

Finding unknown coefficients

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T&T2h 19.4
Finding...



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Functions

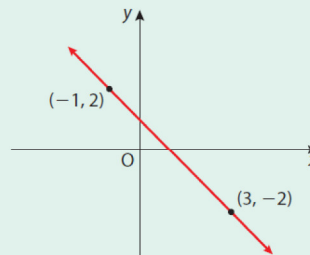
chapter
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Section 19.4 Finding coefficients of functions

Example 1

The given diagram shows part of the graph of the function $y = ax + b$.
Find the values of a and b .



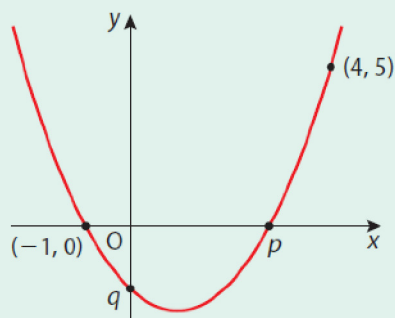
Example 2

The graph of the quadratic function

$f(x) = x^2 + bx + c$ is shown.

Find the values of b and c .

Hence write down the coordinates of p and q .



Exercise 19.4

$$f(x) = y$$

1. $f(x) = 3x + k$ is a function.

If $f(4) = 10$, find the value of k .

$x = 4$
 $y = 10$ } sub in to given function

$$f(x) \\ 10 = 3(4) + k$$

$$10 = 12 + k$$

$$\begin{array}{l|l} -12 & -2 = k \\ \hline & \end{array} \quad \begin{array}{l|l} & -12 \\ \hline & \end{array}$$

$$\begin{array}{l} \text{verify} \\ \hline 3(4) - 2 = 10 \\ 12 - 2 = 10 \\ 10 = 10 \end{array}$$

2. If $(1, 5)$ is a couple of the function $f(x) = kx + 4$, find the value of k .

3. $f(x) = ax - 6$ is a function.

If $f(2) = -2$, find the value of a .

4. $f: x \rightarrow x^2 - 2x + k$ is a function.

If $(1, 2)$ is a couple of the function, find the value of k .

5. $(-3, 2)$ is a point on the line $y = ax + 11$. Find the value of a .

6. $f(x) = kx^2 + 3$ is a function.

If $(-1, -1)$ is a couple of this function, find the value of k .

7. The graph of the linear function

$$f(x) = ax + b$$

is shown. Find the values of a and b .

① $(0, 4)$ $x=0$
 $y=4$

$$4 = a(0) + b$$

$$4 = b$$

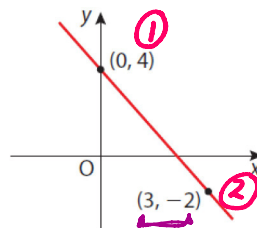
② $(3, -2)$ $x=3$
 $y=-2$

$$-2 = a(3) + 4$$

$$-2 = 3a + 4$$

$$\begin{array}{r|l} -4 & -6 = 3a \\ \div 3 & -2 = a \end{array}$$

$f(x)$



Note: Point (x, y)

sub the value for x into the function (x part)
Put the function equal to the y value

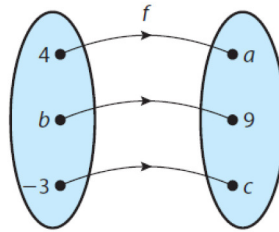
$$f(x) = ax + b$$

$$a = -2 \quad b = 4$$

$$f(x) = -2x + 4$$

8. A function f is defined as $f: x \rightarrow 2x - 1$.

If the mapping diagram on the right represents f , find the values of a , b and c .



9. $g: x \rightarrow ax^2 + bx + 1$ defines a function.

If $g(1) = 0$ and $g(2) = 3$, write down two equations in a and b .
Solve these equations to find the values of a and b .

$a > 0$ $-a < 0$

① $x=1$ $y=0$

$$0 = a(1)^2 + b(1) + 1$$

$$0 = a + b + 1$$

$$a + b + 1 = 0$$

$$-1 \mid a + b = -1 \mid -1$$

② $x=2$ $y=3$

$$3 = a(2)^2 + b(2) + 1$$

$$3 = 4a + 2b + 1$$

$$4a + 2b + 1 = 3$$

$$-1 \mid 4a + 2b = 2 \mid -1$$

Simultaneous Equations

$$a + b = -1$$

$$4a + 2b = 2$$

Solve for a and b

10. A function is defined by $f: x \rightarrow ax^2 + bx + 1$.

If $f(1) = 0$ and $f(-1) = 0$, find the value of a and the value of b .

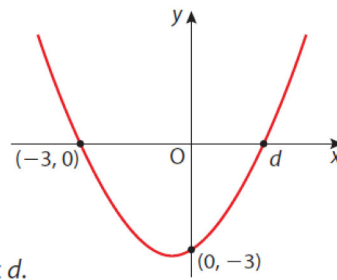
11. $f: x \rightarrow x^2 + px + q$ defines a function.

Given that $f(3) = 4$ and $f(-1) = 4$, find the values of p and q .

Using these values for p and q , solve the equation $x^2 + px + q = 0$.

12. The function $f(x) = x^2 + bx + c$ is graphed on the right.

- (i) Use $f(0)$ to find the value of c .
- (ii) Use the graph to find another equation in b and c . Use this equation and the value for c found in (i) to find the value of b .
- (iii) Using these values for b and c , solve the equation $x^2 + bx + c = 0$ to find the coordinates of the point d .



13. Functions f and g are defined as follows:

$f: x \rightarrow x^2 + 1$ and $g: x \rightarrow ax + b$, where a and b are constants.

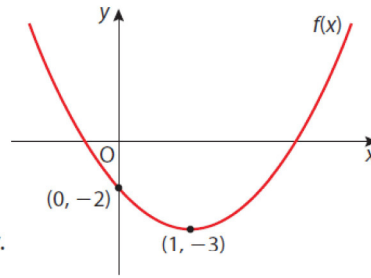
If $f(0) = g(0)$ and $g(2) = 15$, find the values of a and b .

14. The diagram shows part of the graph of the function

$$f: x \rightarrow x^2 + bx + c.$$

The named couples are elements of the function.

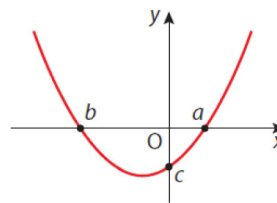
- (i) Find the values of b and c .
- (ii) If $(2, y)$ is a point on the graph, find the value of y .



15. The curve on the right is the graph of the function

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

Find the coordinates of the points a , b and c .



16. $f(x) = 2x^2$ and $g(x) = 3x - 1$ are two functions.

Find (i) $f(3)$ (ii) $g(1)$ (iii) $g\left(\frac{1}{3}\right)$.

If $f(3) = kg(1)$, find k .

17. Given that $f(x) = 3^x$, find

(i) $f(4)$ (ii) $f(-2)$ (iii) $f\left(\frac{1}{2}\right)$ (iv) the value of x for which $f(x) = \frac{\sqrt{3}}{3}$.