

Graphs of Functions

Types of Graphs / Quadratic Graphs / Drawing Graphs from Tables / Solving Equations Using Graphs / Trigonometric Graphs / Solving Trig Equations

Easy (18 questions)	/49
Medium (16 questions)	/61
Hard (21 questions)	/98
Total Marks	/208

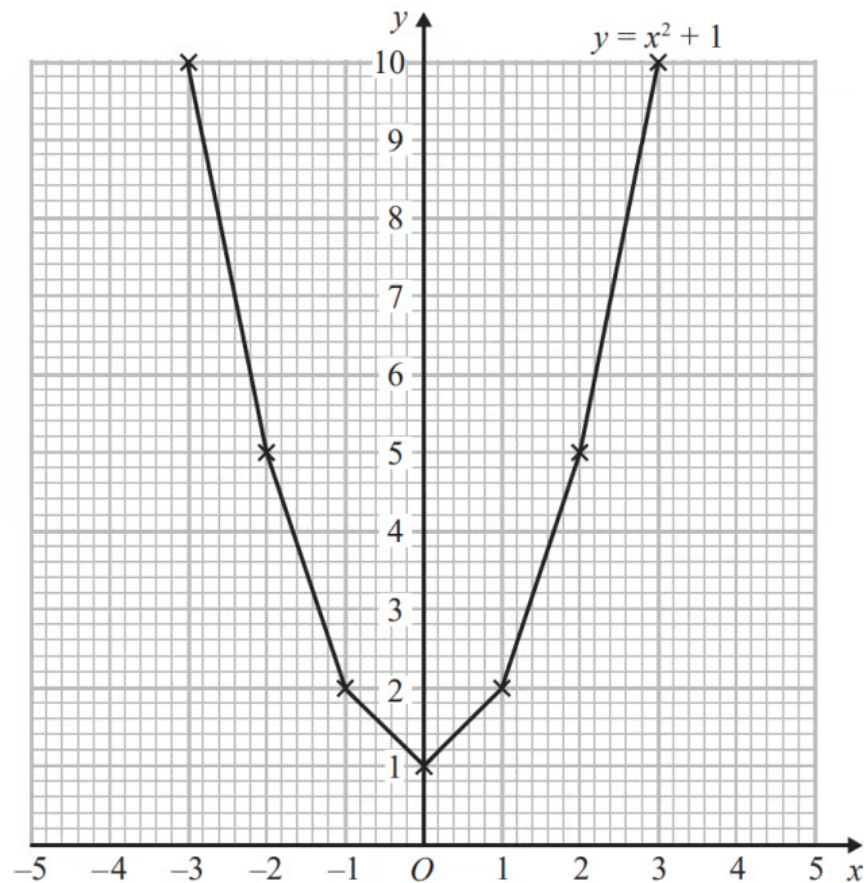
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Easy Questions

- 1 Brogan needs to draw the graph of $y = x^2 + 1$

Here is her graph.



Write down one thing that is wrong with Brogan's graph.

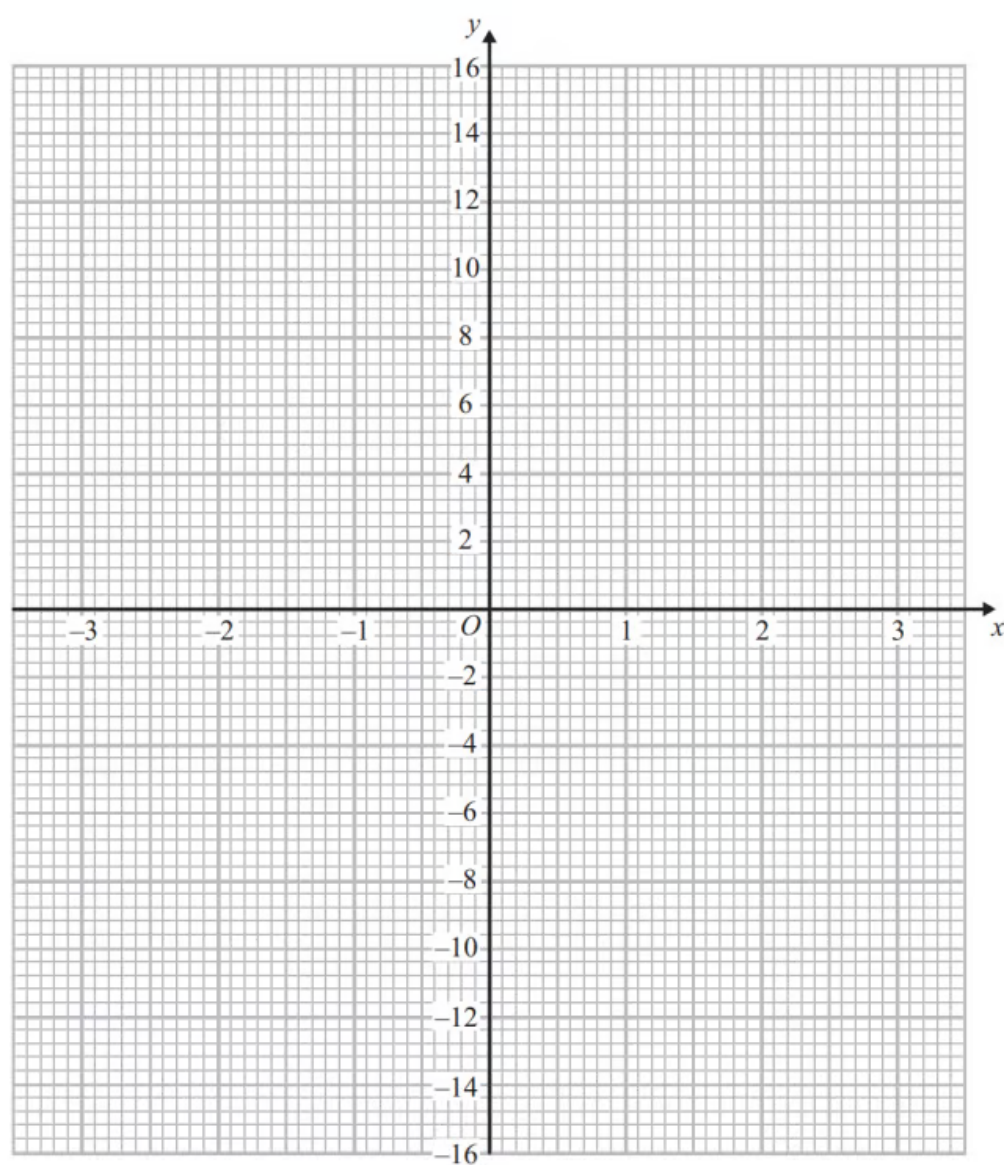
(1 mark)

- 2 (a) Complete the table of values for $y = x^3 - 4x$

x	-3	-2	-1	0	1	2	3
y			3	0			15

(2 marks)

(b) On the grid, draw the graph of $y = x^3 - 4x$ from $x = -3$ to $x = 3$



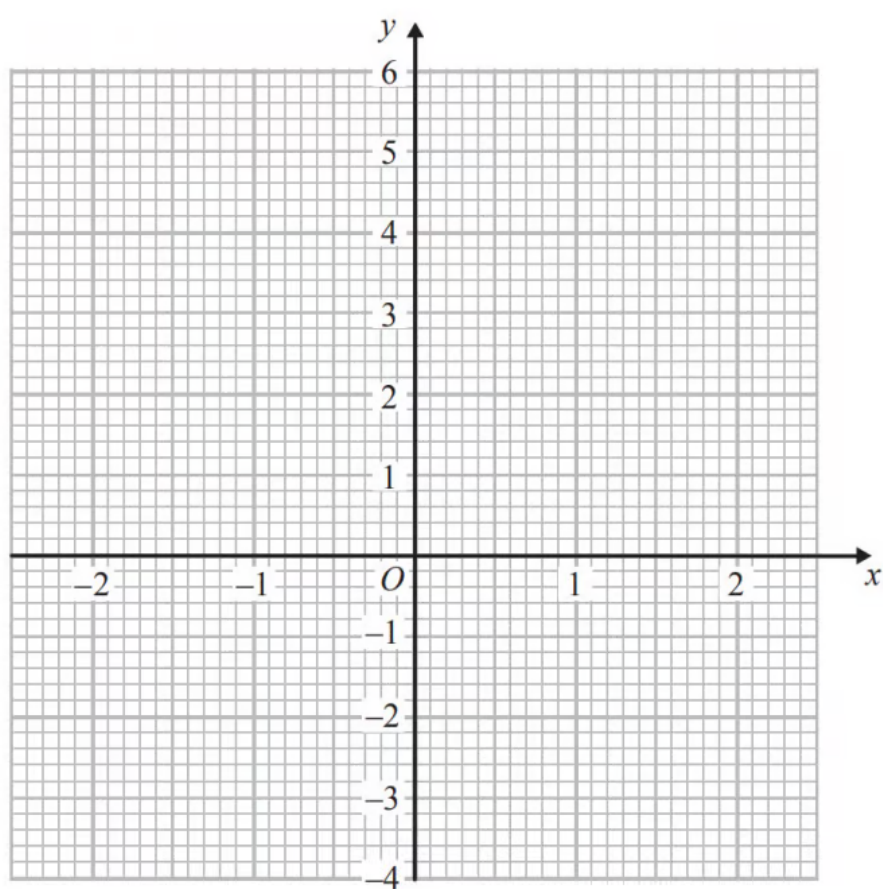
(2 marks)

