



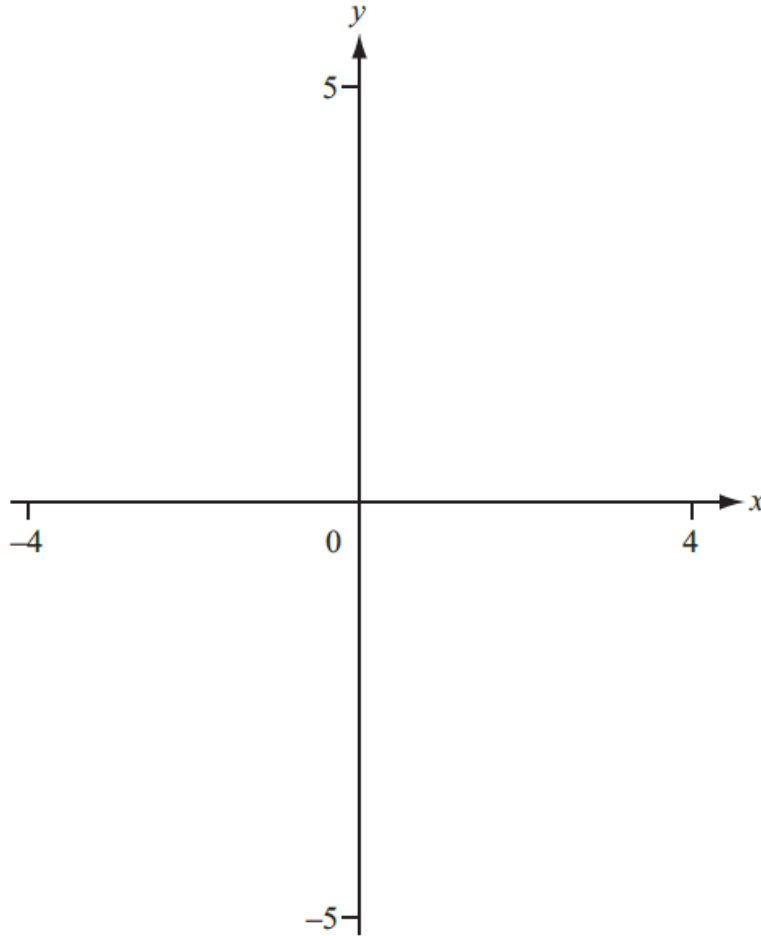
3 – Functions

Student name: _____ Score: _____

1.

The graph of $y = f(x)$ where $f(x) = ax^2 + bx + 3$ crosses the x -axis at $(-3, 0)$ and $(1, 0)$.
The y coordinate of the vertex is 4.

(a) On the axes, sketch the graph of $y = f(x)$, for $-4 \leq x \leq 4$.



[2]

(b) Find the values of a and b .

$a = \dots\dots\dots$ [1]

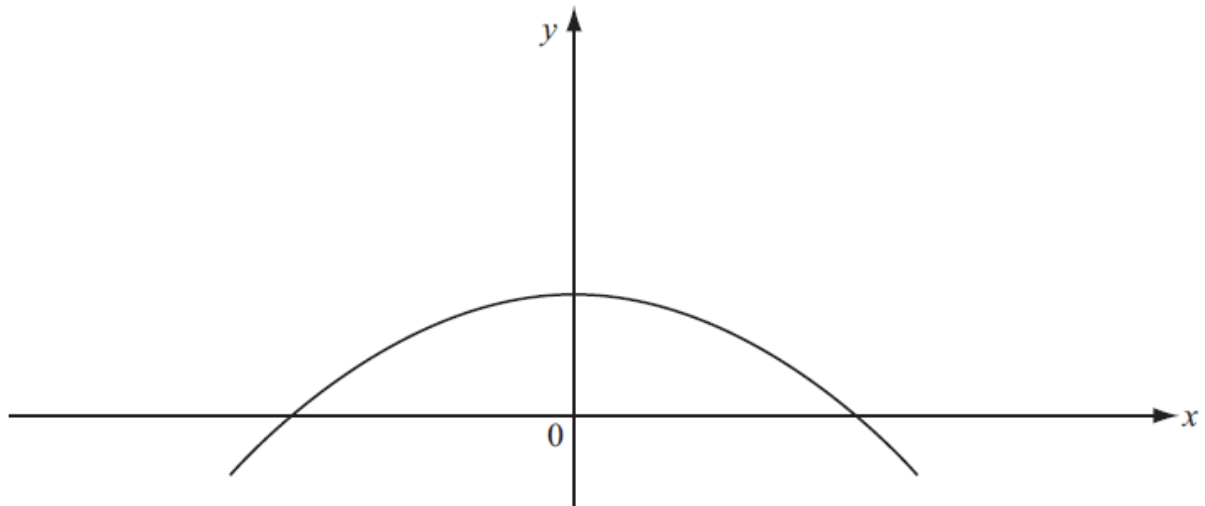
$b = \dots\dots\dots$ [1]

(c) Write down the range of $f(x)$ when the domain is \mathbb{R} .

$\dots\dots\dots$ [1]



2.



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

Using the same axes, sketch the graph of $y = 2f(x)$.

[2]

3.

$$f(x) = 3 + 2x$$

Find

(a) $f(f(-4))$,

..... [2]

(b) $f^{-1}(x)$.

..... [2]

4.

$$f(x) = x + 3 \quad \text{and} \quad g(x) = \frac{12}{x}, \quad x \neq 0$$

Find

(a) $g(f(1))$,

..... [2]

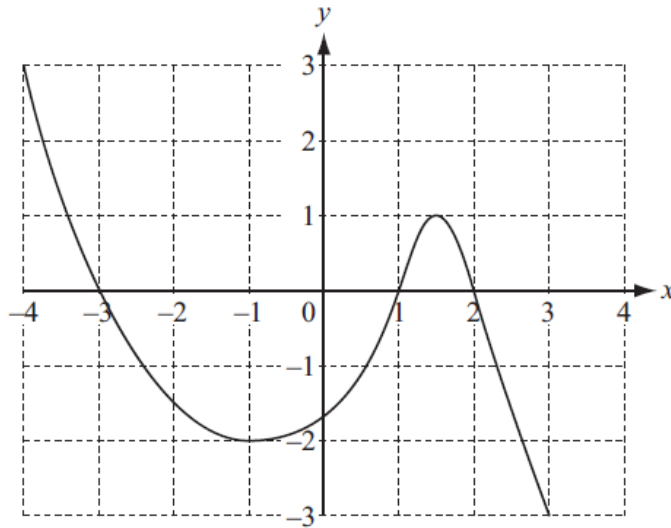
(b) $g^{-1}(x)$.

