

1.3 Functions

Question Paper

Course	CIEAS Maths
Section	1. Algebra & Functions
Topic	1.3 Functions
Difficulty	Hard

Time allowed: 40
Score: /31
Percentage: /100

Question 1

State whether the following mappings are one-to-one, many-to-one, one-to-many or many-to-many.

(i) $f: x \mapsto 2 - x^3$

(ii) $f: x \mapsto \sin x$

(iii) $f: x \mapsto \frac{1}{x^2}$

(iv) $f: x \mapsto \ln x$

[4 marks]

Question 2a

It is given

$$f(x) = \frac{2}{x}$$

(a) Write down the domain of the function $f(x)$.

[1 mark]

Question 2b

(b) Sketch the graph of $y = f(x)$, stating the coordinates of any intersections with the coordinate axes and the equations of any asymptotes.

[3 marks]

Question 2c

(c) Write down the range of $f(x)$.

[1 mark]

Question 3a

The function $f(x)$ is defined as

$$f(x) = x(x + 3)^2 + 1 \quad x \geq 0$$

(a) Work out the range of $f(x)$.

[1 mark]

Question 3b

(b) If the domain of $f(x)$ is changed to $x \leq 0$, what is the range of $f(x)$?

[2 marks]

Question 4a

The functions $f(x)$ and $g(x)$ are defined as follows

$$f(x) = 3x^2 + 2 \quad x \in \mathbb{R}$$

$$g(x) = 1 - 3x \quad x \in \mathbb{R}$$

(a) Write down the range of $f(x)$.

[1 mark]

Question 4b

(b) Find (i) $fg(x)$
(ii) $gf(x)$

[4 marks]

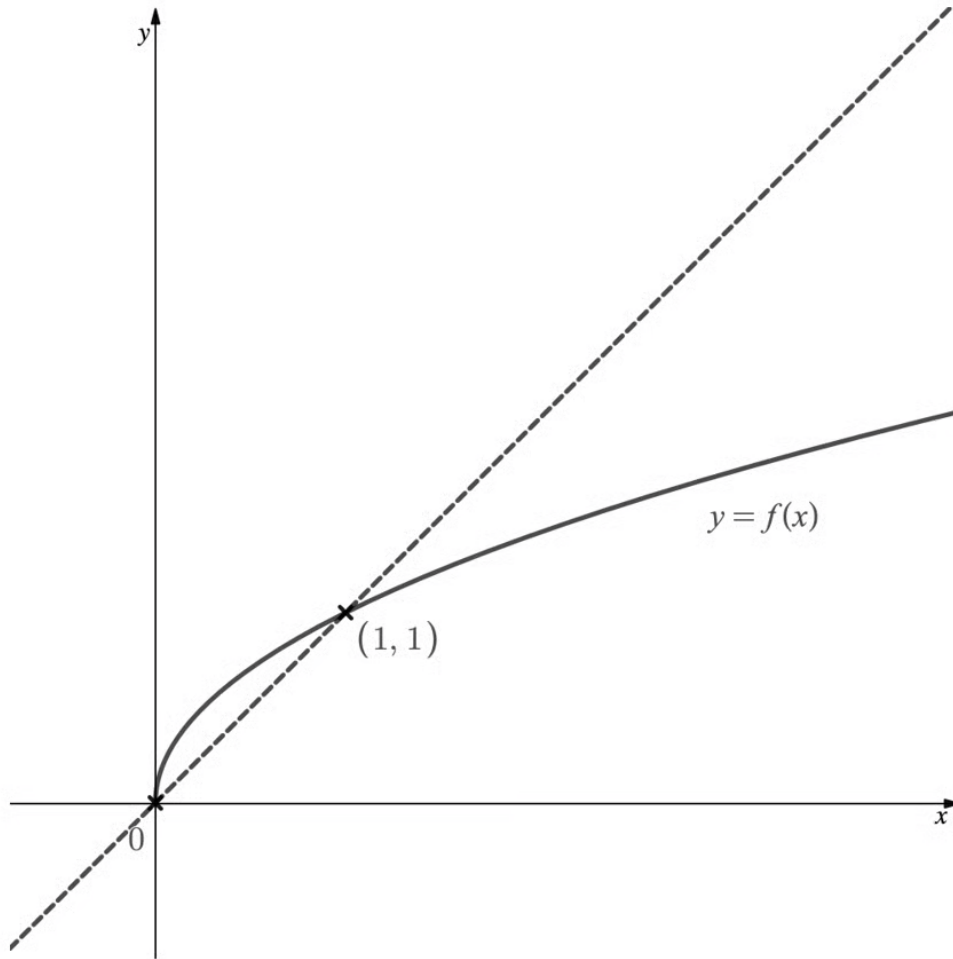
Question 4c

(c) Solve the equation $f(x) = g(x) + 1$

[2 marks]

Question 5a

The graph of $y = f(x)$ is shown below.



- (a) (i) Use the graph to write down the domain and range of $f(x)$.
(ii) Write down the equation of the dotted line on the graph.

[3 marks]

Question 5b

(b) On the diagram above sketch the graph of $y = f^{-1}(x)$.

[2 marks]

Question 6a

The functions $f(x)$ and $g(x)$ are defined as follows

$$\begin{array}{ll} f(x) = e^{x-2} & x \in \mathbb{R} \\ g(x) = 2 + \ln x & x \in \mathbb{R}, x > 0 \end{array}$$

- (a) Find
- (i) $fg(x)$
 - (ii) $gf(x)$

[3 marks]

Question 6b

(b) Write down $f^{-1}(x)$ and state its domain and range.

[2 marks]

Question 6c

(c) The graphs of $f(x)$ and $f^{-1}(x)$ are drawn on the same axes.

Describe the transformation that would map one graph onto the other.

[2 marks]