3 (a) Complete the table of values for $y = x^3 - 3x + 1$

x	-2	-1	0	1	2
y		3			3

(2 marks)

(b) On the grid, draw the graph of $y = x^3 - 3x + 1$ for values of x from -2 to 2



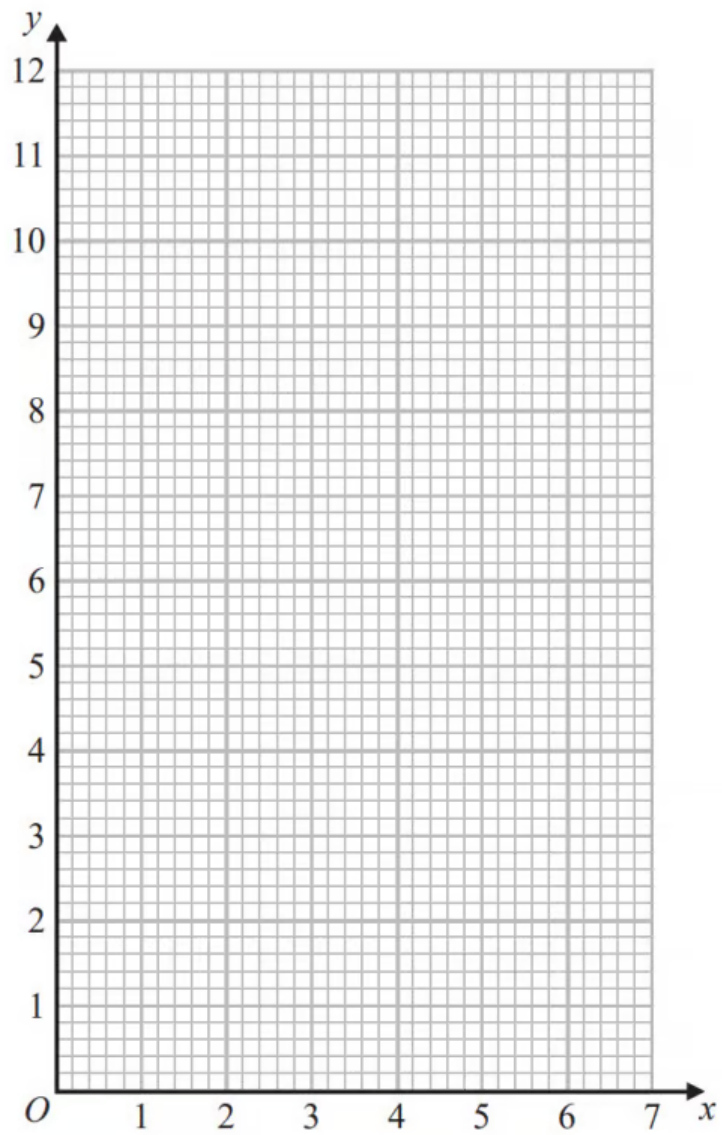
(2 marks)

4 (a) Complete the table of values for $y = \frac{6}{x}$

x	0.5	1	2	3	4	5	6
y		6	3		1.5		1

(2 marks)

(b)



On the grid, draw the graph of $y = \frac{6}{x}$ for $0.5 \leq x \leq 6$

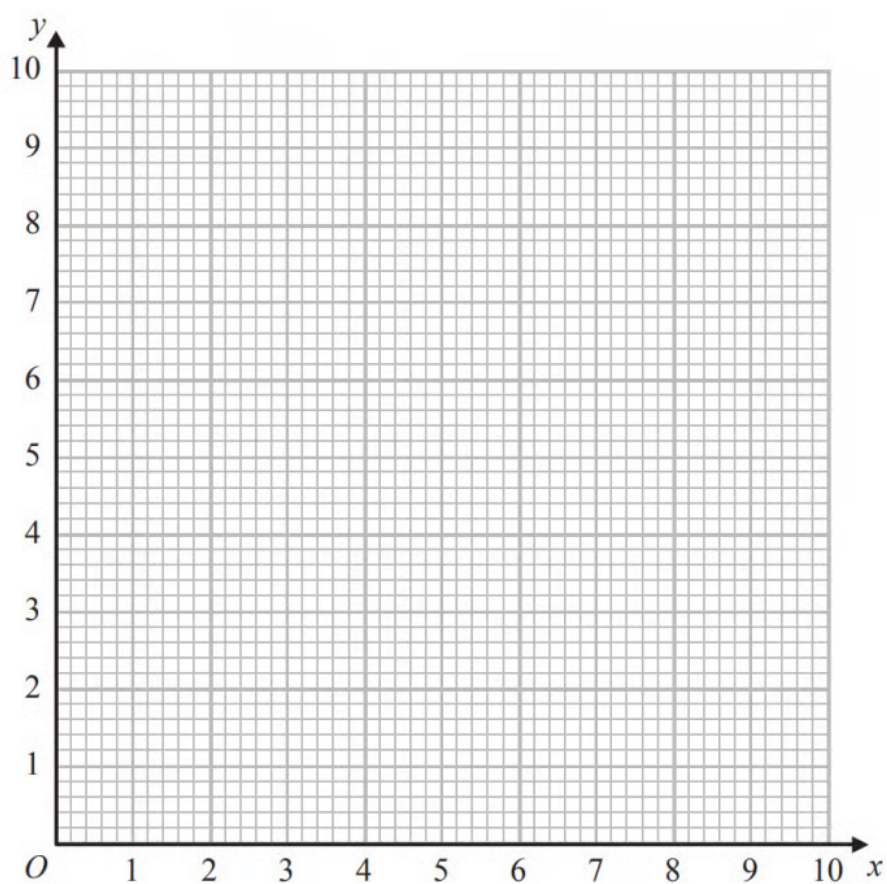
(2 marks)

5 (a) Complete the table of values for $y = \frac{4}{x}$

x	0.5	1	2	4	5	8
y		4	2			

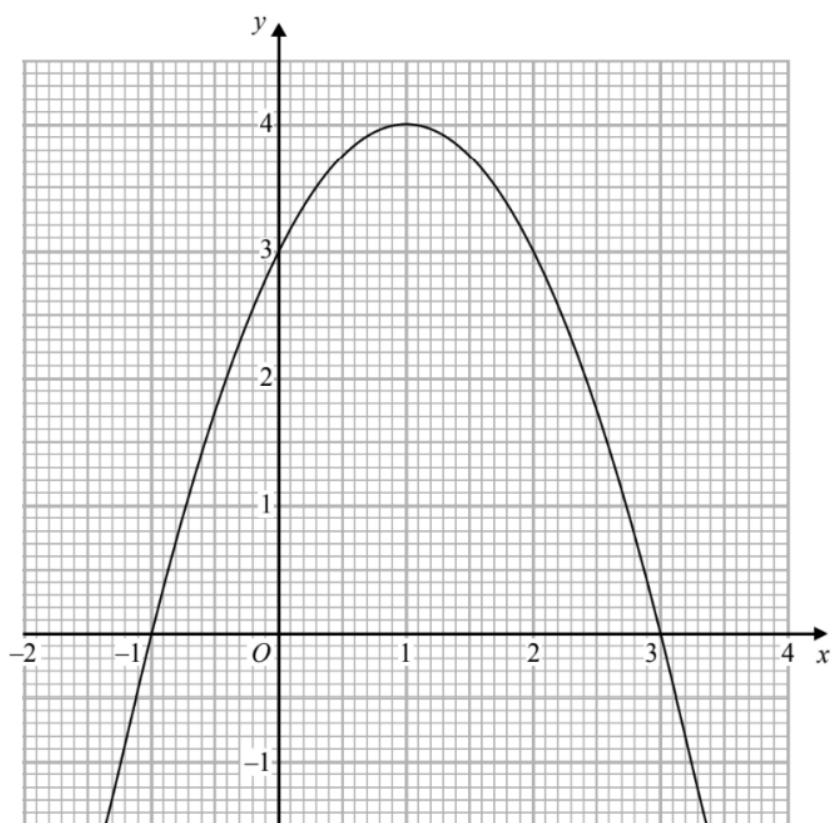
(2 marks)

(b) On the grid, draw the graph of $y = \frac{4}{x}$ for $0.5 \leq x \leq 8$



(2 marks)

6 (a) The graph of $y = f(x)$ is drawn on the grid.