..... [1]

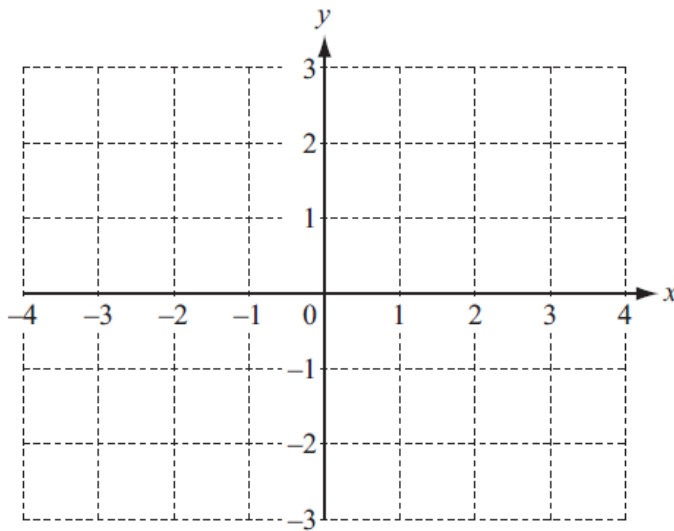


5.

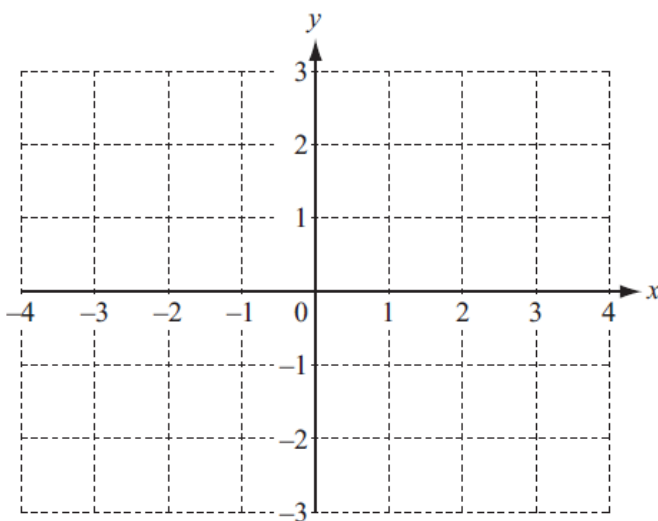
The diagram shows the graph of $y = f(x)$ for $-4 \leq x \leq 3$.



(a) On the diagram below, sketch the graph of $y = |f(x)|$.



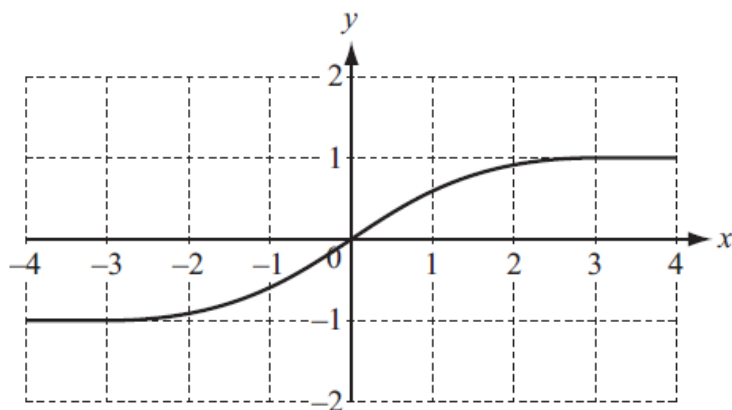
(b) On the diagram below, sketch the graph of $y = f(x - 1)$.



[3]

[2]

6. (a)

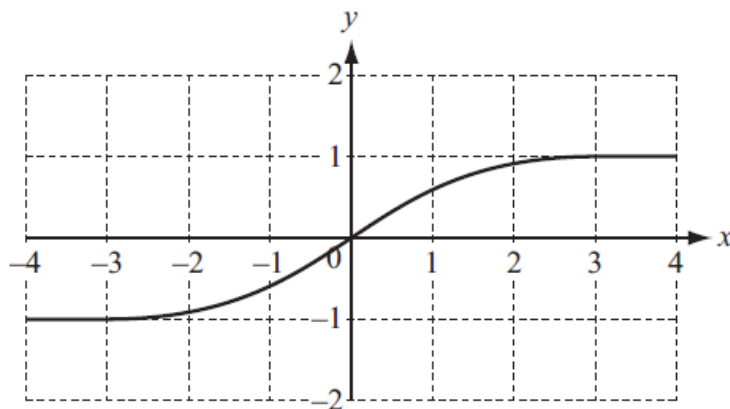


The diagram shows the graph of $y = f(x)$.

On the same diagram, sketch the graph of $y = 2f(x)$.

[1]

(b)



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

On the same diagram, sketch the graph of $y = f(x + 1)$.

[1]

7.
$$f(x) = \frac{1}{3x - 2}$$

(a) Find $f(4)$.

..... [1]

(b) Solve $f(x) = \frac{1}{4}$.

