

1. Let  $f(x) = 3x$ ,  $g(x) = 2x - 5$  and  $h(x) = (f \circ g)(x)$ .

(a) Find  $h(x)$ .

(2)

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

(3)

(Total 5 marks)

2. Let  $f(x) = x^2$  and  $g(x) = 2x - 3$ .

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

(2)

(b) Find  $(f \circ g)(4)$ .

(3)

(Total 5 marks)

3. The functions  $f$  and  $g$  are defined by  $f: x \mapsto 3x$ ,  $g: x \mapsto x + 2$ .

(a) Find an expression for  $(f \circ g)(x)$ .

(2)

(b) Find  $f^{-1}(18) + g^{-1}(18)$ .

(4)

(Total 6 marks)

4. Let  $f(x) = \sqrt{x+4}$ ,  $x \geq -4$  and  $g(x) = x^2$ ,  $x \in \mathbb{R}$ .

(a) Find  $(g \circ f)(3)$ .

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

(c) Write down the domain of  $f^{-1}$ .

(Total 6 marks)

5. Let  $f(x) = x^3 - 4$  and  $g(x) = 2x$ .

(a) Find  $(g \circ f)(-2)$ .

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

**(Total 6 marks)**

6. Consider the functions  $f(x) = 2x$  and  $g(x) = \frac{1}{x-3}$ ,  $x \neq 3$ .

(a) Calculate  $(f \circ g)(4)$ .

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

(c) Write down the domain of  $g^{-1}$ .

**(Total 6 marks)**

7. Let  $f(x) = 2x + 1$  and  $g(x) = 3x^2 - 4$ .

Find

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

(b)  $(g \circ f)(-2)$ ;

(c)  $(f \circ g)(x)$ .

**(Total 6 marks)**

8. The function  $f$  is given by  $f(x) = x^2 - 6x + 13$ , for  $x \geq 3$ .

(a) Write  $f(x)$  in the form  $(x - a)^2 + b$ .

(b) Find the inverse function  $f^{-1}$ .

(c) State the domain of  $f^{-1}$ .

**(Total 6 marks)**

9. Let  $f(x) = 2^x$ , and  $g(x) = \frac{x}{x-2}$ , ( $x \neq 2$ ).

Find

- (a)  $(g \circ f)(3)$ ;  
(b)  $g^{-1}(5)$ .

**(Total 6 marks)**

10. Two functions  $f, g$  are defined as follows:

$$\begin{aligned} f: x &\rightarrow 3x + 5 \\ g: x &\rightarrow 2(1 - x) \end{aligned}$$

Find

- (a)  $f^{-1}(2)$ ;  
(b)  $(g \circ f)(-4)$ .

**(Total 4 marks)**

11. Consider the functions  $f: x \mapsto 4(x-1)$  and  $g: x \mapsto \frac{6-x}{2}$ .

- (a) Find  $g^{-1}$ .  
(b) Solve the equation  $(f \circ g^{-1})(x) = 4$ .

**(Total 6 marks)**

12. The function  $f$  is defined by

$$f: x \mapsto \sqrt{3-2x}, \quad x \leq \frac{3}{2}.$$

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

**(Total 4 marks)**