

Non-Calculator Questions

Functions

Introduction to Functions / Domain & Range / Composite Functions / Inverse Functions

Medium (12 questions)	/58
Hard (15 questions)	/62
Very Hard (15 questions)	/47
Total Marks	/167

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Medium Questions

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

i) Find $f(-3)$.

[1]

ii) Find $gf(-3)$.

[1]

(2 marks)

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

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

(2 marks)

2

$$g(x) = 2x + 7 \quad h(x) = 3x - 8$$

i) Find $gh(x)$ in its simplest form.

[2]

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

$$g^{-1}(x) \dots\dots\dots [2]$$

(4 marks)

3 (a) $f(x) = x^2 + 1$ $g(x) = 1 - 2x$ $h(x) = \frac{1}{x}, x \neq 0$ $j(x) = 5^x$

Find the value of

i) $f(3)$,

[1]

ii) $gf(3)$.

[1]

(2 marks)

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

$g^{-1}(x) = \dots\dots\dots$

(2 marks)

(c) Find x when $h(x) = 2$.

$x = \dots\dots\dots$

(1 mark)

4 (a) $f(x) = 2x + 1$ $g(x) = x^2 + 4$

Solve the equation $f(x) = g(1)$.

$x = \dots\dots\dots$

(2 marks)

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

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

(2 marks)

(c) Find $gf(x)$ in its simplest form.

(3 marks)

5 $f(x) = 3x - 5$.

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

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

(2 marks)

6 (a) $f(x) = 2x - 3$ $g(x) = 9 - x^2$ $h(x) = 3^x$

Find

i) $f(4)$,

[1]

ii) $hg(3)$,

[2]

iii) $g(2x)$ in its simplest form,

[1]

iv) $fg(x)$, in its simplest form.

[2]

(6 marks)

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

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

(2 marks)

7 (a)	$f(x) = 7x - 2$	$g(x) = x^2 + 1$	$h(x) = 3^x$
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Find $gh(2)$.

(2 marks)

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

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

(2 marks)

8 $f(x) = 7 + 3x$.

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

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

(2 marks)

9 $f(x) = x^3$ $g(x) = 5x + 2$

i) Find $gf(x)$.

[1]

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

$g^{-1}(x) = \dots\dots\dots$ [2]

(3 marks)

10 (a) $f(x) = 3x + 4$ $g(x) = 2x - 1$ $h(x) = 3^x$

Find $g\left(\frac{1}{2}\right)$.

(1 mark)

(b) Find $fh(-1)$.

(2 marks)

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

$g^{-1}(x) = \dots\dots\dots$

(2 marks)

(d) Find $ff(x)$ in its simplest form.

(2 marks)

11 $f(x) = 2x - 3$ $g(x) = x^2 + 1$

i) Find $gg(2)$.

[2]

ii) Find $g(x + 2)$, giving your answer in its simplest form.

[2]

iii) Find x when $f(x) = 7$.

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

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

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

(8 marks)

12 (a)

$$f(x) = 3x - 2$$
$$g(x) = \frac{10}{x+2}$$

Express the inverse function f^{-1} in the form $f^{-1}(x) = \dots$

(2 marks)

(b) Find $gf(x)$
Simplify your answer.

(2 marks)

Hard Questions

1 (a) $g(x) = 2x + 3$ $h(x) = 2^x$

Find x when $gg(x) = 7$.

$x = \dots\dots\dots$

(3 marks)

(b) Find x when $h^{-1}(x) = 5$.

$x = \dots\dots\dots$

(2 marks)

2 $f(x) = 3x^2 + a$ where a is an integer. $f(-2) = 19$

Find the value of a .

$a = \dots\dots\dots$

(2 marks)

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

Find $fh(2)$.

(2 marks)

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

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

(2 marks)

(c) Simplify.

i) $f(1 - 2x)$

[2]

ii) $gf(x) - 9g(x)$

[4]

(6 marks)

4 (a) $f(x) = 4x + 3$ $g(x) = 5x - 4$

$fg(x) = 20x + p$

Find the value of p .

$p = \dots\dots\dots$

(2 marks)

(b) $h(x) = \frac{5x - 1}{3}$

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

$h^{-1}(x) = \dots\dots\dots$

(3 marks)

5 $f(x) = 7x - 4$

Find the value of x when $f(x + 2) = -11$.

$x = \dots\dots\dots$

(2 marks)

6 $f(x) = 3x - 5$ $g(x) = 2^x$

Find $fg(3)$.