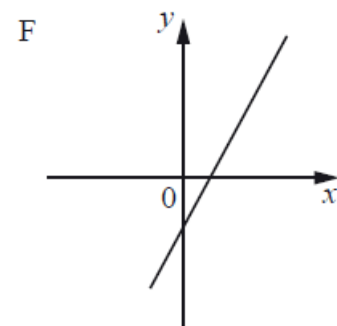
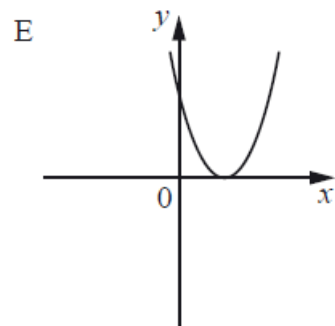
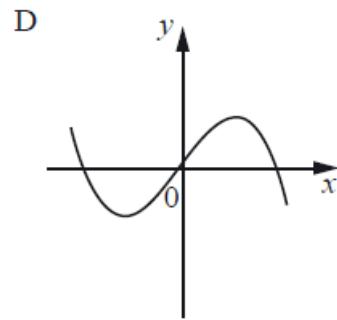
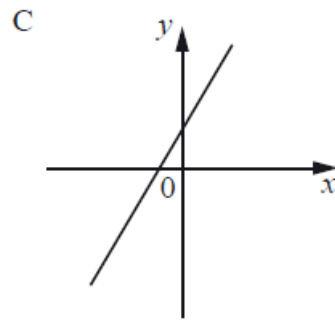
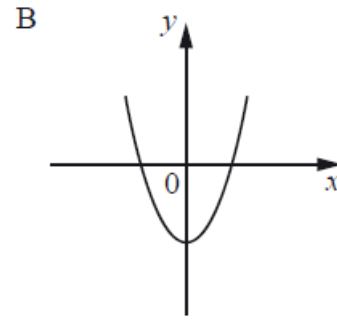
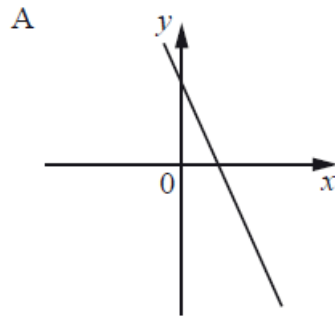
..... [2]

(c) Find $f^{-1}(x)$.

..... [3]



8. These are sketches of the graphs of six functions.



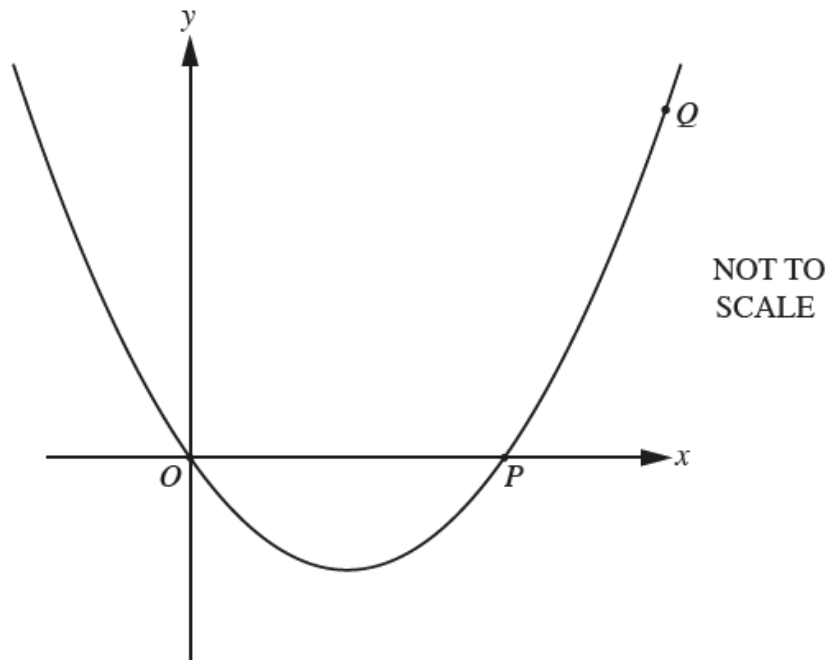
In the table below are four functions.

Write the correct letter in the table to match each function with its graph.

Function	Graph
$f(x) = 2x - 3$	
$f(x) = (x - 2)^2$	
$f(x) = 4x - x^3$	
$f(x) = 5 - 2x$	

[4]

9.



The diagram shows a sketch of the graph of $y = ax^2 + bx$.
 O is the point $(0, 0)$, P is the point $(4, 0)$ and Q is the point $(8, 96)$.

Find the value of a and the value of b .

$a = \dots\dots\dots$

$b = \dots\dots\dots$ [3]

10.

$f(x) = 2x - 1$ $g(x) = 3x^2 + 1$

Find

(a) $g(2)$,

$\dots\dots\dots$ [1]

(b) $g(f(x))$,

$\dots\dots\dots$ [2]

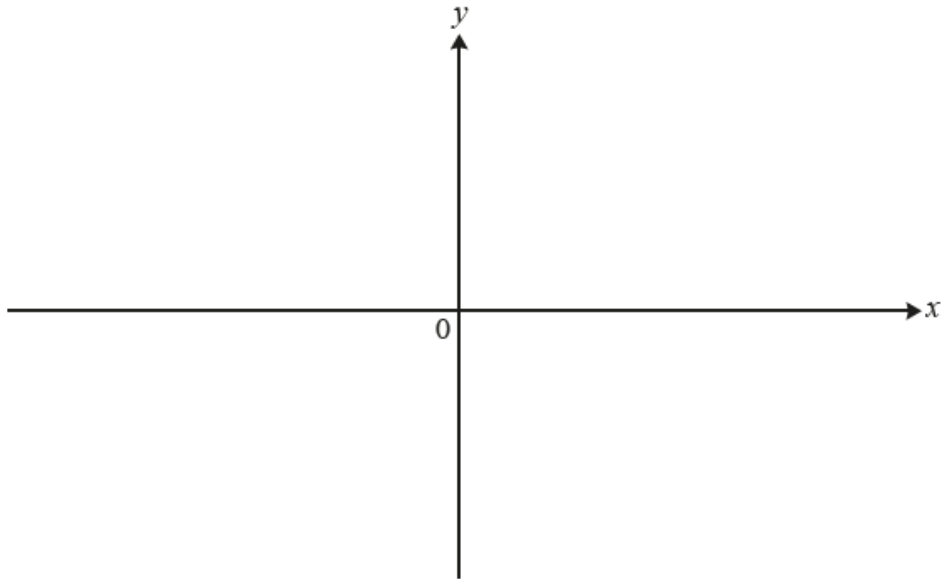
(c) the inverse function $f^{-1}(x)$.

