

# Graphs

## Difficulty: Medium

### Question Paper 3

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Graphs
Paper	Paper 4
Difficulty	Medium
Booklet	Question Paper 3

**Time allowed:** 122 minutes

**Score:** /106

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D
>83%	67%	51%	41%	31%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4
>95%	87%	80%	69%	58%	46%

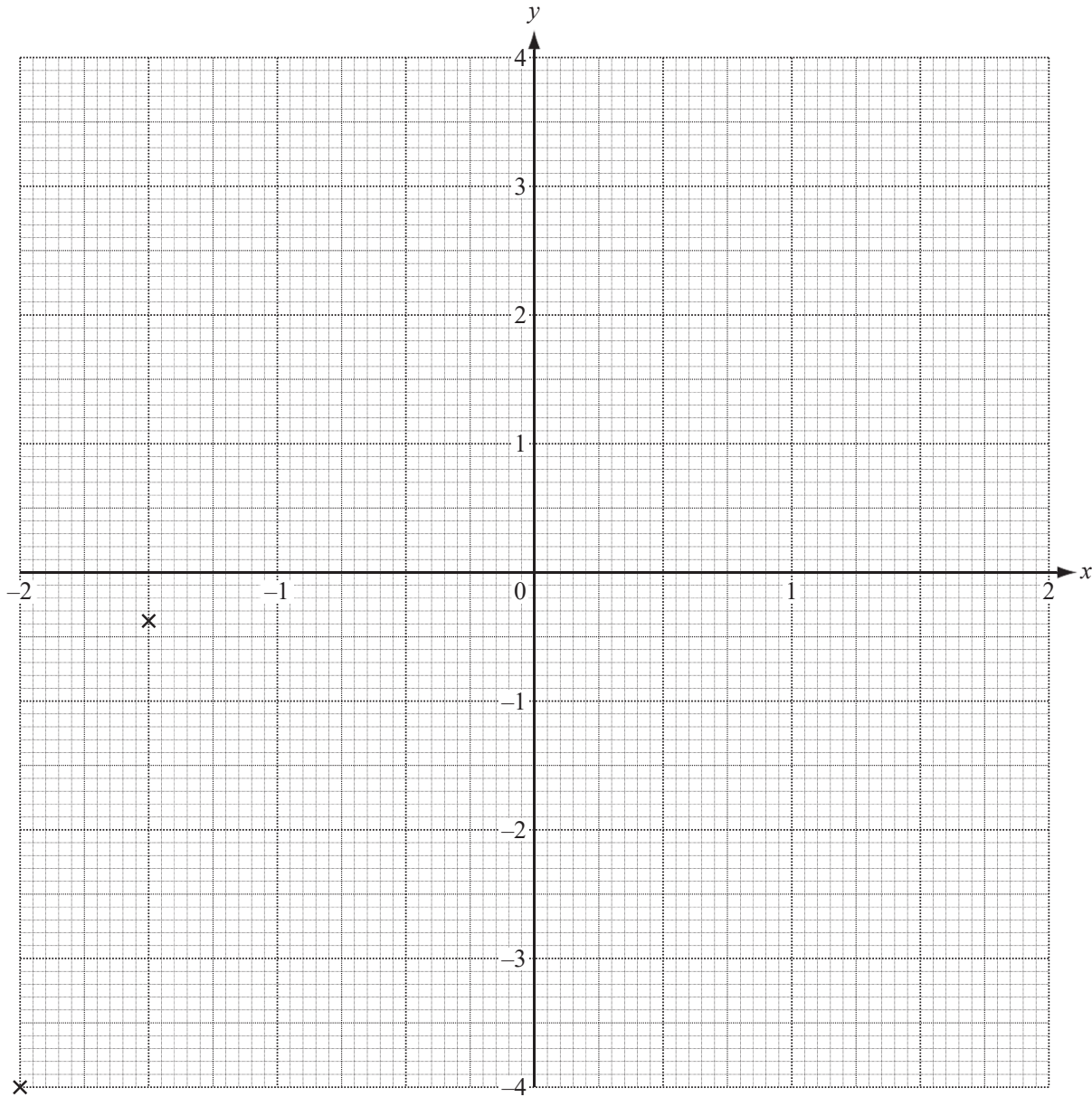
# Question 1

The table shows some values for the equation  $y = x^3 - 2x$  for  $-2 \leq x \leq 2$ .

