

FUNCTIONS 1

[Jun/83/3]

Given that $f(x) = \frac{x+1}{2x-5}$

$$g(x) = \frac{2x-5}{x+1}$$

$$h(x) = \frac{5x+1}{2x-1}$$

- (i) Evaluate $f(3)$ and $g(4)$
- (ii) Show that $hf(3) = 3$
- (iii) Write down the expression for f^{-1} [7mks]

4) [Jan/89/2]

Given that

$$f: x \rightarrow 3x - 2$$

$$g: x \rightarrow 2x + 5$$

$$h: x \rightarrow \frac{2x+3}{x-1}$$

- a) Evaluate (i) $g(-6)$
(ii) $fg(3)$
- b) If $f(x) = 8$, calculate the value of x .
- c) Obtain an expression, in terms of x , for $h^{-1}(x)$

[4mks]

[Jun/87/6]

The function $g(x) = \frac{x+1}{x-1}$

- (i) Calculate $g(\frac{1}{2})$.
- (ii) Given that $g^2(x) = g[g(x)]$, and $g^3(x) = g[g^2(x)]$ and so on, Show that $g^2(x) = x$, and hence, deduce the value of $g^{21}(\frac{1}{2})$ [12mks]

5) [Jun/89/7]

Given that $f(x) = 5x$ and $g(x) = x - 2$,

- (i) calculate $f(2)$ and $gf(2)$
- (ii) determine x when $fg(x) = 0$
- (iii) prove $(gf)^{-1}(23) = 5$ [7mks]

6) [Jan/90/4]

Given that $f: x \rightarrow \frac{x^2 - 14}{5x}$ and $x \neq 0$.

- (i) calculate $f(-4)$
- (ii) obtain an expression for $fg(x)$ if $g: x \rightarrow x - 1$ [5mks]

[Jun/88/7]

Given that

$$f: x \rightarrow \frac{2x-3}{x+1}$$

$$g: x \rightarrow x + 2$$

- (i) evaluate $f(-2)$ and $gf(-2)$
- (ii) Determine $f^{-1}(x)$
- (iii) calculate the value of x , if $f(x) = 12$
- (iv) calculate the values of x , for which
 - (a) $f(x) = 0$
 - (b) $f(x)$ is undefined. [12mks]

7) [Jan/91/5]

Given that

$$f: x \rightarrow 3x + 7$$

$$\text{and } g: x \rightarrow \frac{4x}{5} - 9$$

Calculate $fg(10)$ [3mks]

Given that

$$h: x \rightarrow \frac{3x-1}{x+5} \text{ For } x \in R,$$

- (i) state the value of x for which $h(x) = 0$
 $h(x)$ is undefined.

- (ii) determine $h^{-1}(x)$
Hence, solve the equation $\frac{3x-1}{x+5} = 2$

[7mks]

- 10) [Jan/93/3]
Determine the inverse of the functions:

(i) $f: x \rightarrow 2x+5$

(ii) $g: x \rightarrow \frac{x-4}{3x}$

[6mks]

8) [Jun/91/6]

The functions f and g are defined by:

$$f: x \rightarrow 5+x$$

$$g: x \rightarrow x^3$$

Determine expressions for the functions:

(i) fg

(ii) g^{-1}

[4mks]

11) [Jan/93/12]

The functions f and g are defined by:

$$f: x \rightarrow x^3$$

$$g: x \rightarrow px+q$$

- (a) Determine the values of x if $f(x) = -64$

- (b) Given that $g(0) = -5$ and $fg(2) = -8$ calculate the values of p and q .

- (c) Given that $-8 < fg(x) < 27$,

determine the domain of x

- (i) if x is a real number

- (ii) if x is an integer

[10mks]

9) [Jan/92/10]

Three functions f, g and h are defined as follows:

$$f: x \rightarrow x-3$$

$$g: x \rightarrow x^2$$

$$h: x \rightarrow x^2 - 6x + 9$$

- (a) Given that $f^2(x) = f[f(x)]$ and

$$f^3(x) = f[f^2(x)] \text{ and so on,}$$

- (i) deduce an algebraic expression, in terms of x , for $f^4(x)$

and hence, calculate $f^4(3)$

- (ii) show that $gf(x) = h(x)$

- (b) (i) Determine the range of values of $h(x)$ such that $h(x) > 1$

- (ii) Show that if $h(x) < 25$, then $-2 < x < 8$ [10mks]

- (c) Hence, or otherwise, for $x \in R$, determine the range of values of x for which $1 < h(x) < 25$

and represent your answer on a number line. [5mks]

12) [Jun/93/9]

A composite function k is defined as

$$k(x) = (2x-1)^2$$

- (i) Express $k(x)$ as $gf(x)$, where

$f(x)$ and $g(x)$ are two simpler functions.