$\dots\dots\dots$ [2]



11. (a) Sketch the graph of $y = x^3 + 2$.

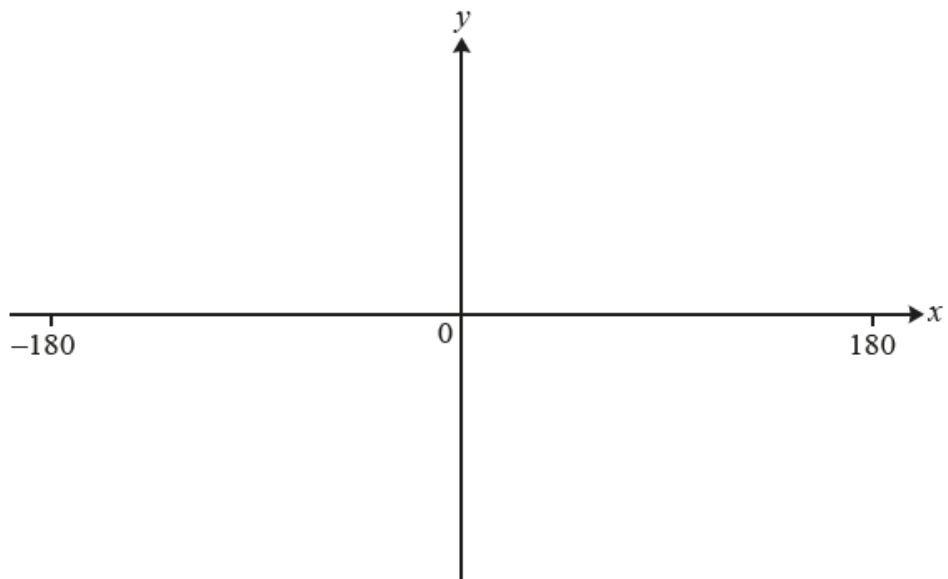
Give the co-ordinates of the point where the graph crosses the y -axis.



(..... ,) [2]

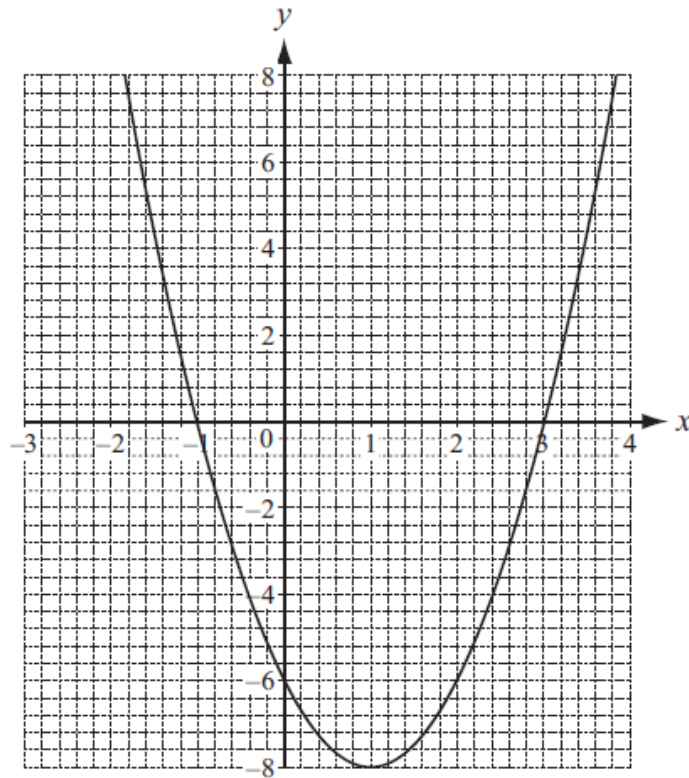
(b) Sketch the graph of $y = 2 \cos x$ for $-180^\circ \leq x \leq 180^\circ$.

Give the co-ordinates of the point where the graph crosses the y -axis.



(..... ,) [3]

12. The diagram shows part of the graph of $y = f(x)$, where $f(x) = ax^2 + bx - 6$.



Find the values of a and b .

Answer $a =$

$b =$ [3]

13. $f(x) = 3x - 1$ $g(x) = 12 - x$

Find

(a) $f(g(8))$,
..... [2]

(b) $f(g(x))$, in its simplest form,
..... [2]

(c) $g^{-1}(x)$.
..... [1]



14. Which of the following functions are shown by the graphs below?

In each case $k > 1$.

Write the correct letter under each graph.

