

Functions

Question Paper 2

Level	International A Level
Subject	Maths
Exam Board	CIE
Topic	Functions
Sub Topic	
Booklet	Question Paper 2

Time Allowed: 59 minutes

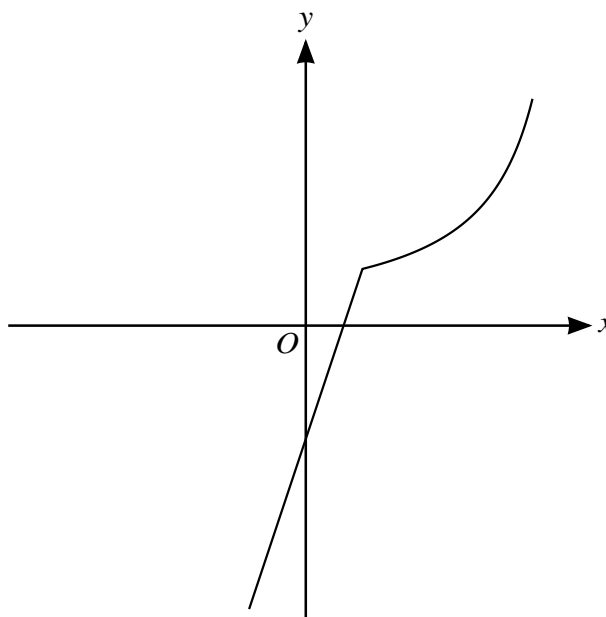
Score: /49

Percentage: /100

Grade Boundaries:

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

1



The diagram shows the function f defined for $-1 \leq x \leq 4$, where

$$f(x) = \begin{cases} 3x - 2 & \text{for } -1 \leq x \leq 1, \\ \frac{4}{5-x} & \text{for } 1 < x \leq 4. \end{cases}$$

- (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 the function f^{-1} , giving also the set of values for which each expression is valid. [6]

2 Functions f and g are defined by

$$f : x \mapsto 2x - 3, \quad x \in \mathbb{R},$$
$$g : x \mapsto x^2 + 4x, \quad x \in \mathbb{R}.$$

(i) Solve the equation $ff(x) = 11$. [2]

(ii) Find the range of g . [2]

(iii) Find the set of values of x for which $g(x) > 12$. [3]

(iv) Find the value of the constant p for which the equation $gf(x) = p$ has two equal roots. [3]

Function h is defined by $h : x \mapsto x^2 + 4x$ for $x \geq k$, and it is given that h has an inverse.

(v) State the smallest possible value of k . [1]

(vi) Find an expression for $h^{-1}(x)$. [4]

3 The function f is defined by

$$f : x \mapsto x^2 + 1 \text{ for } x \geq 0.$$

(i) Define in a similar way the inverse function f^{-1} . [3]

(ii) Solve the equation $ff(x) = \frac{185}{16}$. [3]

4 A function f is defined by $f : x \mapsto 3 \cos x - 2$ for $0 \leq x \leq 2\pi$.

(i) Solve the equation $f(x) = 0$. [3]

(ii) Find the range of f . [2]

(iii) Sketch the graph of $y = f(x)$. [2]

A function g is defined by $g : x \mapsto 3 \cos x - 2$ for $0 \leq x \leq k$.

(iv) State the maximum value of k for which g has an inverse. [1]

(v) Obtain an expression for $g^{-1}(x)$. [2]

5 The function f is defined by $f : x \mapsto x^2 + 4x$ for $x \geq c$, where c is a constant. It is given that f is a one-one function.

(i) State the range of f in terms of c and find the smallest possible value of c . [3]

The function g is defined by $g : x \mapsto ax + b$ for $x \geq 0$, where a and b are positive constants. It is given that, when $c = 0$, $gf(1) = 11$ and $fg(1) = 21$.

(ii) Write down two equations in a and b and solve them to find the values of a and b . [6]