Write down the coordinates of the turning point of the graph.

(1 mark)

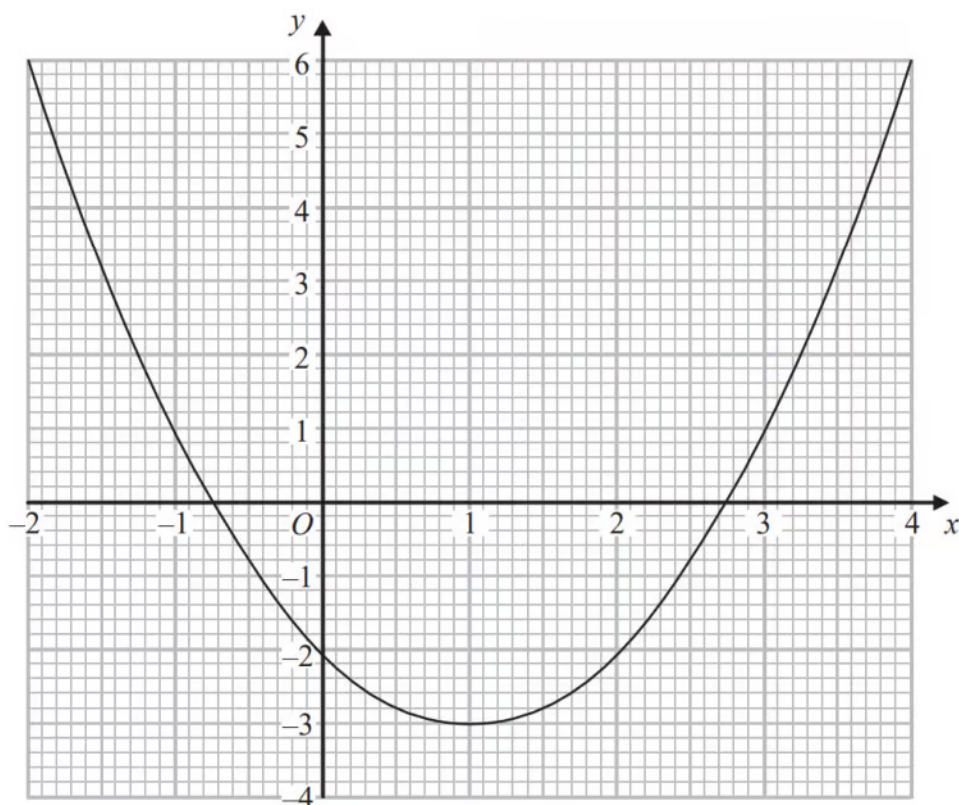
(b) Write down the roots of $f(x) = 2$

(1 mark)

(c) Write down the value of $f(0.5)$

(1 mark)

7 (a) The graph of $y = f(x)$ is drawn on the grid.



Write down the coordinates of the turning point of the graph.

(1 mark)

(b) Write down estimates for the roots of $f(x) = 0$

(1 mark)

(c) Use the graph to find an estimate for $f(1.5)$

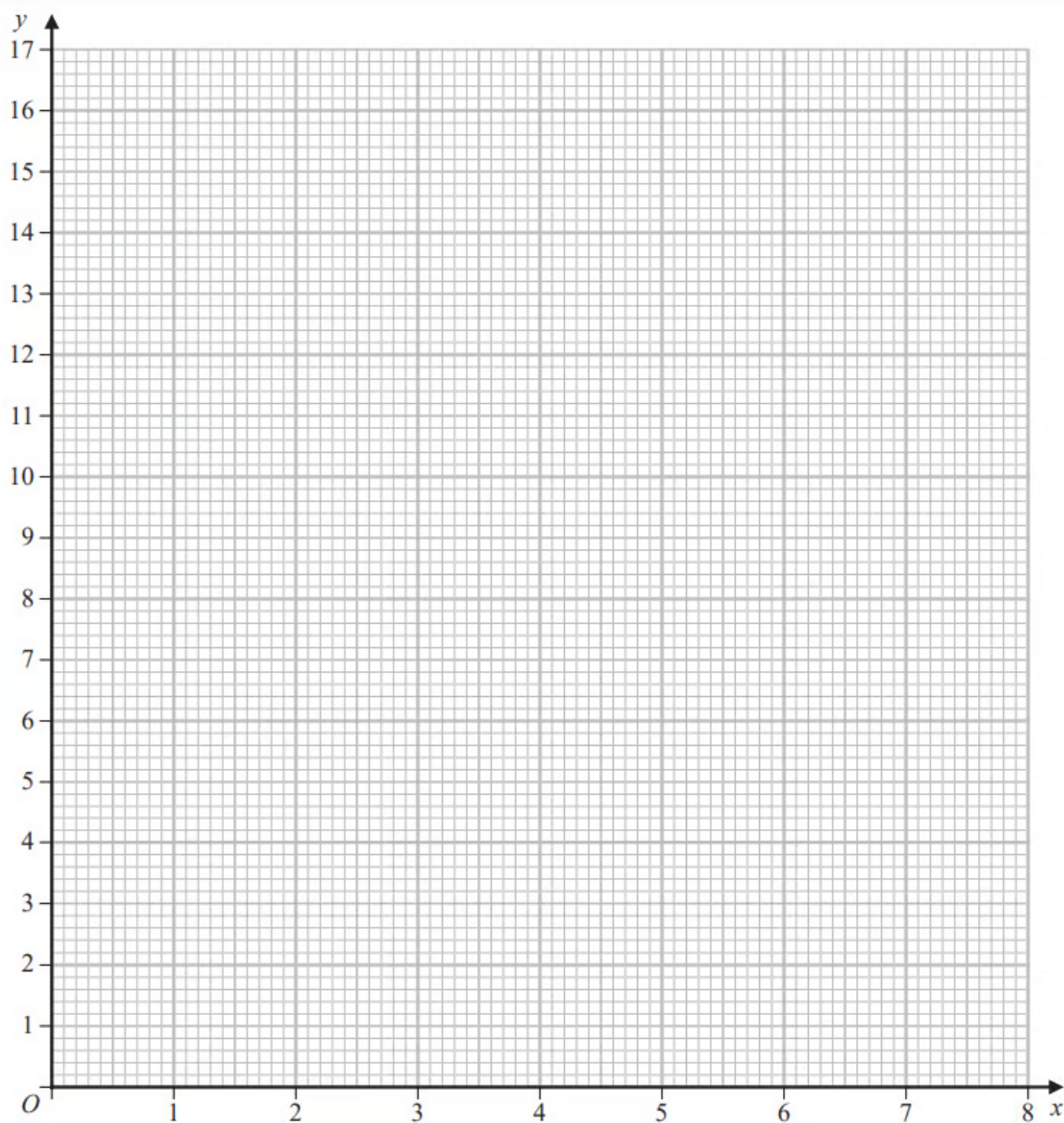
(1 mark)