A $y = \frac{k}{x}$

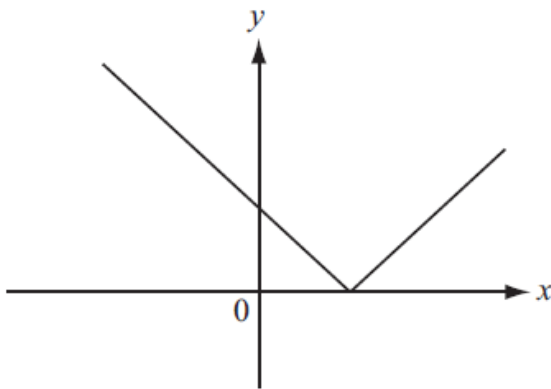
B $y = |x + k|$

C $y = k^x$

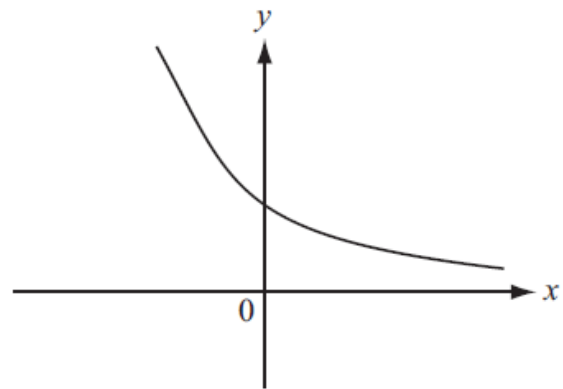
D $y = |x - k|$

E $y = k^{-x}$

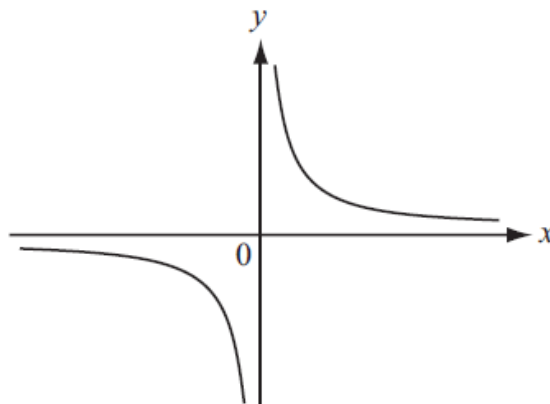
F $y = \frac{x}{k}$



.....



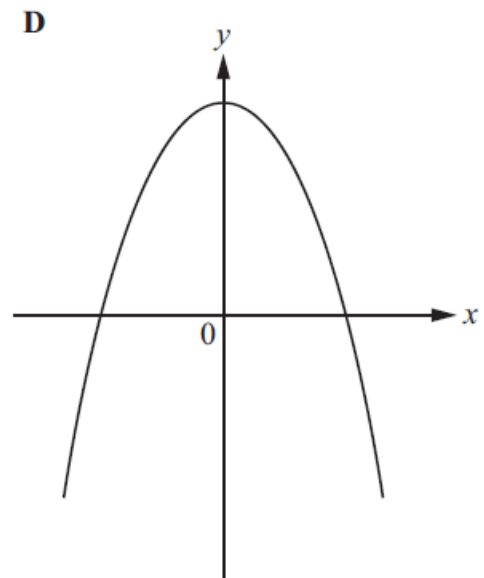
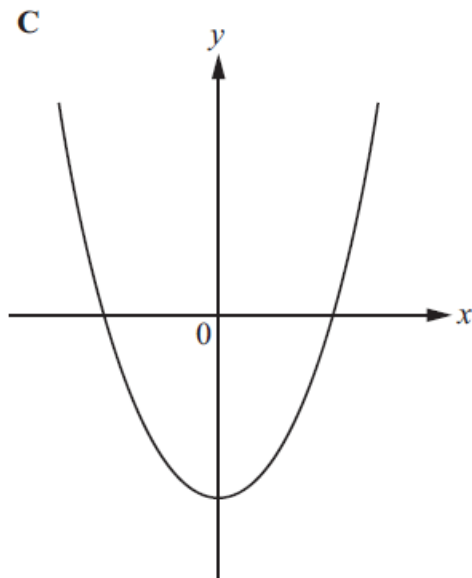
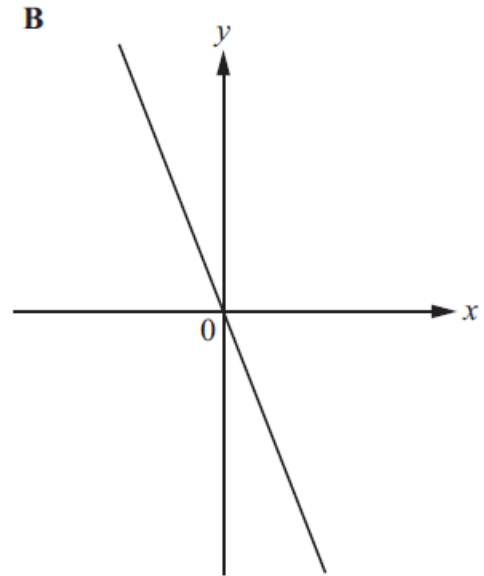
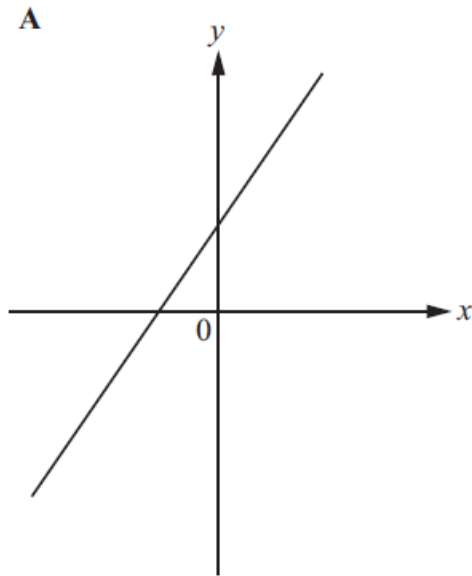
.....



.....

[3]

15. Here are the sketches of four graphs.



Each of the graphs represents one of these equations.

$y = x^2 + 3x$	$y = 3 - 2x$	$y = 3 - x^2$	$y = 2x + 3$
$y = x^2$	$y = -3x$	$y = x^2 - 3$	$y = 3x$

From the equations above, write down which one represents each graph.

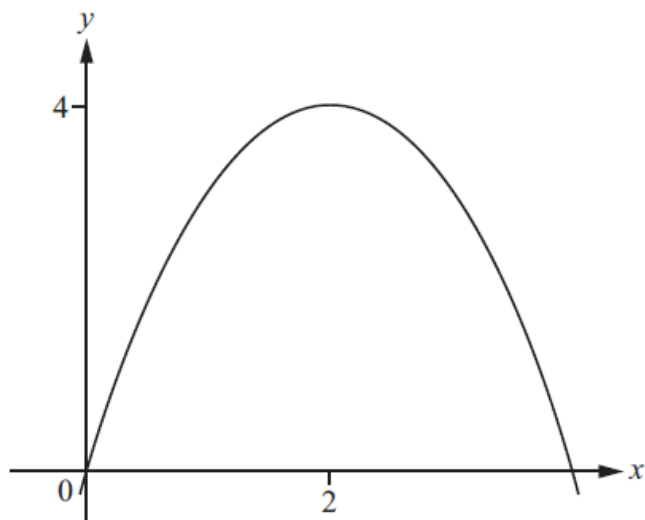
Answer Graph A $y =$

Graph B $y =$

Graph C $y =$

Graph D $y =$ [4]

16.



