

# Functions

## Question Paper 6

Level	International A Level
Subject	Maths
Exam Board	CIE
Topic	Functions
Sub Topic	
Booklet	Question Paper 6

Time Allowed: **48 minutes**

Score: **/40**

Percentage: **/100**

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	'77.5%	70%	62.5%	57.5%	45%	<45%

1 The function  $f$  is defined by

$$f(x) = x^2 - 4x + 7 \text{ for } x > 2.$$

(i) Express  $f(x)$  in the form  $(x - a)^2 + b$  and hence state the range of  $f$ . [3]

(ii) Obtain an expression for  $f^{-1}(x)$  and state the domain of  $f^{-1}$ . [3]

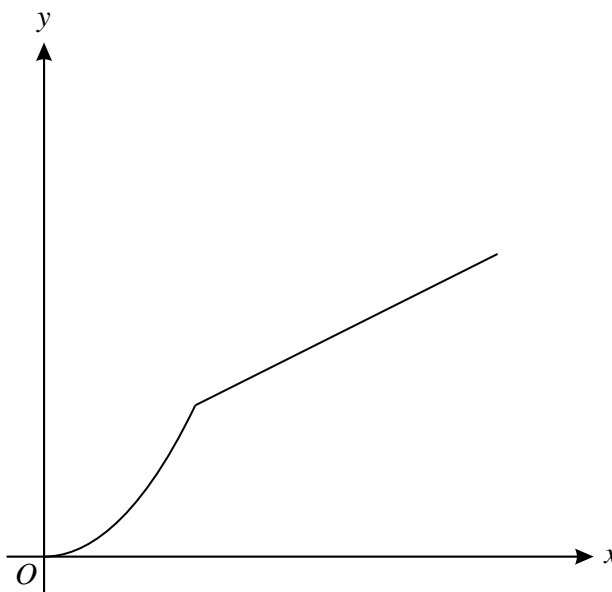
The function  $g$  is defined by

$$g(x) = x - 2 \text{ for } x > 2.$$

The function  $h$  is such that  $f = hg$  and the domain of  $h$  is  $x > 0$ .

(iii) Obtain an expression for  $h(x)$ . [1]

2



The diagram shows the function  $f$  defined for  $0 \leq x \leq 6$  by

$$x \mapsto \frac{1}{2}x^2 \text{ for } 0 \leq x \leq 2,$$

$$x \mapsto \frac{1}{2}x + 1 \text{ for } 2 < x \leq 6.$$

(i) State the range of  $f$ . [1]

(ii) Copy the diagram and on your copy sketch the graph of  $y = f^{-1}(x)$ . [2]

(iii) Obtain expressions to define  $f^{-1}(x)$ , giving the set of values of  $x$  for which each expression is valid. [4]

- 3 The function  $f : x \mapsto 4 - 3 \sin x$  is defined for the domain  $0 \leq x \leq 2\pi$ .
- (i) Solve the equation  $f(x) = 2$ . [3]
  - (ii) Sketch the graph of  $y = f(x)$ . [2]
  - (iii) Find the set of values of  $k$  for which the equation  $f(x) = k$  has no solution. [2]

The function  $g : x \mapsto 4 - 3 \sin x$  is defined for the domain  $\frac{1}{2}\pi \leq x \leq A$ .

- (iv) State the largest value of  $A$  for which  $g$  has an inverse. [1]
- (v) For this value of  $A$ , find the value of  $g^{-1}(3)$ . [2]

- 4 The function  $f : x \mapsto 2x^2 - 8x + 14$  is defined for  $x \in \mathbb{R}$ .
- (i) Find the values of the constant  $k$  for which the line  $y + kx = 12$  is a tangent to the curve  $y = f(x)$ . [4]
  - (ii) Express  $f(x)$  in the form  $a(x + b)^2 + c$ , where  $a$ ,  $b$  and  $c$  are constants. [3]
  - (iii) Find the range of  $f$ . [1]

The function  $g : x \mapsto 2x^2 - 8x + 14$  is defined for  $x \geq A$ .

- (iv) Find the smallest value of  $A$  for which  $g$  has an inverse. [1]
- (v) For this value of  $A$ , find an expression for  $g^{-1}(x)$  in terms of  $x$ . [3]

- 5 The equation of a curve is  $y = 3 \cos 2x$ . The equation of a line is  $x + 2y = \pi$ . On the same diagram, sketch the curve and the line for  $0 \leq x \leq \pi$ . [4]