$x$	-2	-1.5	-1	-0.6	-0.3	0	0.3	0.6	1	1.5	2
$y$	-4	-0.38			0.57		-0.57			0.38	4

(a) Complete the table of values. [3]

(b) On the grid below, draw the graph of  $y = x^3 - 2x$  for  $-2 \leq x \leq 2$ .  
The first two points have been plotted for you.



[4]

(c) (i) On the grid, draw the line  $y = 0.8$  for  $-2 \leq x \leq 2$ . [1]

(ii) Use your graph to solve the equation  $x^3 - 2x = 0.8$ . [3]

(d) By drawing a suitable tangent, work out an estimate for the gradient of the graph of  $y = x^3 - 2x$  where  $x = -1.5$ .

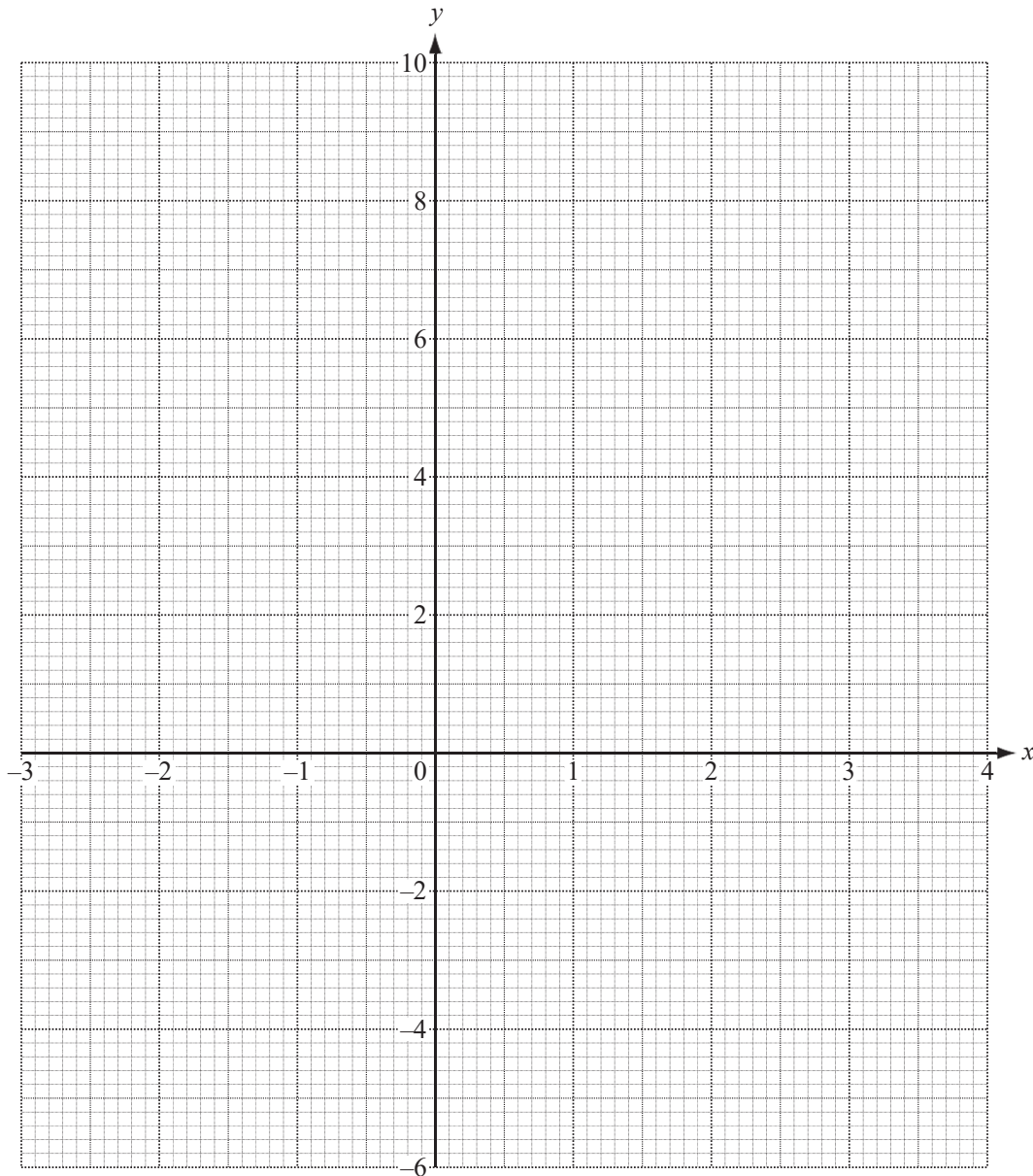
You must show your working. [3]