8 (a) Complete the table of values for $y = \frac{1}{x}(x^2 + 4)$

x	0.25	0.5	1	2	4	8
y	16.25					8.5

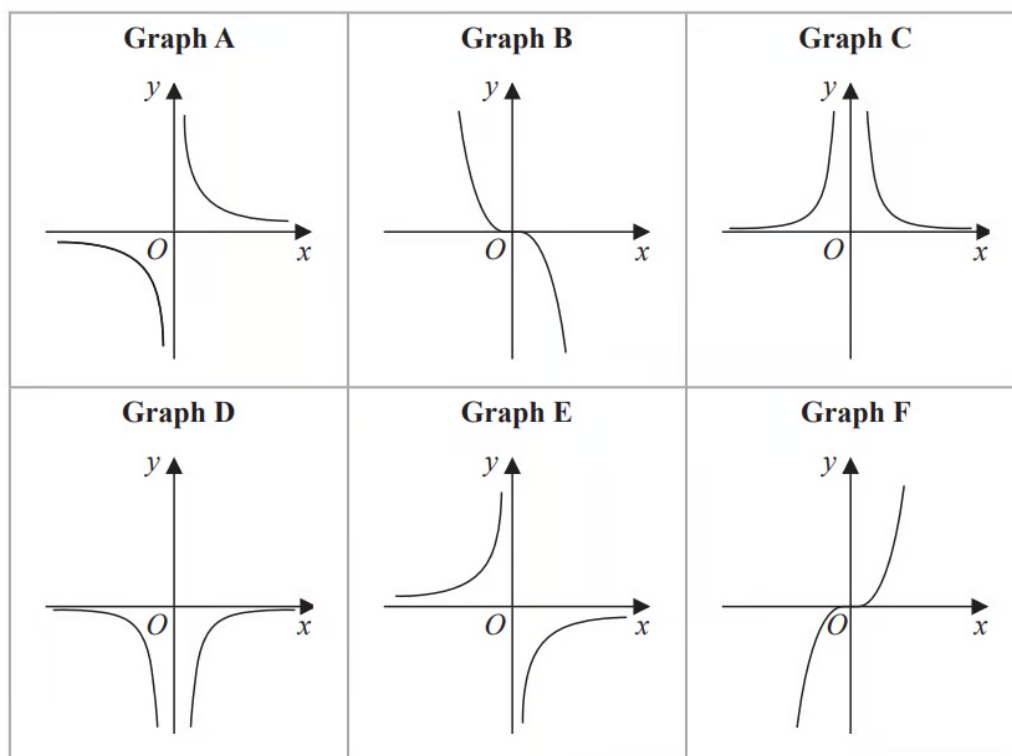
(2 marks)

(b) On the grid, draw the graph of $y = \frac{1}{x}(x^2 + 4)$ for $0.25 \leq x \leq 8$



(2 marks)

9 Here are six graphs.



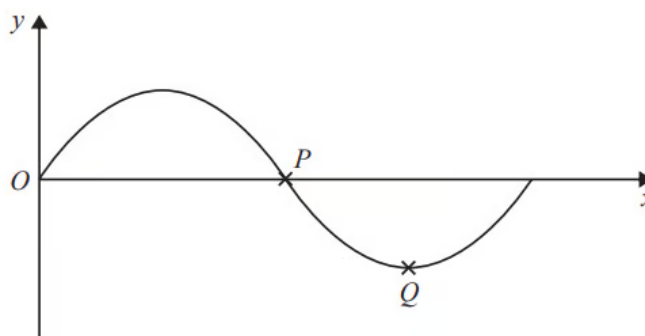
Complete the table below with the letter of the graph that could represent each given equation.

Write your answers on the dotted lines.

Equation	Graph
$y = \frac{2}{x^2}$	
$y = -\frac{1}{2}x^3$	
$y = -\frac{5}{x}$	

(3 marks)

10 (a) The diagram shows part of a sketch of the curve $y = \sin x^\circ$



Write down the coordinates of

i) the point P

[1]

ii) the point Q

[1]

(2 marks)

(b) Sketch the graph of $y = \tan x$ for $0^\circ \leq x \leq 360^\circ$

Show the coordinates of any points of intersection with the coordinate axes.



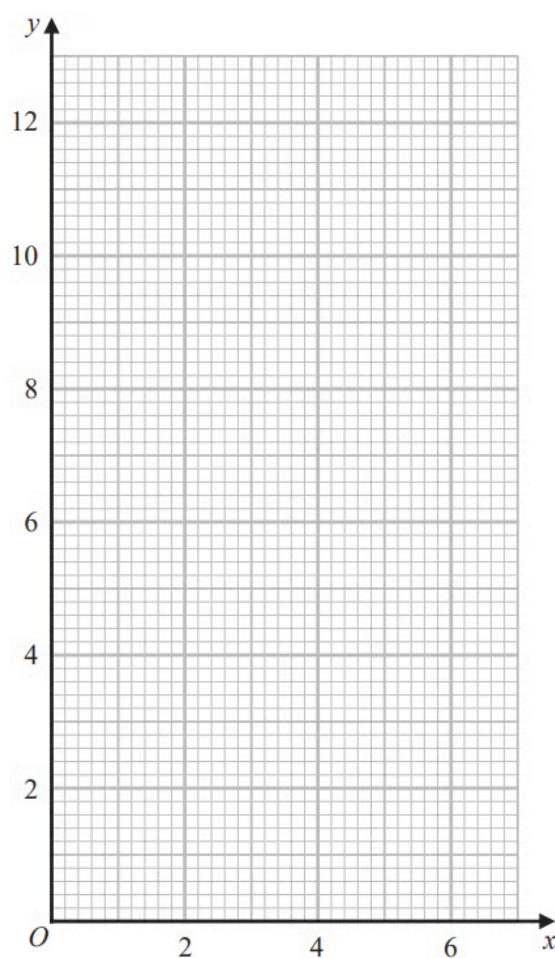
(2 marks)

11 (a) Complete the table of values for $y = \frac{6}{x}$

x	0.5	1	2	3	4	5	6
y		6		2			1

(2 marks)

(b) On the grid, draw the graph of $y = \frac{6}{x}$ for $0.5 \leq x \leq 6$



(2 marks)

12 Choose the point that is on the graph of $y = \frac{1}{x}$

- A. (-1, 1)
- B. (0.3, 3)
- C. (0.8, 0.2)
- D. (2.5, 0.4)

(1 mark)

13 The equation of a curve is $y = (x - 1)^2 - 6$

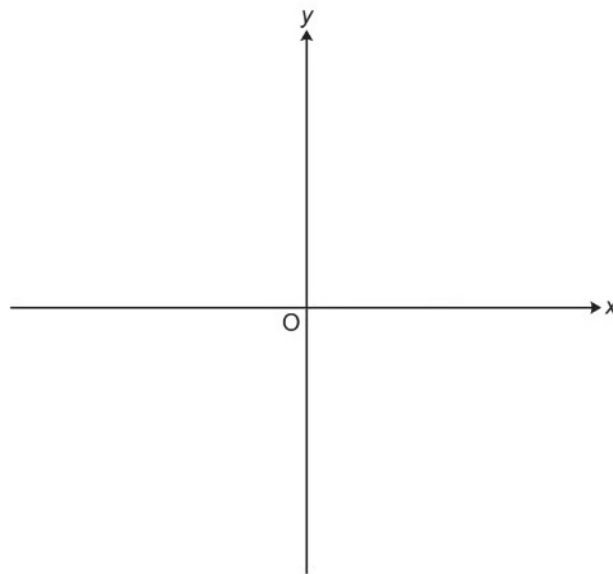
Choose the coordinates of the turning point.

- A. (-1, -6)
- B. (1, 6)
- C. (-1, 6)
- D. (1, -6)

(1 mark)

14 Sketch the graph of $y = 3^x$

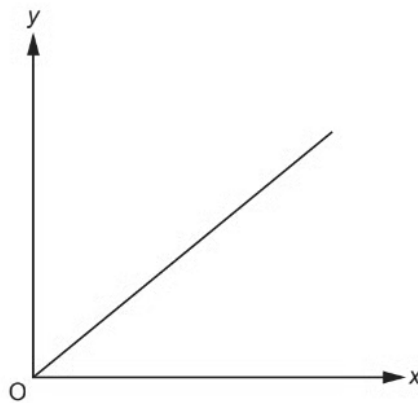
Give the value of the y-intercept.



(2 marks)

- 15 Shirley is asked to sketch a graph of $y = 5^x$ for $x > 0$

She produces the following.