(2 marks)

7 $g(x) = \frac{10}{x}, x \neq 0$.

Solve.

$$g(2x + 1) = 4$$

$x = \dots\dots\dots$

(3 marks)

8 (a)

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

$$g(x) = 9 - x^2$$

Find x when $5f(x) = 3$.

$x = \dots\dots\dots$

(2 marks)

(b) Solve the equation $gf(x) = -16$.

$x = \dots\dots\dots$ or $x = \dots\dots\dots$

(4 marks)

9 $f(x) = 2x + 3$

Find $f(1 - x)$ in its simplest form.

(2 marks)

10

$$f(x) = 7 + 3x$$

$$g(x) = x^4$$

Find the value of x when $f(x) = g(2)$.

$x = \dots\dots\dots$

(2 marks)

11 $h(x) = ax^2 + 1$

Find the value of a when $h(-2) = 21$.

$a = \dots\dots\dots$

(2 marks)

12 $f(x) = 3x + 4$.

Find $(f(x))^2$ in the form $ax^2 + bx + c$.

(2 marks)

13 (a)

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

$$g(x) = x^2 + 8$$

Calculate $ff(-3)$

(2 marks)

(b) Find

i) $g(2x)$,

[1]

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

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

(3 marks)

14

$f(x) = 8 - 3x$ $g(x) = \frac{10}{x+1}, x \neq -1$ $h(x) = 2^x$

Find

i) $hf\left(\frac{8}{3}\right)$,

[2]

ii) $gh(-2)$,

[2]

iii) $g^{-1}(x)$,

$g^{-1}(x) = \dots\dots\dots$ [3]

iv) $f^{-1}f(5)$.

[1]

(8 marks)

15 (a) $f(x) = 7 - x$ $g(x) = 4x + 2$ $h(x) = 15 - x^2$

Find $ff(2)$.

(2 marks)

(b) Find $gf(x)$ in its simplest form.

(2 marks)

(c) Find $h(2x)$ in its simplest form.

(2 marks)

Very Hard Questions

1

$$g(x) = 1 - 2x$$

Find the value of

Find $g(x)g(x) - gg(x)$, giving your answer in the form $ax^2 + bx + c$.

(4 marks)

2 $j(x) = 5^x$.

Find x when $j^{-1}(x) = 2$.

$x = \dots\dots\dots$

(1 mark)

3 $h(x) = 3^x$.

Find the value of k for which $\frac{1}{h(x)} = 9^{kx}$

$k = \dots\dots\dots$

(2 marks)

4 $f(x) = 3x + 2$ $g(x) = x^2 + 1$

Find $\frac{g(x)}{f(x)} + x$.

Give your answer as a single fraction, in terms of x , in its simplest form.

(3 marks)

5 $h(x) = x^2$

Find the values of p that satisfy $h(p) = p$.

(2 marks)

6 (a) $f(x) = 7 - 2x$ $g(x) = \frac{10}{x}, x \neq 0$ $h(x) = 27^x$

Simplify, giving your answer as a single fraction.

$$\frac{1}{f(x)} + g(x)$$

(3 marks)

(b) Find $h^{-1}(19\,683)$.

(1 mark)

7 $h(x) = 3^x$.

Find x when $h^{-1}(x) = -2$.

$X = \dots\dots\dots$

(1 mark)

8 (a)

$f(x) = 7x - 2$	$g(x) = x^2 + 1$	$h(x) = 3^x$
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$gg(x) = ax^4 + bx^2 + c$ Find the values of a , b , and c .