NOT TO SCALE

The diagram shows the graph of $y = ax^2 + bx + c$.
The graph passes through $(0, 0)$ and has a maximum point $(2, 4)$.

Find the values of a , b and c .

$a = \dots\dots\dots$
 $b = \dots\dots\dots$
 $c = \dots\dots\dots$ [3]

17.

$f(x) = 2x + 3$ $g(x) = 5 - 3x$

(a) Find $g(x)$ when $f(x) = 11$.

$\dots\dots\dots$ [2]

(b) Find and simplify an expression for $f(g(x))$.

$\dots\dots\dots$ [2]

(c) Find $g^{-1}(x)$.

$\dots\dots\dots$ [2]

18.

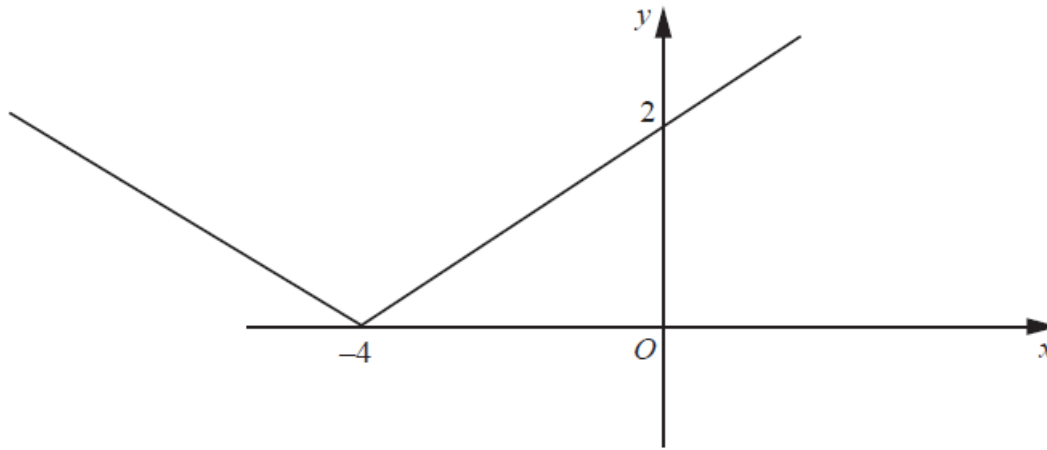
The graph of $y = (x - h)^2 + k$ has a vertex at $(2, -3)$.

Find the value of h and the value of k .

$h = \dots\dots\dots$
 $k = \dots\dots\dots$ [2]



19.



NOT TO SCALE

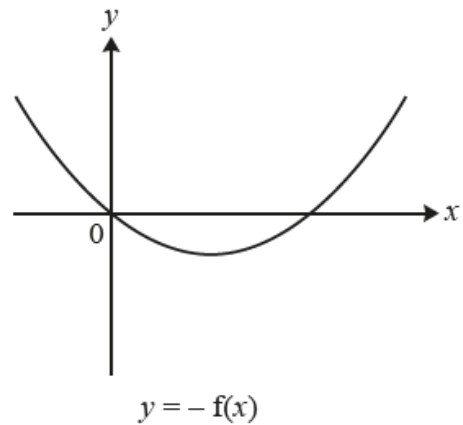
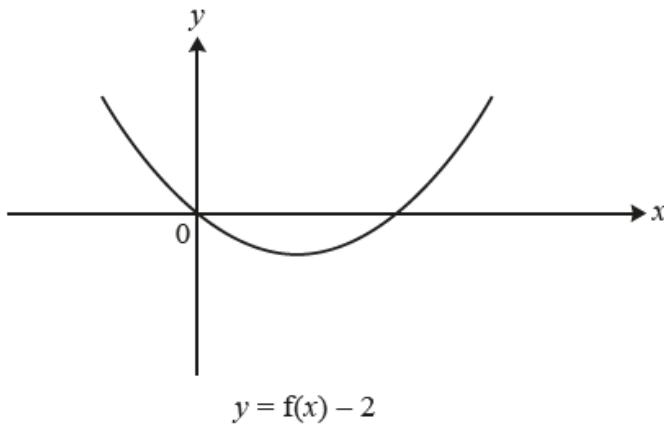
The diagram shows the graph of $y = |px + q|$.

Find the value of p and the value of q .

$p = \dots\dots\dots$
 $q = \dots\dots\dots$ [2]

20. Each diagram shows the graph of $y = f(x)$.

On each diagram, sketch the function indicated.



[2]

21. $g(x) = \frac{2x+1}{x-1}, x \neq 1$

Solve the equation $g^{-1}(x) = 2$.

$x = \dots\dots\dots$ [1]

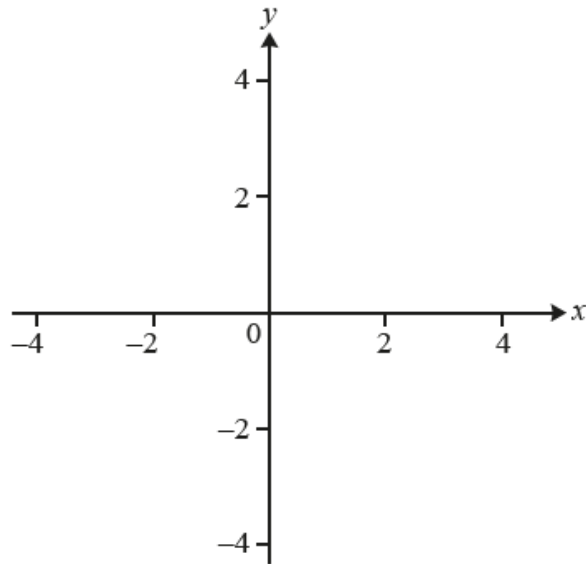
22. $f(x) = 10^x$

Find $f^{-1}(x)$.