## Question 2

- (a) Complete the table for the function  $f(x) = \frac{x^3}{2} - 3x - 1$ . [3]

$x$	-3	-2	-1.5	-1	0	1	1.5	2	3	3.5
$f(x)$	-5.5		1.8	1.5		-3.5	-3.8	-3		9.9

- (b) On the grid draw the graph of  $y = f(x)$  for  $-3 \leq x \leq 3.5$ . [4]



(c) Use your graph to

(i) solve  $f(x) = 0.5$ , [3]

(ii) find the inequalities for  $k$ , so that  $f(x) = k$  has only 1 answer. [2]

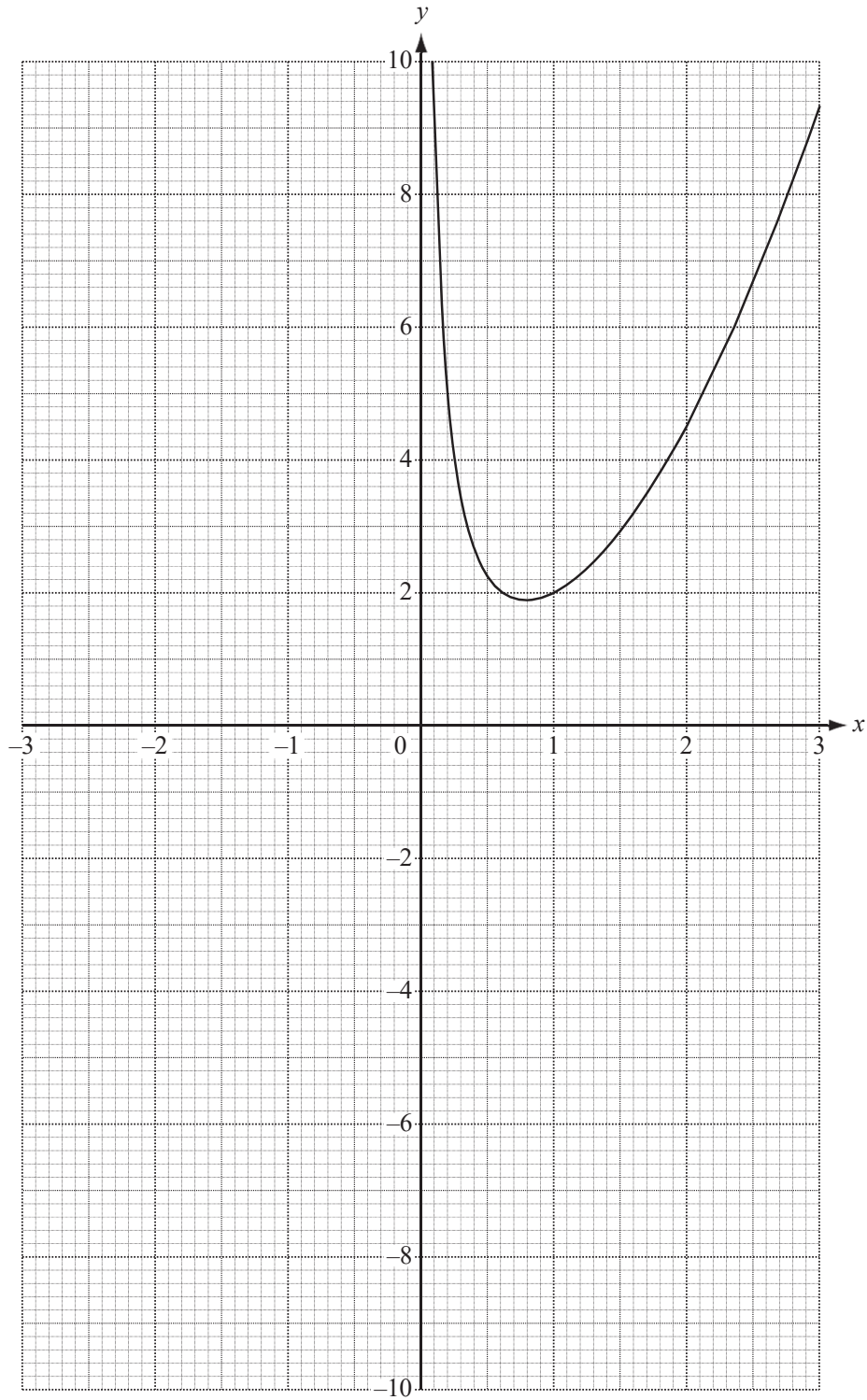
(d) (i) On the same grid, draw the graph of  $y = 3x - 2$  for  $-1 \leq x \leq 3.5$  [3]