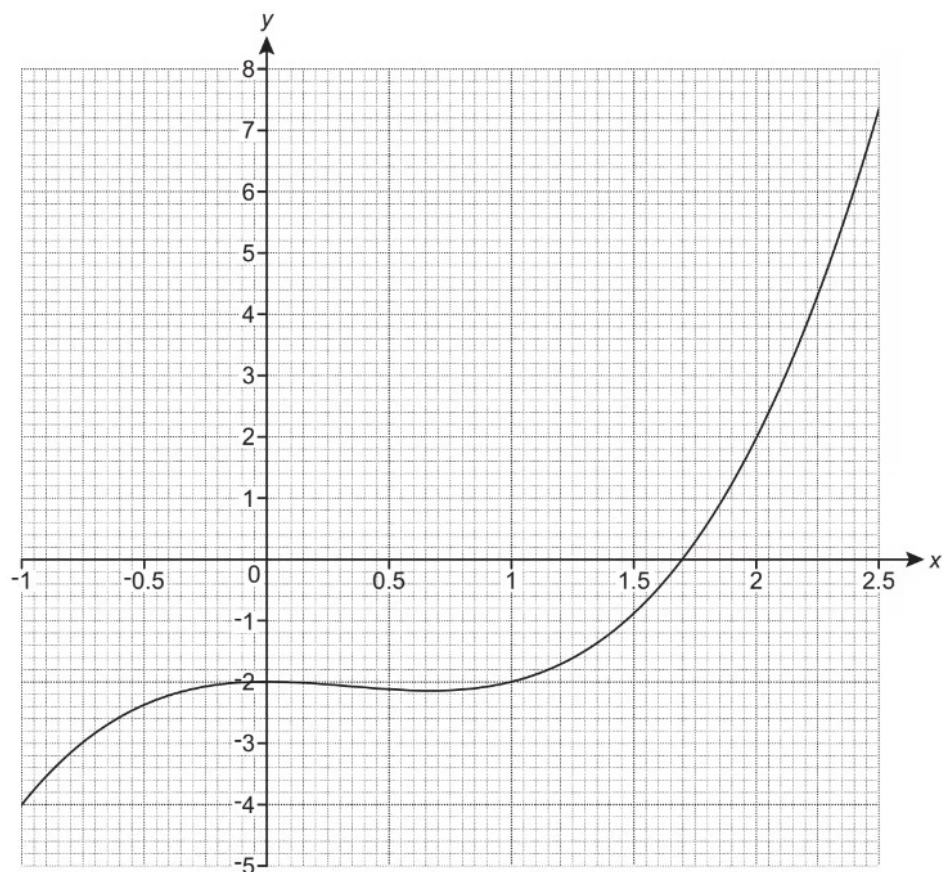


The graph has two errors.

How should they be corrected?

(2 marks)

16 The graph of $y = x^3 - x^2 - 2$ is drawn on the grid.

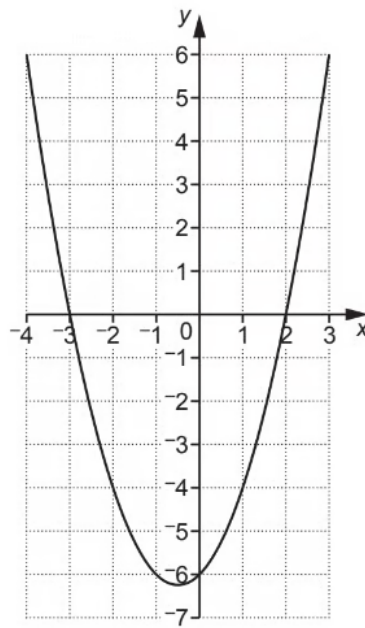


Use the graph to solve $x^3 - x^2 - 2 = 0$.
Give your answer correct to 1 decimal place.

$x =$

(1 mark)

17 Here is the graph of $y = x^2 + x - 6$.

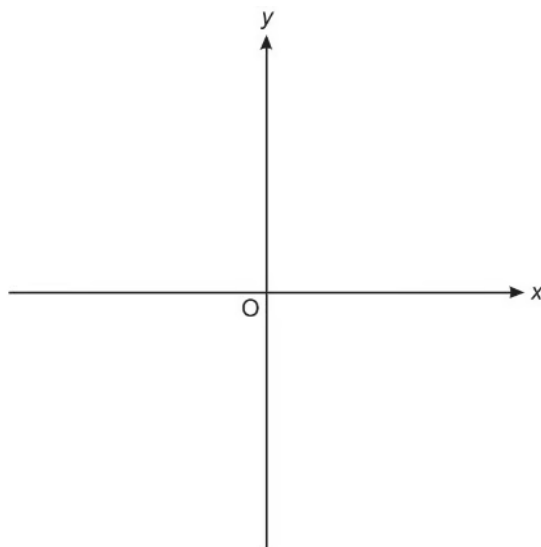


Use the graph to solve the equation $x^2 + x - 6 = 0$.

$x = \dots\dots\dots$ Or $x = \dots\dots\dots$

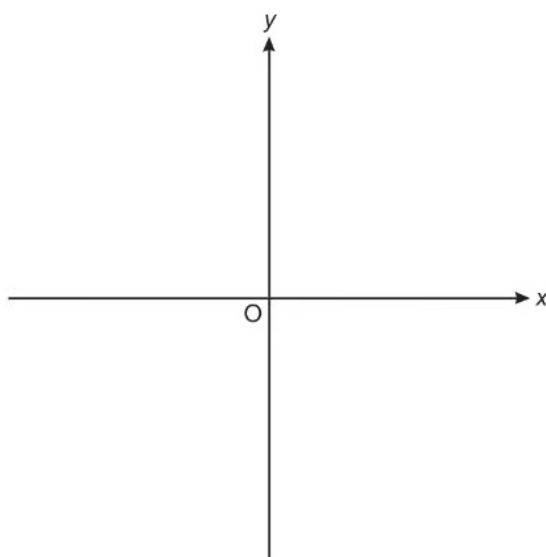
(2 marks)

- 18 i) Sketch a graph on the axes that shows that y is directly proportional to x .



[2]

- ii) Sketch a graph on the axes that shows $y = x^3$



[2]
(2 marks)

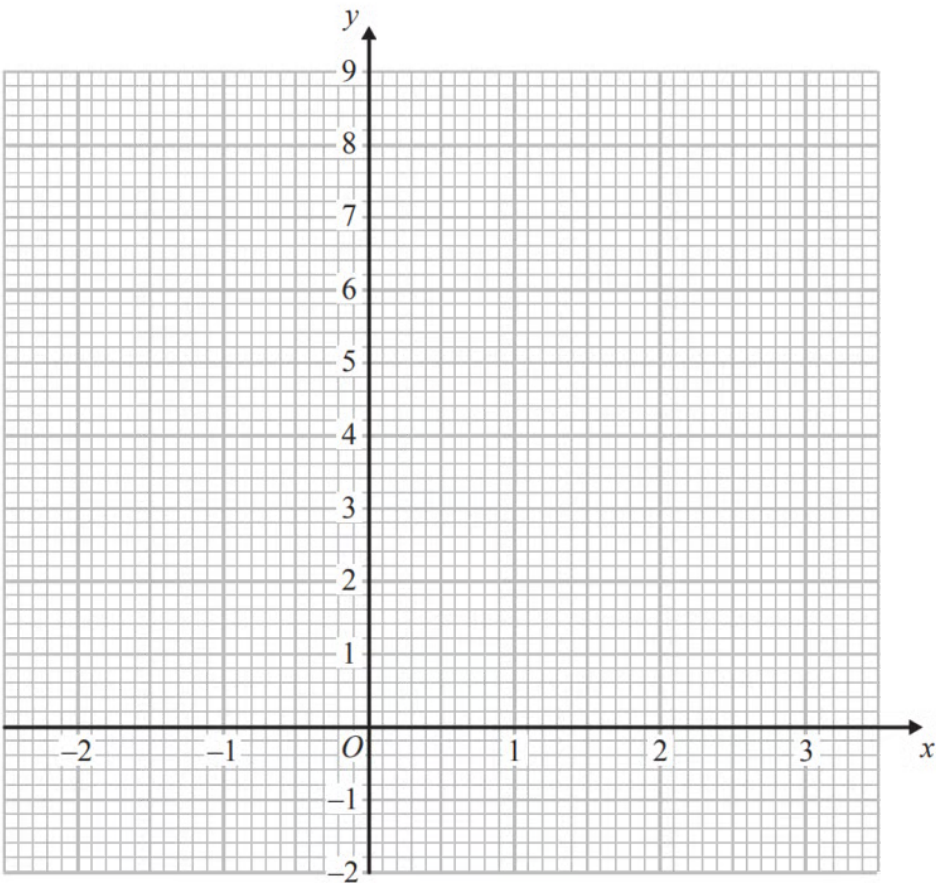
Medium Questions

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

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

(2 marks)

