



Perth Academy

Mathematics Department

Higher

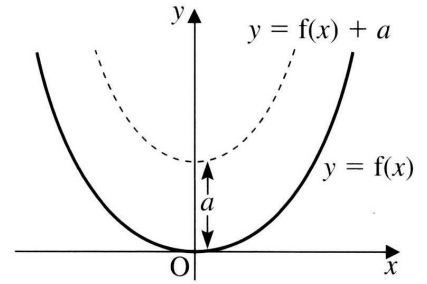
Key Points

Graphs of Functions

Graphs of Functions

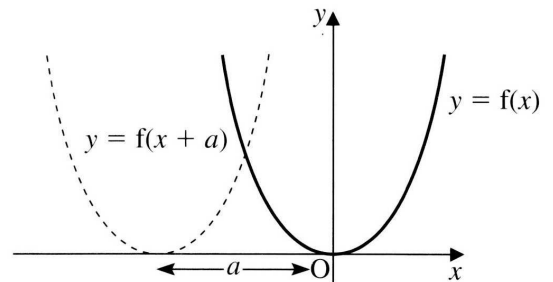
- 1** To obtain the graph of $y = f(x) + a$,
slide $y = f(x)$ **vertically**

upwards for $a > 0$
downwards for $a < 0$.

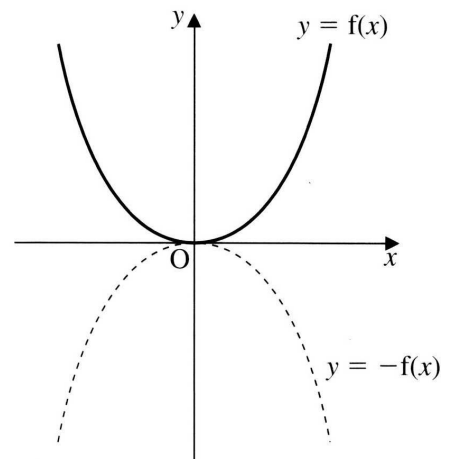


- 2** To obtain the graph of $y = f(x + a)$,
slide $y = f(x)$ **horizontally**

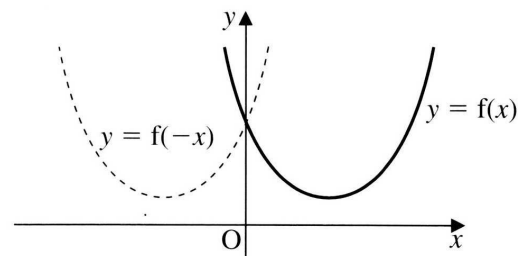
to the left for $a > 0$
to the right for $a < 0$.



- 3** To obtain the graph of $y = -f(x)$,
reflect $y = f(x)$ **in the x-axis**.

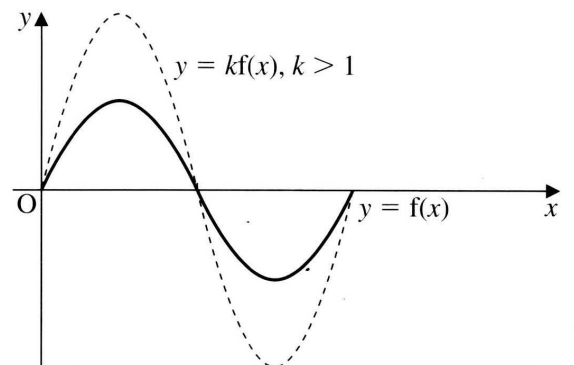


- 4** To obtain the graph of $y = f(-x)$,
reflect $y = f(x)$ **in the y-axis**.



- 5** To obtain the graph of $y = kf(x)$,
stretch or **compress** $y = f(x)$
vertically by a factor of k :

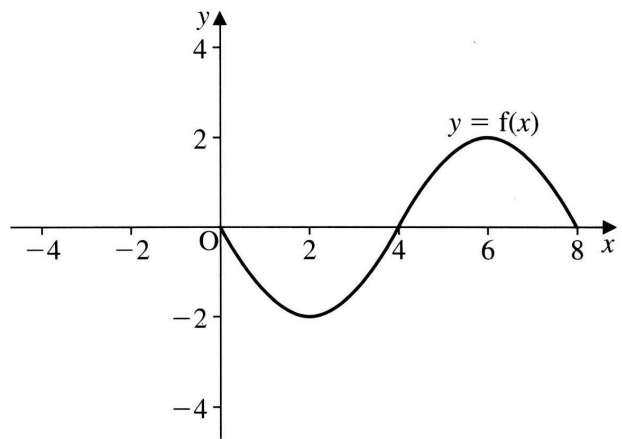
stretch for $k > 1$
compress for $k < 1$.