$f^{-1}(x) = \dots\dots\dots$ [1]



23. Sketch the graph of $y = |x + 2|$.



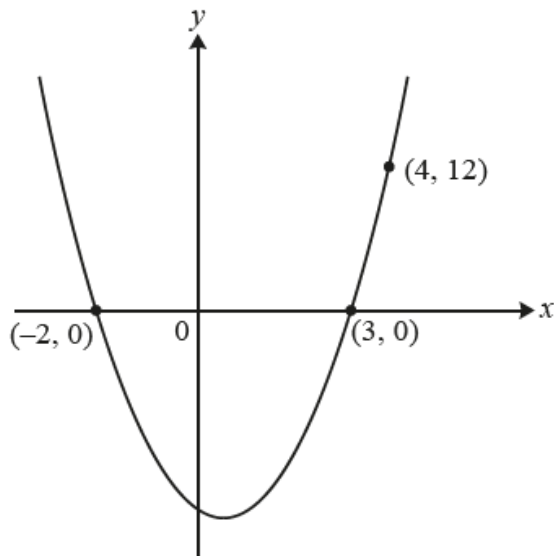
[3]

24. $f(x) = x^3 - 2$

Find the value of x when $f(x) = 25$.

$x = \dots\dots\dots$ [2]

25.



NOT TO SCALE

The equation of this curve is $y = ax^2 + bx + c$.
Find the values of a , b and c .

$a = \dots\dots\dots$
 $b = \dots\dots\dots$
 $c = \dots\dots\dots$ [3]

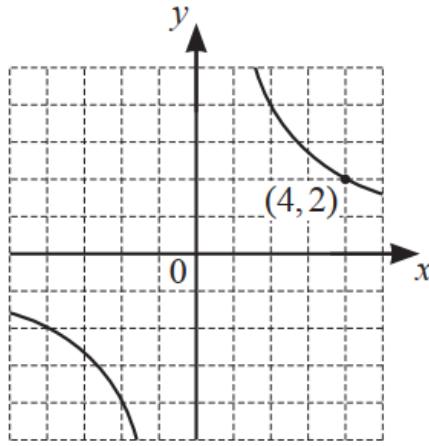
26. $f(x) = 1 - 3x$

Find the value of $f(-1)$.

$\dots\dots\dots$ [1]



27.

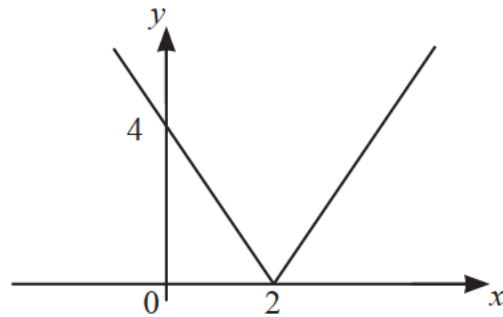


In the diagram, the graph passes through the point (4, 2).

Write down the equation of the graph.

..... [2]

28.



NOT TO SCALE

The diagram shows the graph of $y = |ax + b|$, where $a > 0$.

Find the value of a and the value of b .

$a =$

$b =$ [2]

29.

$$f(x) = |2x + 3|$$

Find the values of x when $f(x) = 15$.

..... [2]

30. $f(x) = 2x - 3$

Find the range of $f(x)$ for the domain $\{0, 1, 2\}$.

{.....} [1]

31. $f(x) = |2x - 7|$ for all real x .

(a) Find $f(2)$.

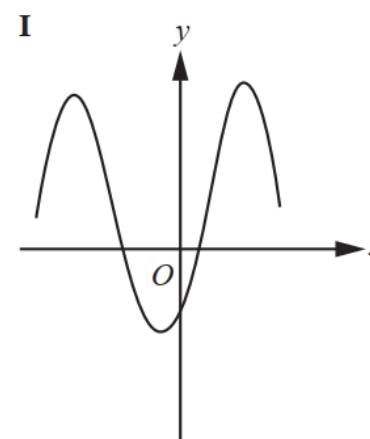
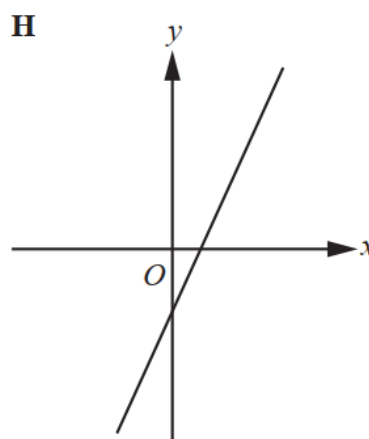
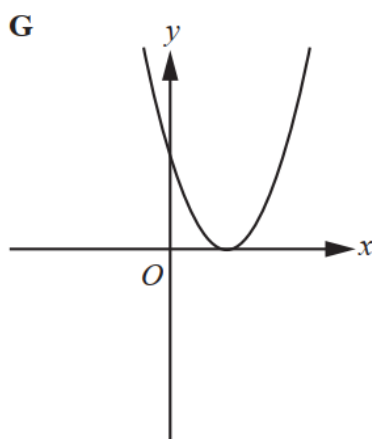
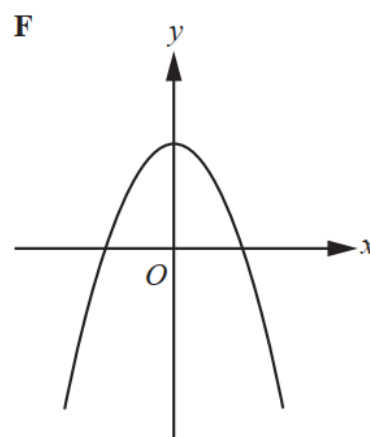
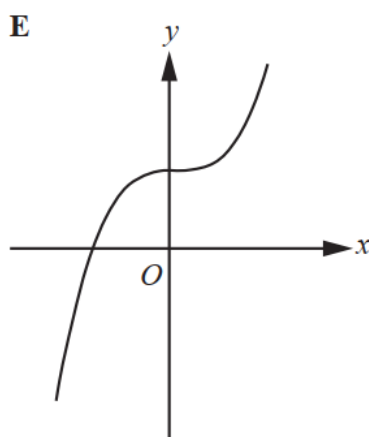
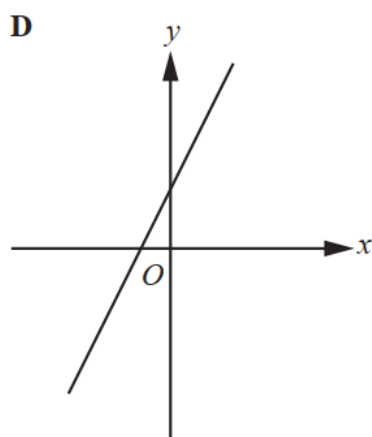
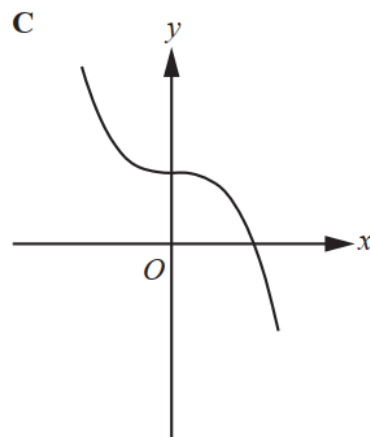
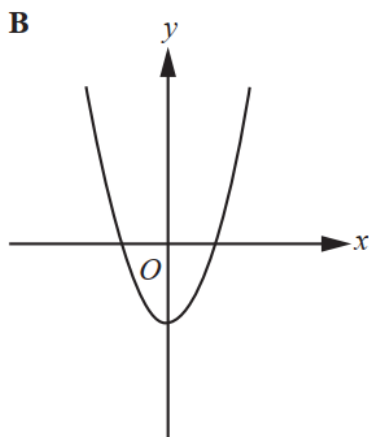
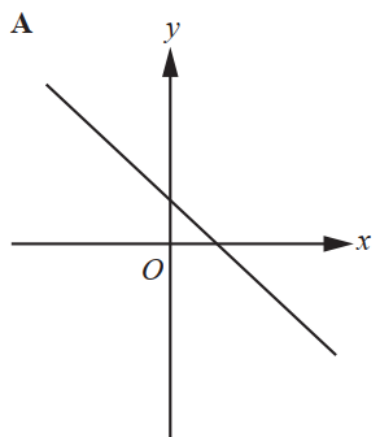
..... [1]