(ii) The equation  $\frac{x^3}{2} - 3x - 1 = 3x - 2$  can be written in the form  $x^3 + ax + b = 0$ . [2]  
Find the values of  $a$  and  $b$ .

(iii) Use your graph to find the **positive** answers to  $\frac{x^3}{2} - 3x - 1 = 3x - 2$  for  $-3 \leq x \leq 3.5$ . [2]

### Question 3

The diagram shows the accurate graph of  $y = f(x)$  where  $f(x) = \frac{1}{x} + x^2$  for  $0 < x \leq 3$ .



(a) Complete the table for  $f(x) = \frac{1}{x} + x^2$ . [3]

$x$	-3	-2	-1	-0.5	-0.3	-0.1
$f(x)$		3.5	0	-1.8		

(b) On the grid, draw the graph of  $y = f(x)$  for  $-3 \leq x < 0$ . [3]

(c) By drawing a tangent, work out an estimate of the gradient of the graph where  $x = 2$ . [3]

(d) Write down the inequality satisfied by  $k$  when  $f(x) = k$  has three answers. [1]

(e) (i) Draw the line  $y = 1 - x$  on the grid for  $-3 \leq x \leq 3$ . [2]

(ii) Use your graphs to solve the equation  $1 - x = \frac{1}{x} + x^2$ . [1]

(f) (i) Rearrange  $x^3 - x^2 - 2x + 1 = 0$  into the form  $\frac{1}{x} + x^2 = ax + b$ , where  $a$  and  $b$  are integers. [2]

(ii) Write down the equation of the line that could be drawn on the graph to solve  $x^3 - x^2 - 2x + 1 = 0$ . [1]