Example 1

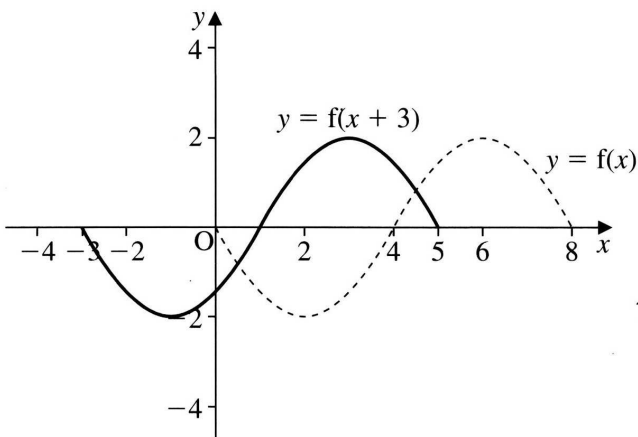
The diagram shows part of the graph of $y = f(x)$.

- (a) Make a sketch of $y = f(x)$ and on the same diagram draw the graph of $y = f(x + 3)$.
- (b) Make a second sketch of $y = f(x)$ and on the same diagram draw the graph of $y = 2f(x)$.

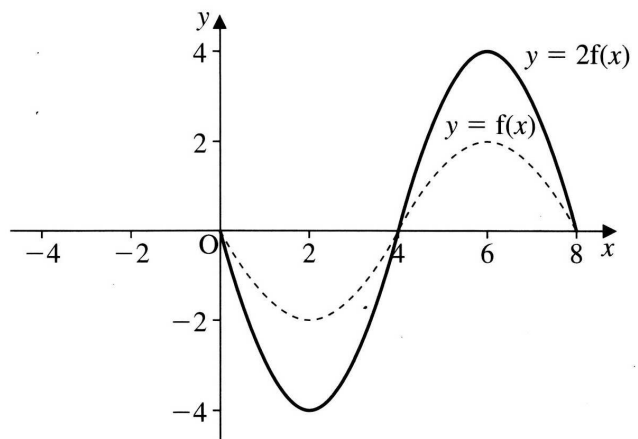


Solution

- (a) Slide the graph horizontally 3 units to the left

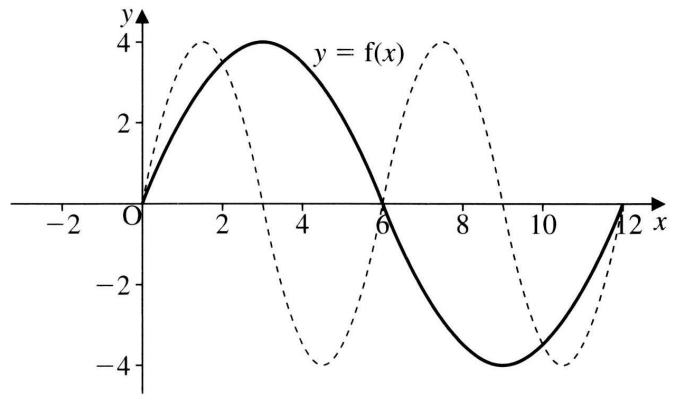


- (b) Stretch the graph vertically by a factor of 2

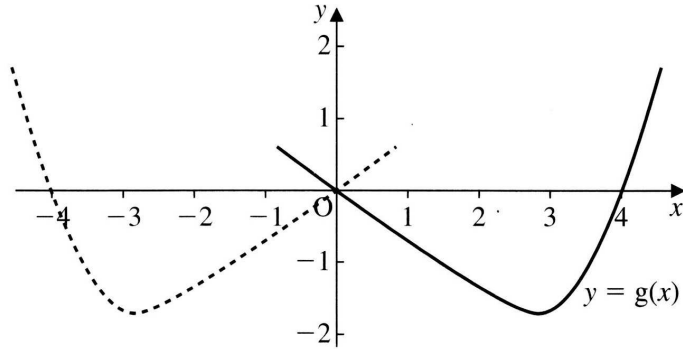


Example 2

- (a) The diagram shows part of the graph of $y = f(x)$ and, shown by a dotted curve, the graph of a related function. Write down an equation for the related function.



- (b) The diagram shows part of the graph of $y = g(x)$ and, shown by a dotted curve, the graph of a related function. Write down an equation for the related function.