(b) Write down the range of $f(x)$.

..... [1]



32. The diagram shows nine sketch graphs.



Write the letter of the graph which shows each of these functions.

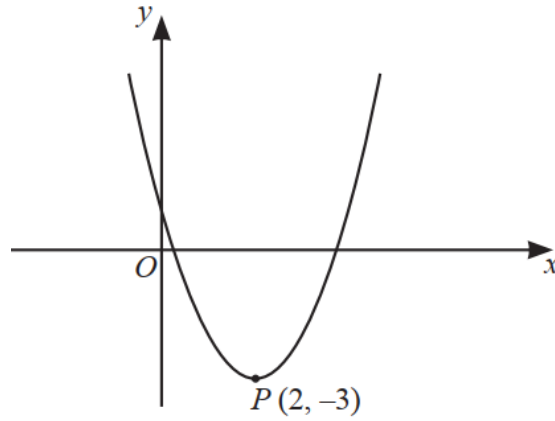
$f(x) = 2x - 3$ Graph

$f(x) = x^2 - 3$ Graph

$f(x) = 3 - x^3$ Graph

$f(x) = (x - 3)^2$ Graph [4]

33.



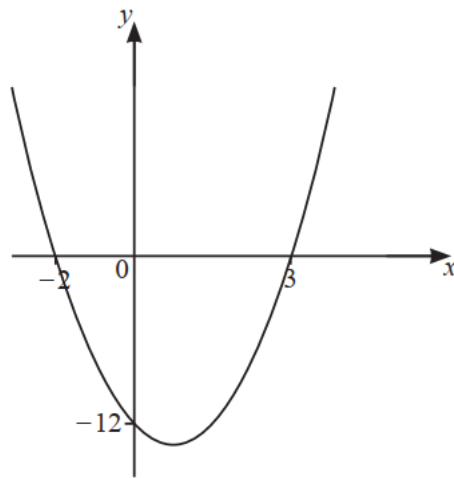
NOT TO SCALE

The diagram shows a sketch of the graph $y = x^2 + bx + c$.
The minimum point is at $P(2, -3)$.

Find the value of b and the value of c .

$b = \dots\dots\dots c = \dots\dots\dots$ [3]

34.



NOT TO SCALE

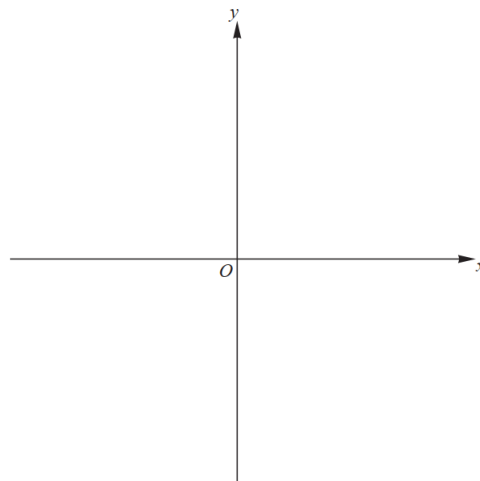
The equation of the curve is $y = ax^2 + bx - 12$.

Find the value of a and the value of b .

$a = \dots\dots\dots$

$b = \dots\dots\dots$ [3]

35. On the diagram, sketch the graph of $y = \frac{1}{x}$.



[2]



36. $f(x) = \frac{1}{2x-5}, \quad x \neq 2.5$

(a) Find $f(2)$.

..... [1]

(b) Solve $f(x) = 5$.

..... [2]

37. $f(x) = 11x+2$ $g(x) = \sin x^\circ$

(a) Find $f^{-1}(x)$.

$f^{-1}(x) =$ [2]

(b) Find $g(f(8))$.

..... [2]