## Question 4

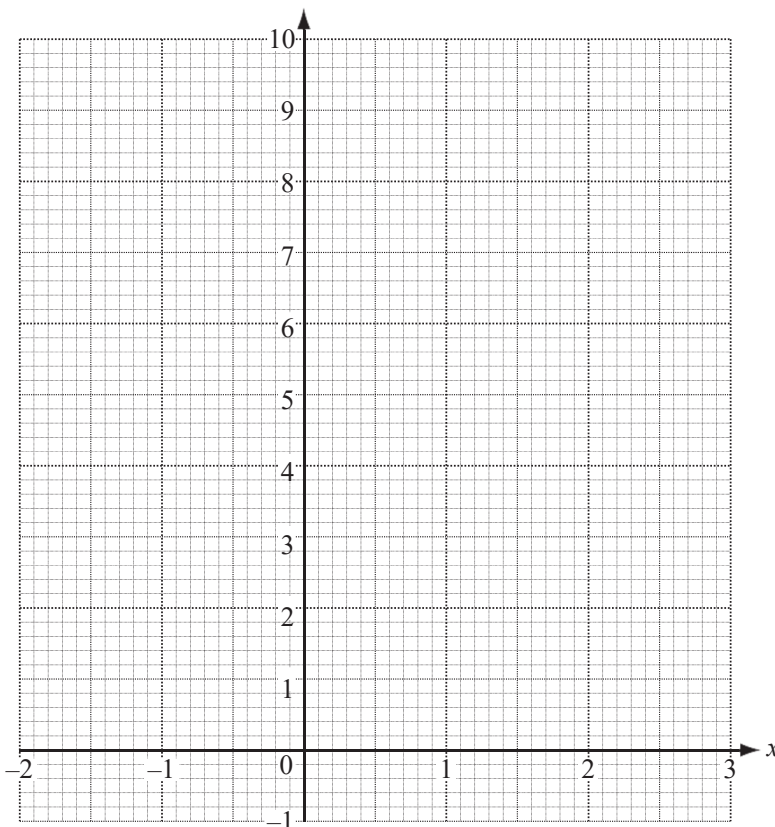
(a) Complete the table of values for  $y = 2^x$ .

[2]

$x$	-2	-1	0	1	2	3
$y$	0.25		1	2		8

(b) On the grid, draw the graph of  $y = 2^x$  for  $-2 \leq x \leq 3$ .

[3]





(c) (i) On the grid, draw the straight line which passes through the points (0, 2) and (3, 8). [1]

(ii) The equation of this line is  $y = mx + 2$ .

Show that the value of  $m$  is 2. [1]

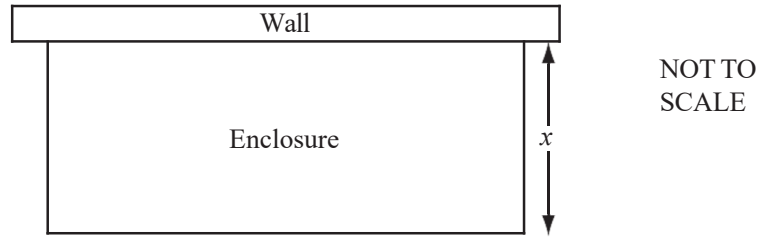
(iii) One answer to the equation  $2^x = 2x + 2$  is  $x = 3$ .

Use your graph to find the other answer. [1]

(d) Draw the tangent to the curve at the point where  $x = 1$ .

Use this tangent to calculate an estimate of the gradient of  $y = 2^x$  when  $x = 1$ . [3]

## Question 5



A farmer makes a rectangular enclosure for his animals.  
He uses a wall for one side and a total of 72 metres of fencing for the other three sides.

The enclosure has width  $x$  metres and area  $A$  square metres.

