

## A247 Functions

**Q1.**

$f$  and  $g$  are functions such that

$$f(x) = 3x^2 \quad \text{and} \quad g(x) = \frac{1}{x-2}$$

Find  $gf(4)$ .

Give your answer as a fraction.

.....  
**(Total for question = 2 marks)**

**Q2.**

$f$  and  $g$  are functions such that

$$f(x) = \frac{2}{x^2} \quad \text{and} \quad g(x) = 4x^3$$

(a) Find  $f(-5)$

.....  
**(1)**

(b) Find  $fg(1)$

.....  
**(2)**

**(Total for question = 3 marks)**

**Q3.**

The function  $f$  is such that

$$f(x) = 4x - 1$$

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

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

(2)

The function  $g$  is such that

$$g(x) = kx^2 \text{ where } k \text{ is a constant.}$$

Given that  $fg(2) = 12$

(b) work out the value of  $k$

$$k = \dots\dots\dots$$

(2)

**(Total for question = 4 marks)**

**Q4.**

For all values of  $x$

$$f(x) = 2x - 3 \quad \text{and} \quad g(x) = x^2 + 2$$

(a) Find  $g(-4)$

.....  
(1)

(b) Show that  $gf(x) = 4x^2 - 12x + 11$

(2)

(c) Solve  $fg(x) = gf(x)$

.....  
(4)

**(Total for question = 7 marks)**

**Q5.**

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

(a) Work out  $f(5)$

Give your answer as a fraction.

.....

(2)

(b) Write down a value of  $x$  for which  $f(x)$  is not defined.

.....

(1)

Given that  $f(x) = 4$

(c) find the possible values of  $x$ .

Give your answer in the form  $\frac{p \pm \sqrt{q}}{r}$  where  $p$ ,  $q$  and  $r$  are positive integers.

.....

(5)

**(Total for question = 8 marks)**

**Q6.**

The function  $f$  is given by

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

(a) Show that  $f^{-1}(50) = 3$

(2)

The functions  $g$  and  $h$  are given by

$$g(x) = x + 2 \text{ and } h(x) = x^2$$

(b) Find the values of  $x$  for which

$$hg(x) = 3x^2 + x - 1$$

.....  
(4)

**(Total for question = 6 marks)**

**Q7.**

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

$$g(x) = 4x - 1$$

(a) Find  $fg(2)$

.....  
(2)

$$h(x) = fg(x)$$

(b) Find an expression for  $h^{-1}(x)$

$h^{-1}(x) =$  .....  
(3)

**(Total for question = 5 marks)**

**Q8.**

For all values of  $x$

$$f(x) = (x + 1)^2 \quad \text{and} \quad g(x) = 2(x - 1)$$

(a) Show that  $gf(x) = 2x(x + 2)$

(2)

(b) Find  $g^{-1}(7)$

.....  
(2)

**(Total for question = 4 marks)**

**Q9.**

$$f(x) = 4\sin x^\circ$$

(a) Find  $f(23)$

Give your answer correct to 3 significant figures.

.....  
(1)

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

(b) Find  $fg(34)$

Give your answer correct to 3 significant figures.

.....  
(2)

$$h(x) = (x + 4)^2$$

Ivan needs to solve the following equation  $h(x) = 25$

He writes

$$(x + 4)^2 = 25$$

$$x + 4 = 5$$

$$x = 1$$

This is not fully correct.

(c) Explain why.

.....  
.....  
(1)

**(Total for question = 4 marks)**



**Q10.**

The functions  $f$  and  $g$  are such that

$$f(x) = 3x - 1 \quad \text{and} \quad g(x) = x^2 + 4$$

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

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

Given that  $fg(x) = 2gf(x)$ ,

(b) show that  $15x^2 - 12x - 1 = 0$

(5)

**(Total for question = 7 marks)**

**Q11.**

The functions  $f$  and  $g$  are such that

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

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

Find the value of  $a$  and the value of  $b$ .

$$a = \dots\dots\dots$$

$$b = \dots\dots\dots$$

**(Total for question = 5 marks)**

**Q12.**

The functions  $f$  and  $g$  are such that

$$f(x) = 3(x - 4) \text{ and } g(x) = \frac{x}{5} + 1$$

(a) Find the value of  $f(10)$

.....  
(1)

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

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

(c) Show that  $fg(x) = 9x - 48$

(2)  
**(Total for question = 5 marks)**

**Q13.**

$$f(x) = 3x^2 - 2x - 8$$

Express  $f(x + 2)$  in the form  $ax^2 + bx$

.....  
**(Total for question is 3 marks)**