$a = \dots\dots\dots$

$b = \dots\dots\dots$

$c = \dots\dots\dots$

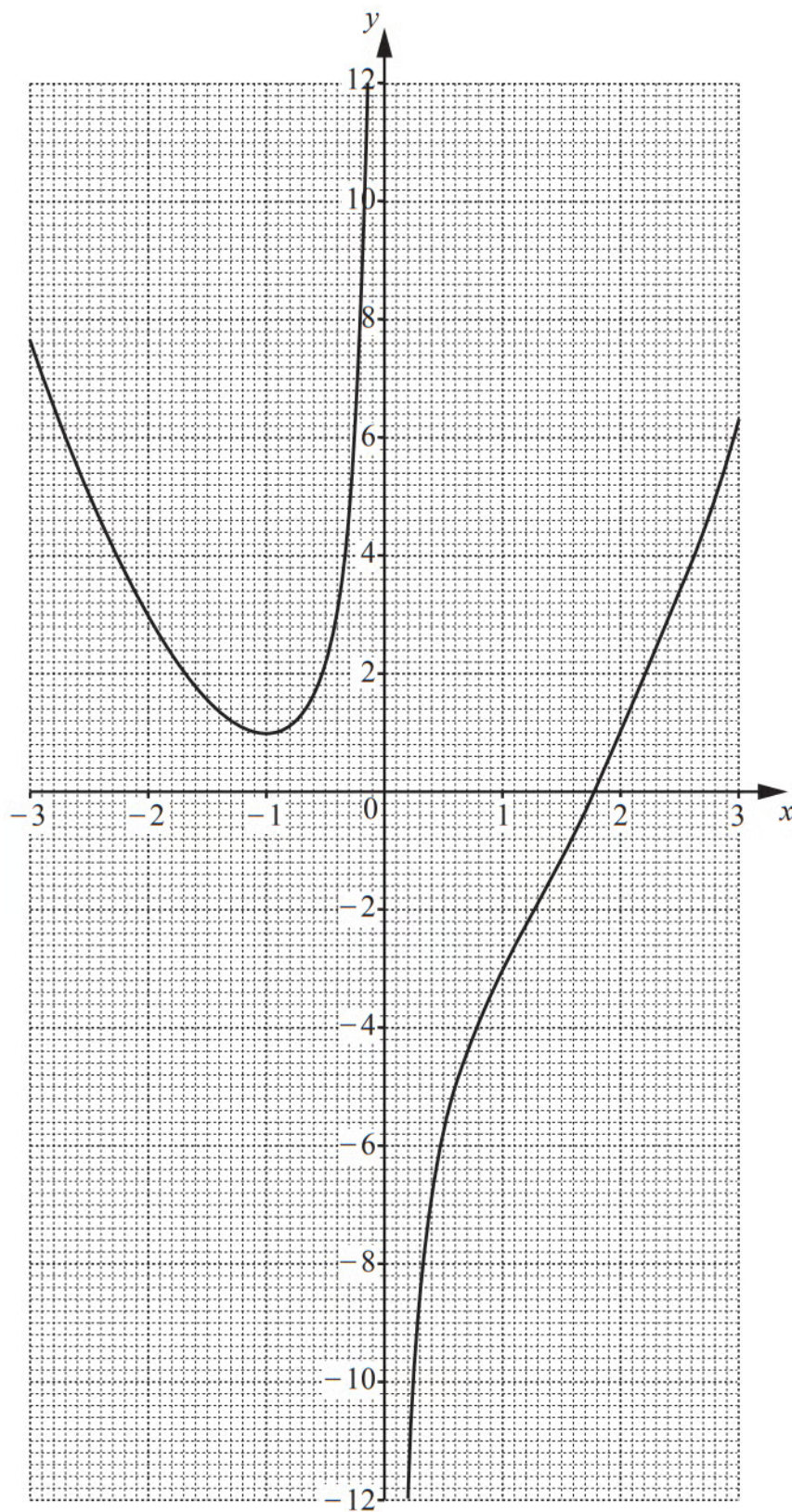
(3 marks)

(b) Find x when $hf(x) = 81$.

$X = \dots\dots\dots$

(3 marks)

- 9 The diagram shows the graph of $y = f(x)$ where $f(x) = x^2 - \frac{2}{x} - 2$, $x \neq 0$.



Use the graph to find

i) $f(1)$.

[1]

ii) $ff(-2)$.

[2]

(3 marks)

10 $h(x) = 3^x$.

If $h(3x) = k^x$, find the value of k .

$k = \dots\dots\dots$

(2 marks)

11

$$g(x) = 2x - 1$$

$$h(x) = 3^x$$

Find x when $h^{-1}(x) = g(2)$.

$x = \dots\dots\dots$

(2 marks)

12 The functions f and g are such that

$$f(x) = 5x + 3 \quad g(x) = ax + b \text{ where } a \text{ and } b \text{ are constants.}$$

$$g(3) = 20 \quad \text{and} \quad f^{-1}(33) = g(1)$$

Find the value of a and the value of b .

(5 marks)

13 $f(x) = \frac{1}{2}x$ $g(x) = x - x^2$

Solve $f^{-1}(x) = gf(x)$

(4 marks)

14 $f(x) = \frac{2x}{5} - 1$

Work out the value of $f^{-1}(3) + f(-0.5)$

(5 marks)

15 $f(x) = 5 - x$ and $g(x) = 3x + 7$

Simplify $f(2x) + g(x - 1)$

(3 marks)