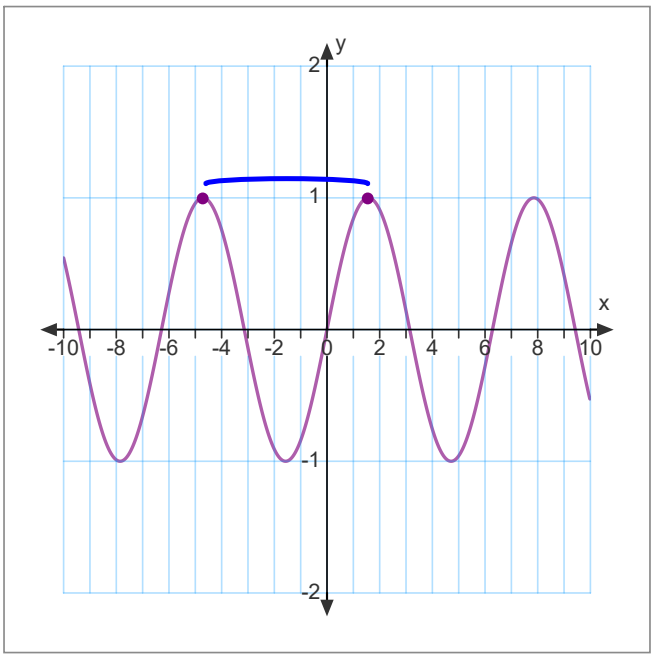
$y = \sin x$



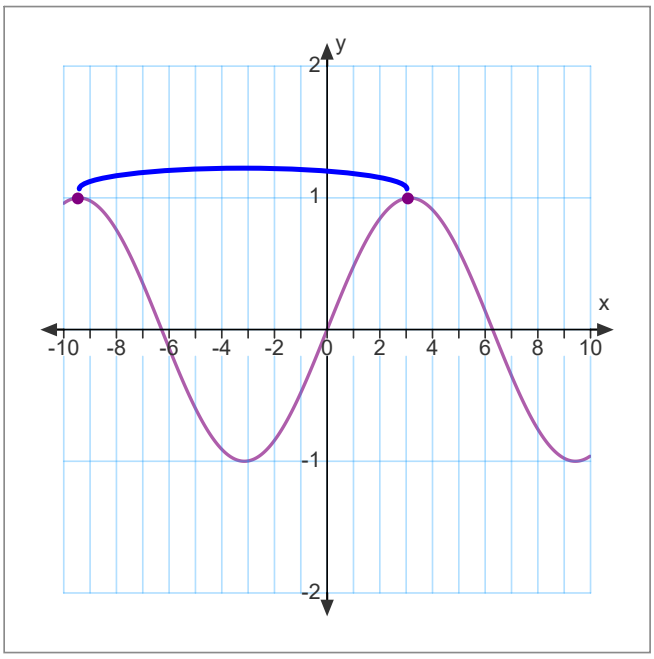
$y = \sin(2x)$ $(b = 2)$



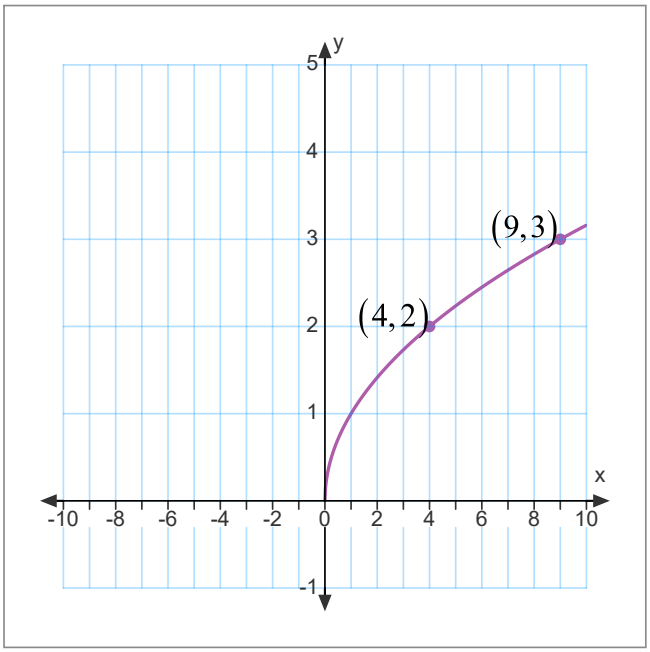
$y = \sin x$



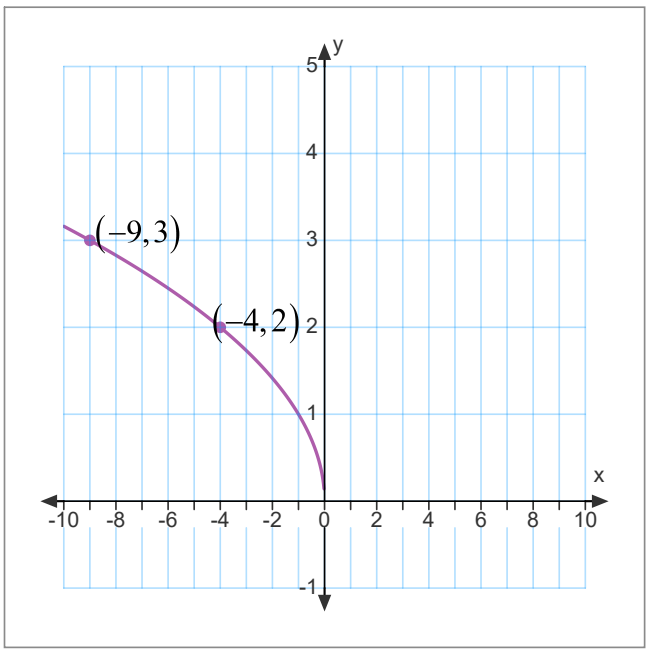
$y = \sin\left(\frac{1}{2}x\right)$



$y = \sqrt{x}$



$y = \sqrt{-x}$



Parameter b (basic function: $b = 1$)

Parameter b affects a function's relationship with the y-axis.

+3 ; -3

$|b| > 1$ the function moves towards the y-axis (horizontal compression).

1/3 & -1/3

$|b| < 1$ the function moves away from the y-axis (horizontal stretch).

$b < 0$ the function is reflected about the y-axis.

Example of a function

Basic

$y = \sqrt{x}$

$a = 1$

$b = 1$

$h = 0$

$k = 0$

Transformed (with parameters)

$y = 2\sqrt{-4(x-6)} - 8$

x - h

$a = 2$

$b = -4$

$h = 6$

$k = -8$