



1 $f(x) = 2x + 3$

Work out

a. $f(4)$

b. $f(-2)$

(2 marks)

a.)

$$\begin{aligned} f(4) &= 2 \times 4 + 3 \\ &= 8 + 3 \end{aligned}$$

11

b.)

$$\begin{aligned} f(-2) &= 2 \times (-2) + 3 \\ &= -4 + 3 \end{aligned}$$

-1

2 $f(x) = 3x - 4$ $g(x) = x^2$

a. Find $f(5)$

b. Find $gf(2)$

(3 marks)

$gf(x)$ means $g(f(x))$: apply f first, then put its output into g . The function nearest the input is done first; gf does not mean multiply g by f

a) $f(5) = 3(5) - 4 = 11$

b) $f(2) = 3(2) - 4 = 2$, then $g(2) = 2^2 = 4$

3

$$g(x) = x^2 - 5$$

- Work out $g(3)$.
- Work out $g(-4)$.
- Find the two values of x for which $g(x) = 20$.

(3 marks)

a)

$$\begin{aligned} g(3) &= 3^2 - 5 \\ &= 9 - 5 \end{aligned}$$

4

b)

$$\begin{aligned} g(-4) &= (-4)^2 - 5 \\ &= 16 - 5 \end{aligned}$$

11

c)

$$\begin{array}{rcl} x^2 - 5 & = & 20 \\ +5 & & +5 \\ \hline x^2 & = & 25 \\ \sqrt{} & & \sqrt{} \\ x & = & \pm 5 \end{array}$$

$$x = 5 \text{ or } x = -5$$

4

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

Complete the table of values.

x	-2	0	1	4
$f(x)$				

(2 marks)

$$f(-2) = 3 \times (-2) - 1 = -7$$

$$f(0) = 3 \times 0 - 1 = -1$$

$$f(1) = 3 \times 1 - 1 = 2$$

$$f(4) = 3 \times 4 - 1 = 11$$

$$-7, -1, 2, 11$$

5

$$f(x) = 2x + 5$$

- Find $f^{-1}(x)$
- Find $f^{-1}(11)$

(3 marks)

The inverse function reverses f : undo +5 by subtracting 5, then undo $\times 2$ by dividing by 2. f^{-1} means inverse function, not $1/f$

a) Write $y = 2x + 5$, swap to make x the subject: $x = \frac{y-5}{2}$, so

$$f^{-1}(x) = \frac{x-5}{2}$$

$$b) f^{-1}(11) = \frac{11-5}{2} = 3. \text{ Check: } f(3) = 11$$

6

$$f(x) = 4x + 9$$

- Solve $f(x) = -7$.
- Solve $f(x) = x$.

(4 marks)

a)

$$\begin{array}{rcl} 4x + 9 & = & -7 \\ -9 & & \\ \hline 4x & = & -16 \\ \div 4 & & \div 4 \\ \hline x & = & -4 \end{array}$$

$$x = -4$$

b)

$$\begin{array}{rcl} 4x + 9 & = & x \\ -x & & \\ \hline 3x + 9 & = & 0 \\ -9 & & \\ \hline 3x & = & -9 \\ \div 3 & & \div 3 \\ \hline x & = & -3 \end{array}$$

$$x = -3$$

7

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

- a. The output of the function is 5. Find the input.
b. The output of the function is -3. Find the input.

(3 marks)

a.)

$$\begin{array}{rcl} \frac{2x-1}{3} & = & 5 \\ \times 3 & & \\ 2x-1 & = & 15 \\ +1 & & \\ 2x & = & 16 \\ \div 2 & & \\ x & = & 8 \end{array}$$

$$x = 8$$

b.)

$$\begin{array}{rcl} \frac{2x-1}{3} & = & -3 \\ \times 3 & & \\ 2x-1 & = & -9 \\ +1 & & \\ 2x & = & -8 \\ \div 2 & & \\ x & = & -4 \end{array}$$

$$x = -4$$

8

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

Express $f(x+3)$ in the form $x^2 + bx + c$ where b and c are integers.

(3 marks)

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

$$\text{Expand: } x^2 + 6x + 9 + 2x + 6$$

$$\text{Collect terms: } x^2 + 8x + 15$$

$$x^2 + 8x + 15$$

9

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

a. Work out $f(3) + f(-1)$.b. Write $f(2x)$ in terms of x . Give your answer in its simplest form.

(4 marks)

a)

$$f(3) = 3^2 + 2 \times 3 = 15$$

$$f(-1) = (-1)^2 + 2 \times (-1) = -1$$

$$15 + (-1) = 14$$

14

b)

Replace every x with $2x$

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

$$4x^2 + 4x$$

10

$$f(x) = 3x - 4$$

a. Show that $f(x + 2) - f(x) = 6$ for every value of x .b. Solve $f(2x) = f(x + 5)$.

(4 marks)

a)

$$f(x + 2) = 3(x + 2) - 4$$

$$= 3x + 6 - 4$$

$$= 3x + 2$$

$$3x + 2 - (3x - 4) = 6$$

The difference is always 6

b)

$$f(2x) = 6x - 4$$

$$f(x + 5) = 3x + 15 - 4 = 3x + 11$$

$$6x - 4 = 3x + 11$$

 $-3x$

$$3x - 4 = 11$$

 $-3x$ $+4$

$$3x = 15$$

 $+4$ $\div 3$

$$x = 5$$

 $\div 3$

$$x = 5$$