(b) On the grid, draw the graph of $y = 2^x$ for values of x from -2 to 3



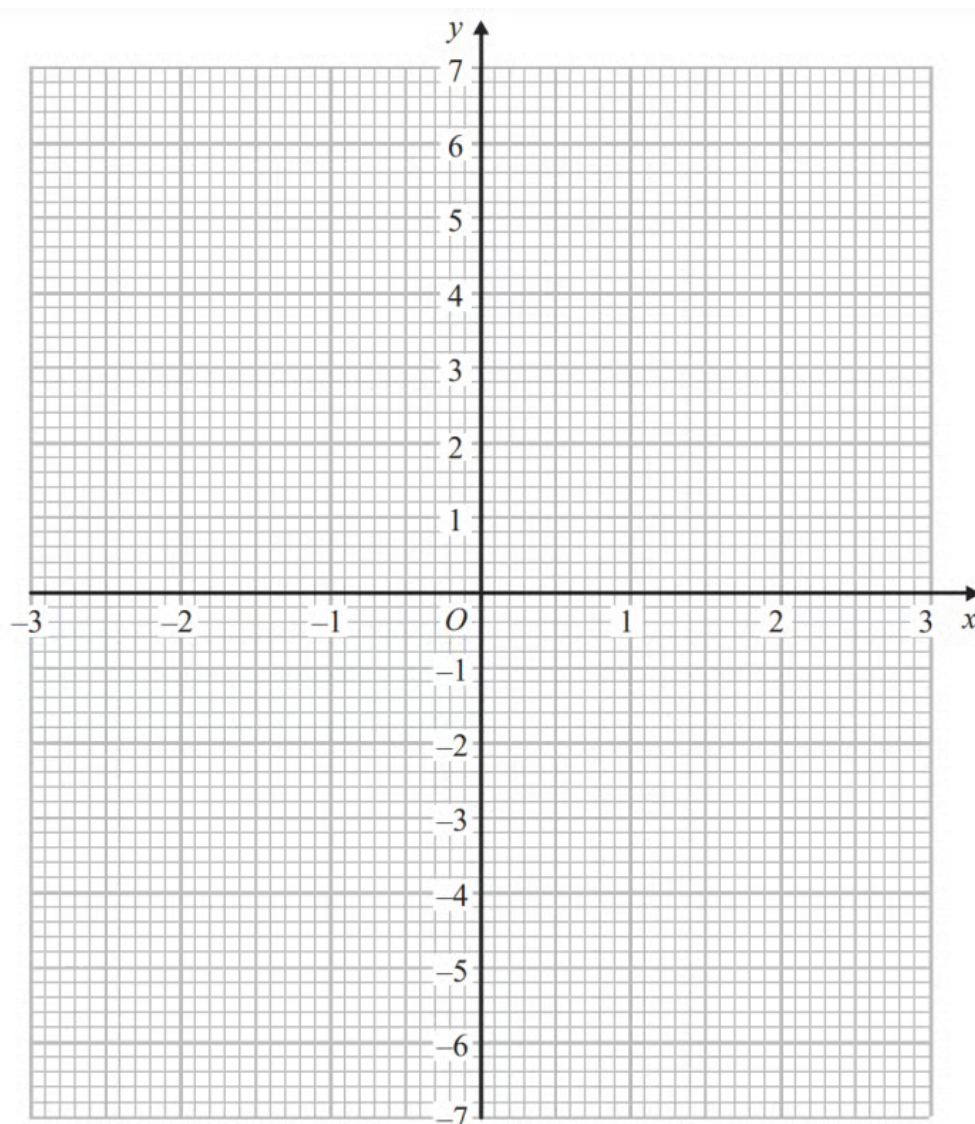
(2 marks)

2 (a) Complete the table of values for $y = x^2 - x - 6$

x	-3	-2	-1	0	1	2	3
y	6			-6			

(2 marks)

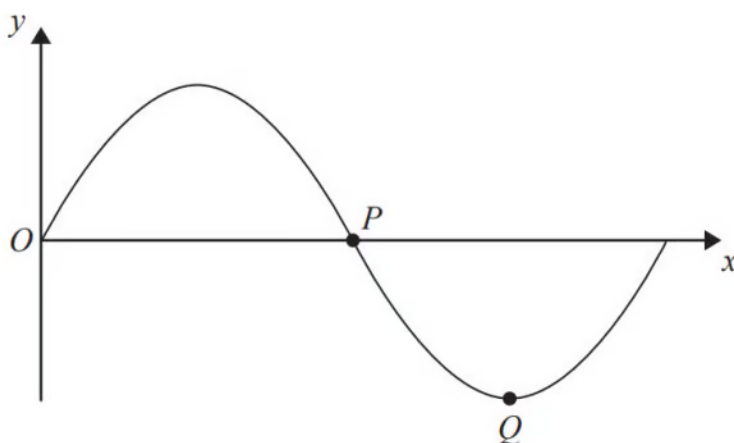
(b) On the grid, draw the graph of $y = x^2 - x - 6$ for values of x from -3 to 3



(2 marks)

- (c) Use your graph to find estimates of the solutions to the equation $x^2 - x - 6 = -2$
(2 marks)

3 (a) The diagram shows part of a sketch of the curve $y = \sin x^\circ$.



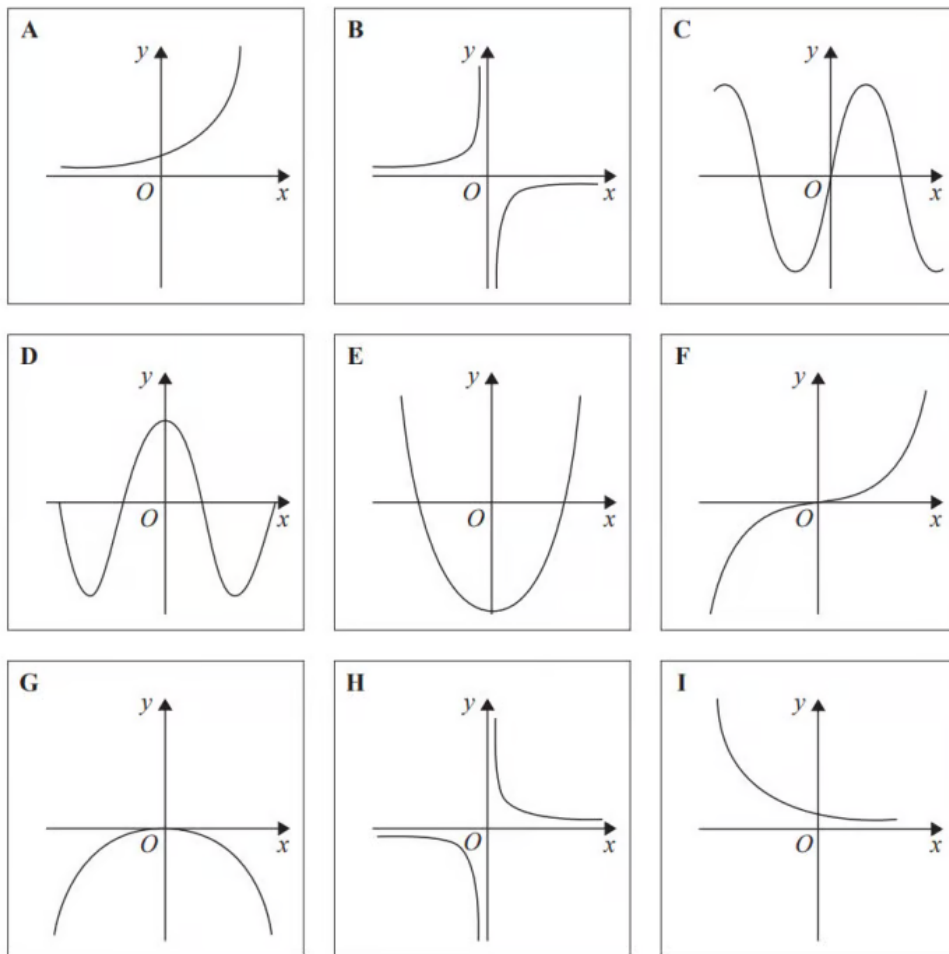
Write down the coordinates of the point P .

(1 mark)

(b) Write down the coordinates of the point Q .

(1 mark)

4 Here are some graphs.



In the table below, match each equation with the letter of its graph.