- (ii) Show that $k^{-1}(x) = f^{-1}g^{-1}(x)$ [9mks]

13) [Jan/95/5]

The functions f and g are defined as follows:

$$f(x) = 2x^2 - 5, x \in R$$

$$g(x) = 3x - 2, x \in R$$

- (a) Evaluate $f(-3)$

$$gf(-3) \quad [4mks]$$

- (b) Write an expression for $g^{-1}(x)$ [2mks]

- (c) Determine the value of x for which

$$g^{-1}(x) = 4 \quad [2mks]$$

- (d) Write an expression for $gf(x)$. [3mks]

14) [Jun/95/7]
Given $f(x) = \frac{1}{2}x$ and $g(x) = x - 2$,
calculate

- (i) $g(-2)$
- (ii) $fg(4)$
- (iii) $f^{-1}(4)$ [4mks]

15) [Resit/95]
Given $f(x) = 4 - 5x$ and $g(x) = x^2 + 1$,
Calculate

- (i) $f(-2)$
- (ii) $gf(-1)$
- (iii) $f^{-1}(4)$ [6mks]

16) [Jan/96]
Given that $h(x) = \frac{x^2 - 16}{x - 2}$

- calculate
- (i) $h(-2)$
 - (ii) the value of x for which $h(x) = 0$

17) [Jun/96]
If $f(x) = 2x - 1$ and $g(x) = \frac{1}{2}(x + 2)$

- calculate
- (i) $f(3)$
 - (ii) $g^{-1}(x)$
 - (iii) $gf(3)$ [5mks]

18) [Jan/97/7]
Given $f(x) = x^2 + 3$, $g(x) = \frac{x}{2}$, find

- (i) the value of $f(3)$, $g(2)$, $fg(2)$
- (ii) an expression for $fg(x)$, $gf(x)$ [5mks]

19) [Jun/97/5]
 f and g are functions defined as follows:
 $f : x \rightarrow 3x - 5$

$$g : x \rightarrow \frac{1}{2}x$$

- (a) Calculate the value of $f(-3)$
- (b) Write expressions for (i) $f^{-1}(x)$
(ii) $g^{-1}(x)$
- (c) Hence, or otherwise, write an expression for $(gf)^{-1}$ [10mks]

20) [Jan/98/10]
Given $f(x) = 3x - 2$

- (i) determine $f^{-1}(x)$
- (i) Hence, solve the equation $3x - 2 = 4$ [4mks]

21) [Jun/98/6]
Given $f(x) = x^2$ and $g(x) = 5x + 3$,
calculate:

- (i) $f(-2)$
- (ii) $gf(-2)$
- (iii) $g^{-1}(x)$ [7mks]

22) [Jan/99/4]
Given that

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

- (i) determine an expression for $f^{-1}(x)$
- (ii) Hence, or otherwise, calculate the value of x for which $f(x) = 7$ [4mks]

23) [Jun/99/5]
If $h(x) = 1 + 3x$ and $k(x) = x + 2$
calculate

- (i) $hk(x)$
- (ii) $hk(4)$
- (iii) $(hk)^{-1}(x)$
- (iv) the value of x when $hk(x) = 0$

- 24) [Jan/00/7]
 The function $f: x \rightarrow \frac{1}{2}x - 1$
 (i) Find the value of $f(0)$.
 (ii) Find the value of x for which $f(x) = -5$

- 25) [Jun/00]
 Given that
 $f: x \rightarrow 3 - x$
 $g: x \rightarrow \frac{x+2}{x-5}$
 (a) Calculate $g(2)$
 (b) State the value of x for which $g(x)$ is not defined.
 (c) Derive an expression for $gf(x)$
 (d) Calculate the value of $f^{-1}(4)$ [10mks]

- 26) [Jan/01/5]
 Given that $f(x) = x + 2$, and $g(x) = \frac{3}{x}$.
 (i) calculate $f(-1)$
 (ii) Write an expression for $gf(x)$
 (iii) Calculate the values of x so that $f(x) = g(x)$.

- 27) [Jun/01/6]
 Given that $g(x) = x + 3$ and $h(x) = x^2$,
 calculate
 (i) $g(-5)$
 (ii) $g^{-1}(7)$
 (iii) $hg(0)$

- 28) [Jan/02/5]
 Given that $f(x) = 9 - x$, and $g(x) = x^2$
 Calculate
 (i) $f(3)$
 (ii) $g(-4)$
 (iii) $fg(2)$

- 29) [Jun/02]
 The functions f and g , are defined by

$$f(x) = \frac{4}{3}x + 1$$

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

- (a) Calculate $g(-3)$
 (b) Find, in its simplest form
 (i) $f^{-1}(x)$
 (ii) $g^{-1}(x)$
 (iii) $fg(x)$
 (iv) $(fg)^{-1}(x)$
 (c) Show that $(fg)^{-1}(x) = g^{-1}f^{-1}(x)$ [11mks]

- 30) [Jan/03/7]
 (a) Given that $g(x) = 6 - x$ and $h(x) = x^3$,
 calculate
 (i) $h(-3)$
 (ii) $hg(2)$
 (iii) $gh(2)$

- 31) [Jun/03/10]
 Two functions g and h are defined as
 $g: x \rightarrow \frac{2x+3}{x-4}$ and $h: x \rightarrow \frac{1}{x}$
 Calculate
 (i) the value of $g(7)$
 (ii) the value for which $g(x) = 6$

Write expressions for

- (iii) $hg(x)$
 (iv) $g^{-1}(x)$

32) [Jan/04/5]

Given that $f(x) = 3x + 4$ and $g(x) = \sqrt{x}$,
calculate

(i) $g(25)$

(ii) $gf(15)$.

[3 mks]

33) [Jan/05/05]

The function f and g are such that

$$f(x) = \frac{2x + 5}{x - 4} \text{ and } g(x) = 2x - 3$$

Calculate the value of

(i) $g(4)$

(ii) $fg(2)$

(iii) $g^{-1}(7)$

[5 mks]

34) [Jun/05/6b]

The function f and g are defined by

$$f(x) = \frac{1}{2}x + 5 \quad g(x) = x^2$$

Evaluate

1) $g(3) + g(-3)$

2) $f^{-1}(6)$

3) $fg(2)$

[8 mks]