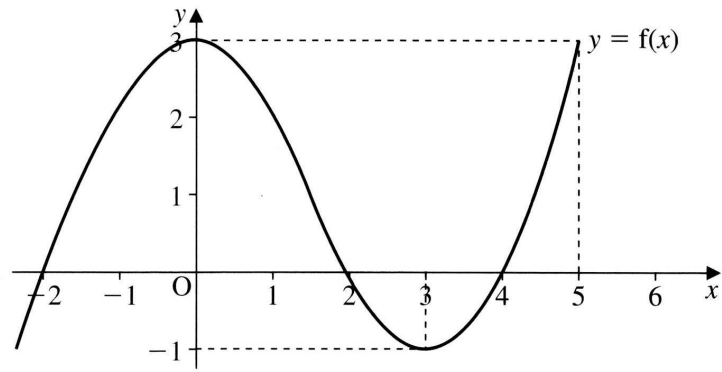
Solution

- (a) $y = f(x)$ is compressed by a factor of 2 so the related function is $y = f(2x)$.
- (b) $y = g(x)$ is reflected in the y -axis so the related function is $y = g(-x)$.

Example 3

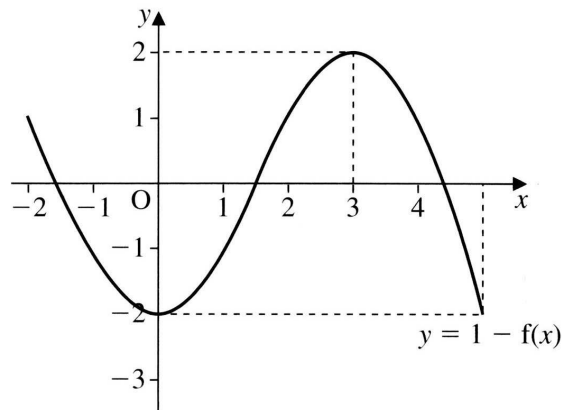
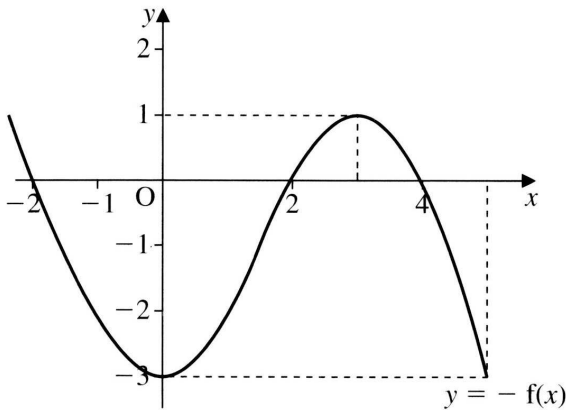
The diagram shows part of the graph of $y = f(x)$.

Sketch the graph of $y = 1 - f(x)$.



Solution

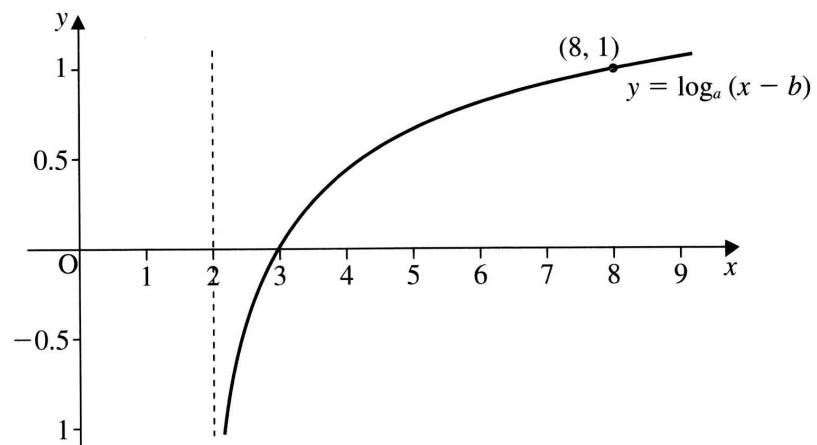
Sketch $y = -f(x)$ by reflecting $y = f(x)$ in the x -axis. Slide up 1 unit to give $y = 1 - f(x)$.



Example 4

The diagram shows part of the graph of a function of the form $y = \log_a(x - b)$.

Find the values of a and b



Solution

Since the graph passes through $(3, 0)$ the graph of $y = \log_a x$ has been moved horizontally to the right by 2 units. So $b = 2$.

The point $(8, 1)$ is 2 units to the right of $(6, 1)$ so $y = \log_a x$ passes through $(6, 1)$.

Hence $a = 6$.

The graph of the function is therefore $y = \log_6(x - 2)$.