(a) Show that  $A = 72x - 2x^2$ . [2]

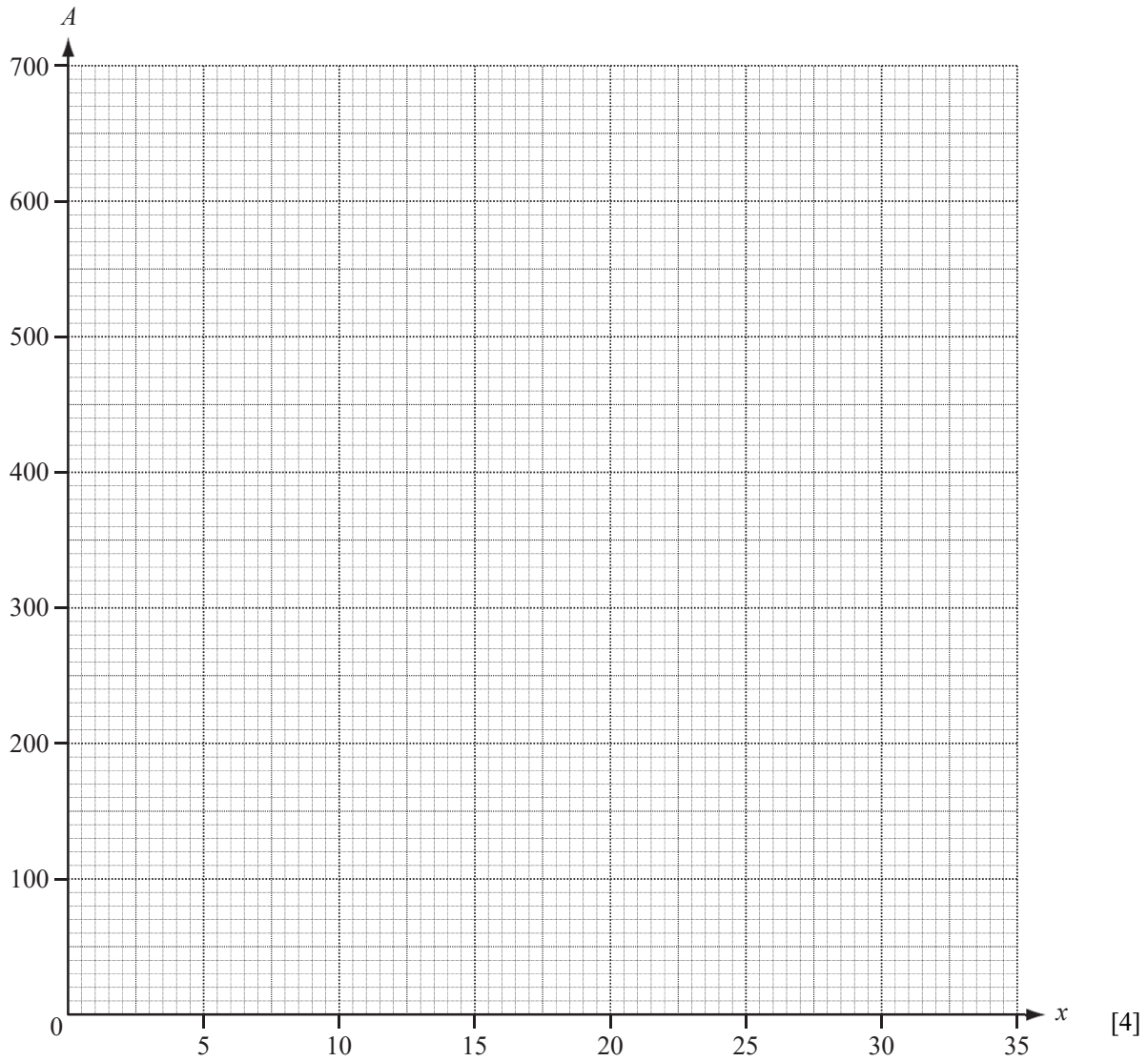
(b) Factorise completely  $72x - 2x^2$ . [2]

(c) Complete the table for  $A = 72x - 2x^2$ .

$x$	0	5	10	15	20	25	30	35
$A$	0	310	520			550	360	

[3]

(d) Draw the graph of  $A = 72x - 2x^2$  for  $0 \leq x \leq 35$  on the grid opposite.



(e) Use your graph to find

(i) the values of  $x$  when  $A = 450$ ,

(ii) the maximum area of the enclosure.