Equation	Graph
$y = \sin x$	
$y = x^3 + 4x$	
$y = 2^x$	
$y = \frac{4}{x}$	

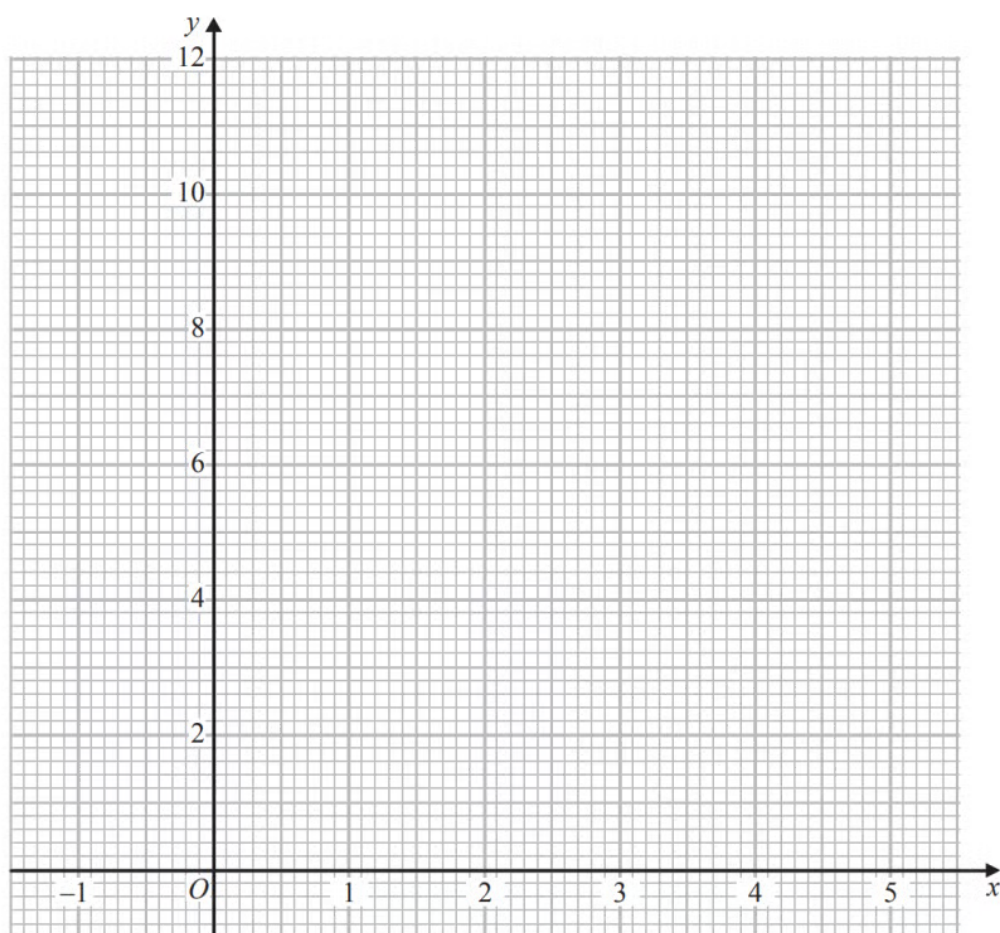
(3 marks)

5 (a) Complete the table of values for $y = x^2 - 3x + 2$

<i>x</i>	-1	0	1	2	3	4	5
<i>y</i>	6				2		12

(2 marks)

(b) On the grid, draw the graph of $y = x^2 - 3x + 2$ for values of x from -1 to 5



(2 marks)

(c) Find estimates for the solutions of the equation $x^2 - 3x + 2 = 4$

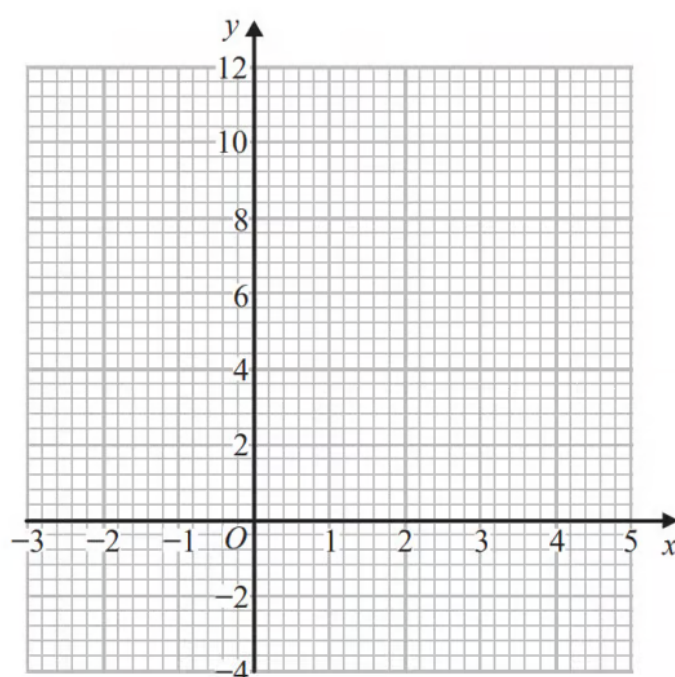
(2 marks)

6 (a) Complete the table of values for $y = x^2 - 3x + 1$

x	-2	-1	0	1	2	3	4
y	11		1	-1		1	

(2 marks)

(b) On the grid, draw the graph of $y = x^2 - 3x + 1$ for values of x from -2 to 4



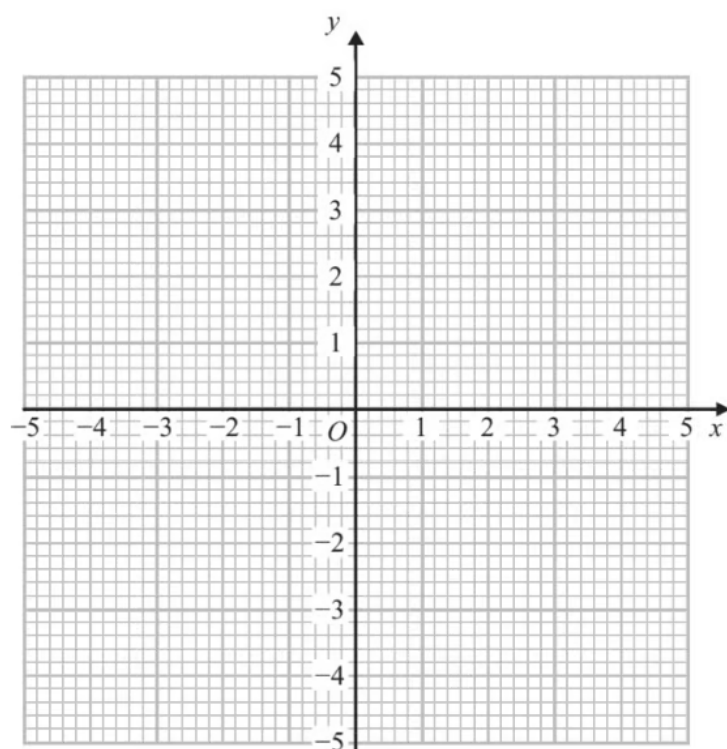
(2 marks)

(c) By drawing a suitable straight line on the grid, find estimates for the solutions of

$$x^2 - 3x + 1 = 3$$

(2 marks)

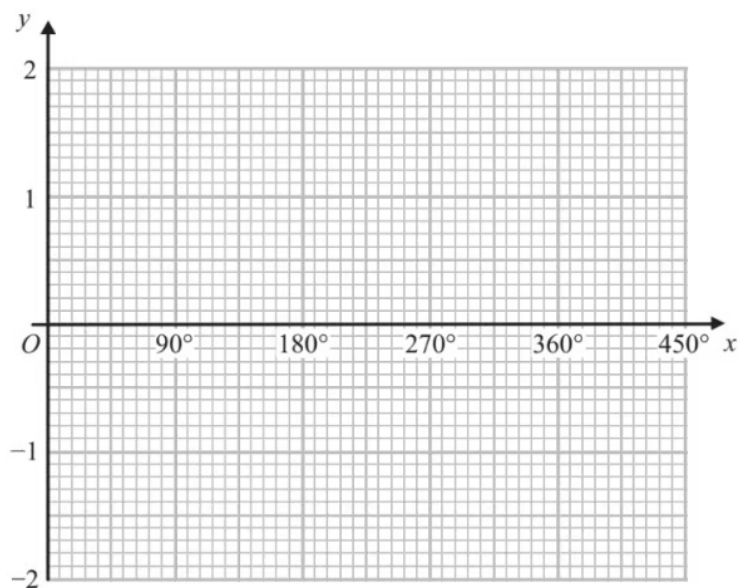
7 (a)



On the grid, draw the graph of $x^2 + y^2 = 4$

(2 marks)

