

Functions

Question Paper 1

Level	International A Level
Subject	Maths
Exam Board	CIE
Topic	Functions
Sub Topic	
Booklet	Question Paper 1

Time Allowed: **58 minutes**

Score: **/48**

Percentage: **/100**

Grade Boundaries:

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

- 1** The function $f : x \mapsto 5 + 3 \cos\left(\frac{1}{2}x\right)$ is defined for $0 \leq x \leq 2\pi$.
- (i) Solve the equation $f(x) = 7$, giving your answer correct to 2 decimal places. [3]
 - (ii) Sketch the graph of $y = f(x)$. [2]
 - (iii) Explain why f has an inverse. [1]
 - (iv) Obtain an expression for $f^{-1}(x)$. [3]

- 2** The function f is defined by $f : x \mapsto 2x^2 - 6x + 5$ for $x \in \mathbb{R}$.
- (i) Find the set of values of p for which the equation $f(x) = p$ has no real roots. [3]

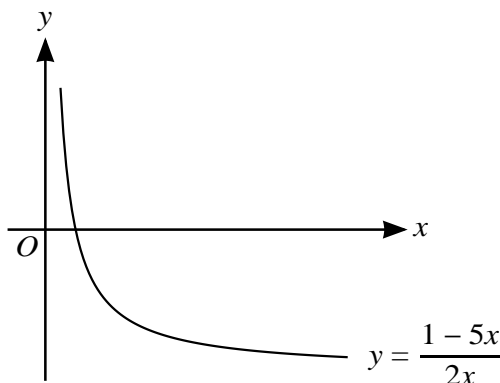
The function g is defined by $g : x \mapsto 2x^2 - 6x + 5$ for $0 \leq x \leq 4$.

- (ii) Express $g(x)$ in the form $a(x + b)^2 + c$, where a , b and c are constants. [3]
- (iii) Find the range of g . [2]

The function h is defined by $h : x \mapsto 2x^2 - 6x + 5$ for $k \leq x \leq 4$, where k is a constant.

- (iv) State the smallest value of k for which h has an inverse. [1]
- (v) For this value of k , find an expression for $h^{-1}(x)$. [3]

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The diagram shows the graph of $y = f^{-1}(x)$, where f^{-1} is defined by $f^{-1}(x) = \frac{1 - 5x}{2x}$ for $0 < x \leq 2$.

- (i) Find an expression for $f(x)$ and state the domain of f . [5]
- (ii) The function g is defined by $g(x) = \frac{1}{x}$ for $x \geq 1$. Find an expression for $f^{-1}g(x)$, giving your answer in the form $ax + b$, where a and b are constants to be found. [2]

- 4 (i) Express $x^2 - 2x - 15$ in the form $(x + a)^2 + b$. [2]

The function f is defined for $p \leq x \leq q$, where p and q are positive constants, by

$$f : x \mapsto x^2 - 2x - 15.$$

The range of f is given by $c \leq f(x) \leq d$, where c and d are constants.

- (ii) State the smallest possible value of c . [1]

For the case where $c = 9$ and $d = 65$,

- (iii) find p and q , [4]

- (iv) find an expression for $f^{-1}(x)$. [3]

- 5 The function $f : x \mapsto 6 - 4 \cos\left(\frac{1}{2}x\right)$ is defined for $0 \leq x \leq 2\pi$.

- (i) Find the exact value of x for which $f(x) = 4$. [3]

- (ii) State the range of f . [2]

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

- (iv) Find an expression for $f^{-1}(x)$. [3]