(f) Each animal must have at least  $12 \text{ m}^2$  for grazing.

Calculate the greatest number of animals that the farmer can keep in an enclosure which has an area of  $500 \text{ m}^2$ .

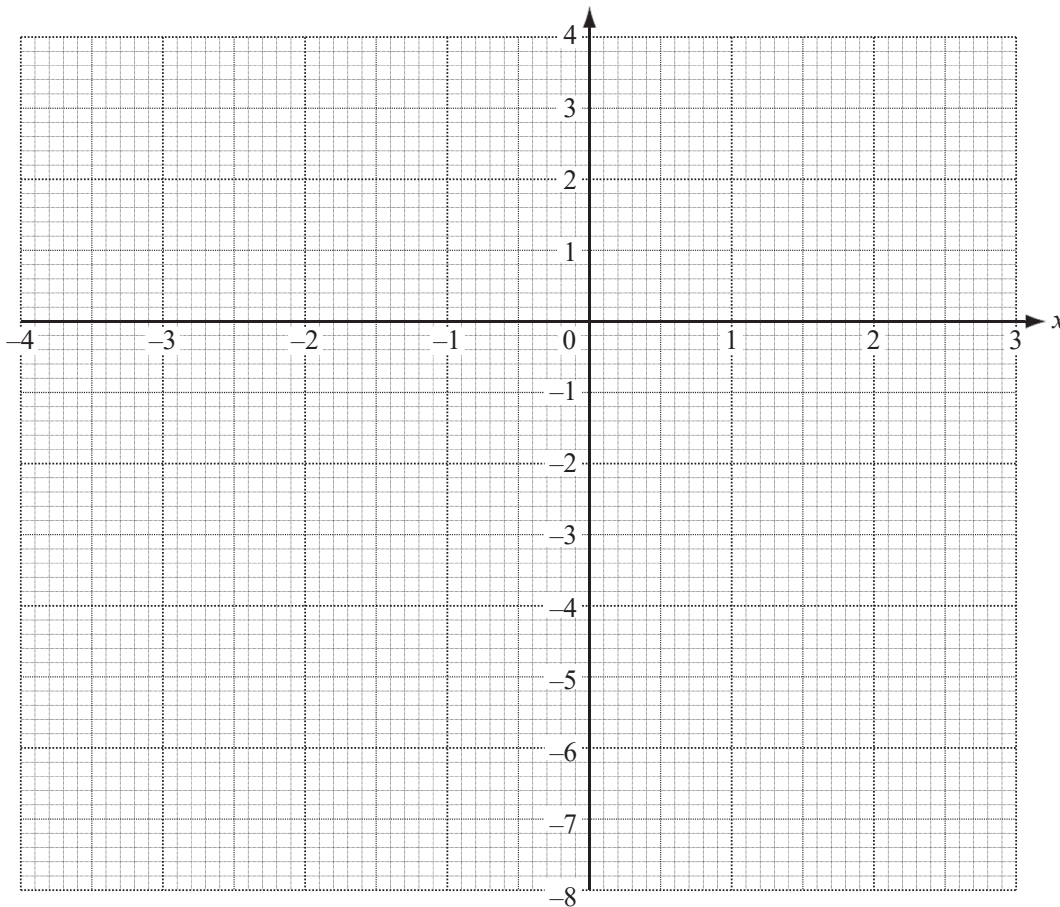
## Question 6

(a) Complete the table for the function  $f(x) = \frac{x^3}{10} + 1$

$x$	-4	-3	-2	-1	0	1	2	3
$f(x)$		-1.7	0.2	0.9	1	1.1	1.8	

[2]

(b) On the grid, draw the graph of  $y = f(x)$  for  $-4 \leq x \leq 3$ .



[4]

(c) Complete the table for the function  $g(x) = \frac{4}{x}$ ,  $x \neq 0$ .

$x$	-4	-3	-2	-1	1	2	3
$g(x)$	-1	-1.3				2	1.3

[2]

(d) On the grid, draw the graph of  $y = g(x)$  for  $-4 \leq x \leq -1$  and  $1 \leq x \leq 3$ . [3]

(e) (i) Use your graphs to solve the equation  $\frac{x^3}{10} + 1 = \frac{4}{x}$ . [2]

(ii) The equation  $\frac{x^3}{10} + 1 = \frac{4}{x}$  can be written as  $x^4 + ax + b = 0$ .

Find the values of  $a$  and  $b$ . [2]

## Question 7

(a)  $f(x) = 2^x$

Complete the table.

$x$	-2	-1	0	1	2	3	4
$y = f(x)$		0.5	1	2	4		

[3]

(b)  $g(x) = x(4 - x)$

Complete the table.

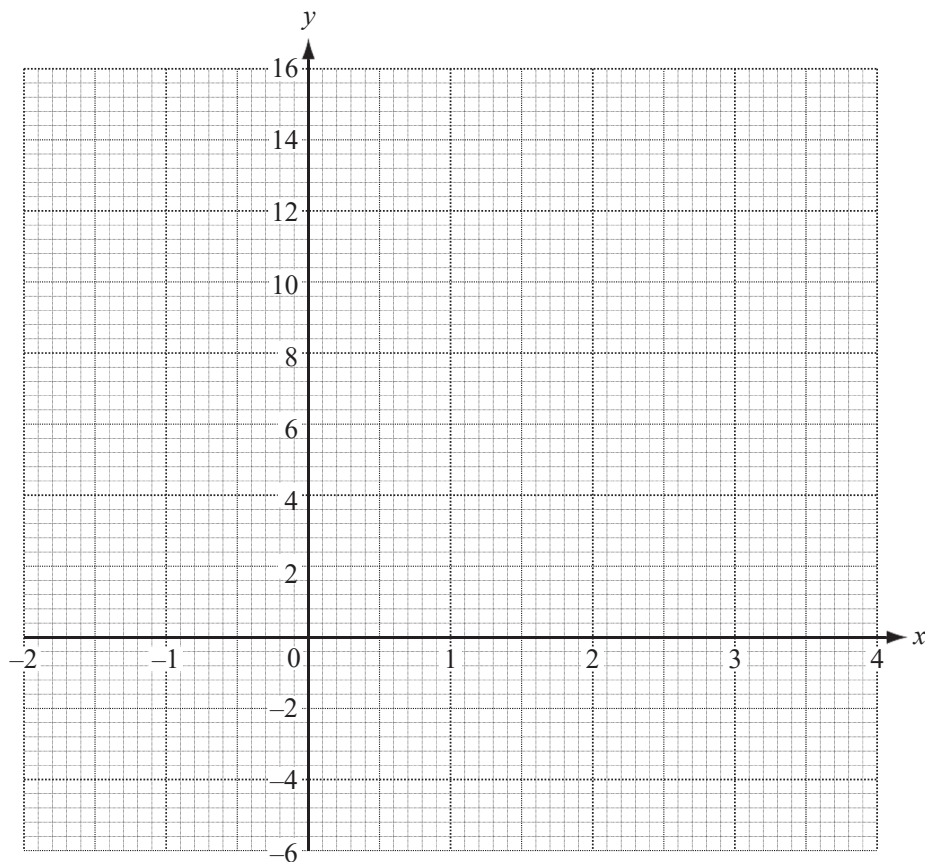
$x$	-1	0	1	2	3	4
$y = g(x)$		0	3		3	0

[2]

(c) On the grid, draw the graphs of

(i)  $y = f(x)$  for  $-2 \leq x \leq 4$ , [3]

(ii)  $y = g(x)$  for  $-1 \leq x \leq 4$ . [3]



(d) Use your graphs to solve the following equations.

(i)  $f(x) = 10$  [1]

(ii)  $f(x) = g(x)$  [2]

(iii)  $f^{-1}(x) = 1.7$  [1]