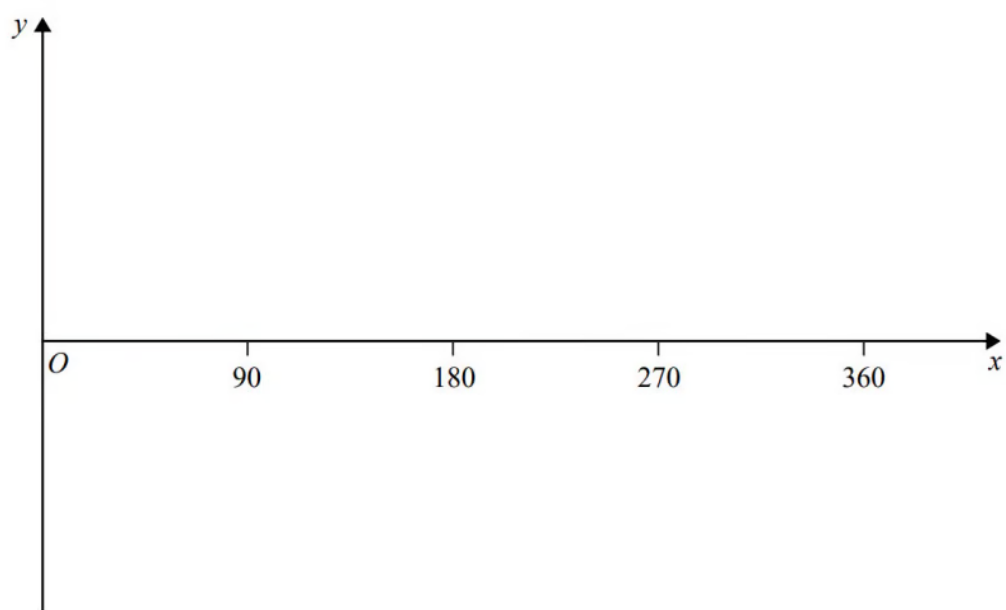
(b)



On the grid, sketch the graph of $y = \cos x$ for $0^\circ \leq x \leq 360^\circ$

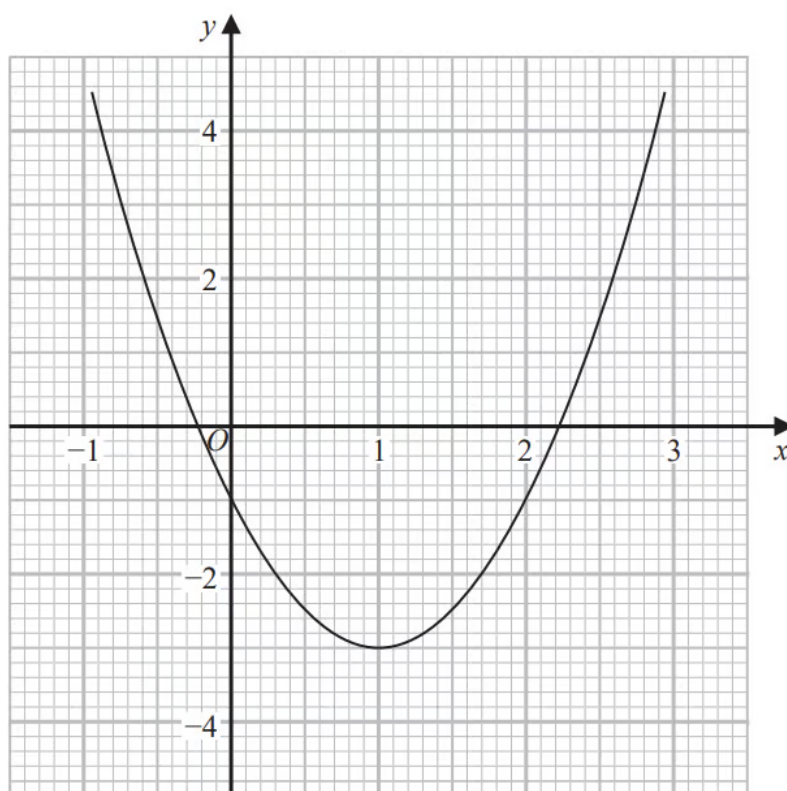
(2 marks)

8 Sketch the graph of $y = \cos x^\circ$ for $0 \leq x \leq 360$



(2 marks)

9 (a) Part of the graph of $y = 2x^2 - 4x - 1$ is shown on the grid.



Use the graph to find estimates for the solutions of the equation $2x^2 - 4x - 1 = 0$

Give your solutions correct to one decimal place.

(2 marks)

(b) By drawing a suitable straight line on the grid, find estimates for the solutions of the equation $x^2 - x - 1 = 0$

Show your working clearly.

Give your solutions correct to one decimal place.

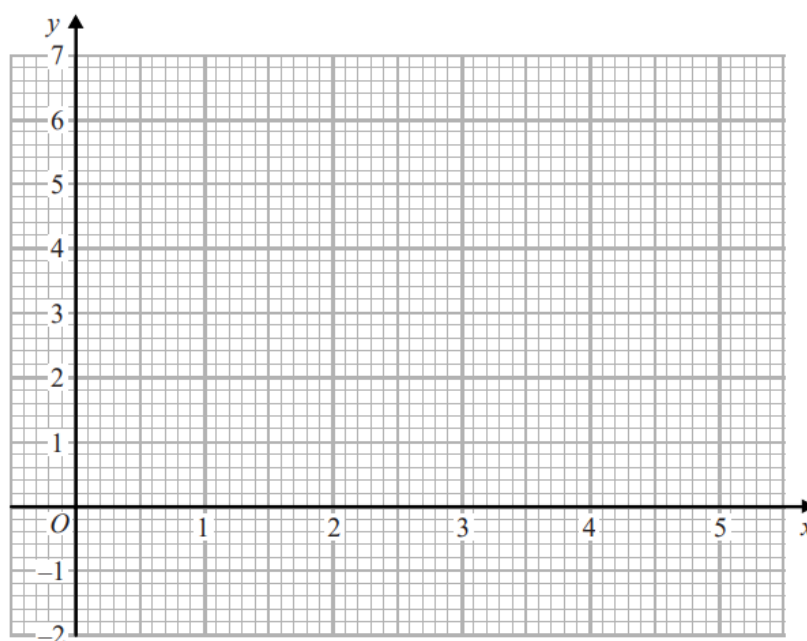
(3 marks)

10 (a) Complete the table of values for $y = x^2 - 5x + 6$

x	0	1	2	3	4	5
y	6		0	0	2	

(1 mark)

(b) On the grid, draw the graph of $y = x^2 - 5x + 6$ for $0 \leq x \leq 5$



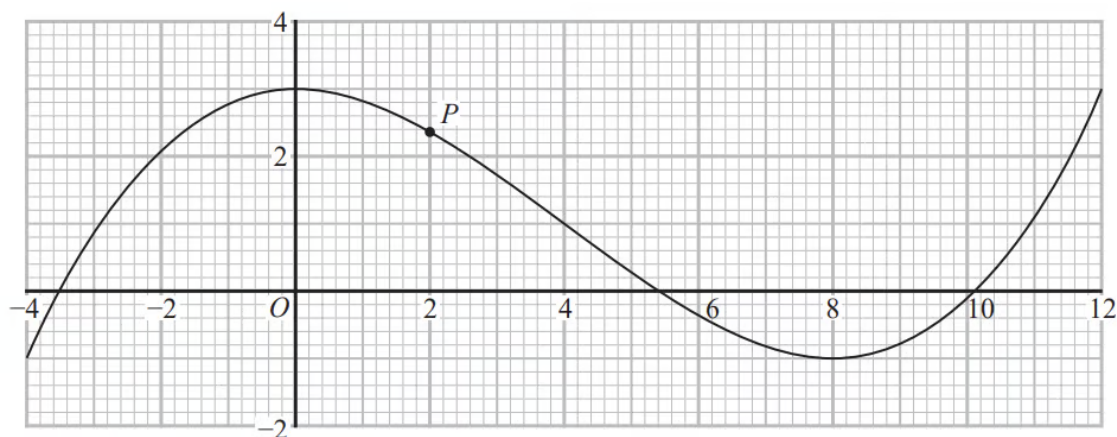
(2 marks)

(c) By drawing a suitable straight line on the grid, find estimates for the solutions of the equation

$$x^2 - 5x = x - 7$$

(3 marks)

11 The diagram shows the graph of $y = f(x)$ for $-4 \leq x \leq 12$



Note: Point P in the graph is from the previous question. It is not required for this question.

The equation $f(x) = k$ has exactly two different solutions for $-4 \leq x \leq 12$

Use the graph to find the two possible values of k .

(2 marks)

12 (a) Write $3x^2 - 12x + 7$ in the form $a(x + b)^2 + c$

(3 marks)

(b) The line **L** is the line of symmetry of the curve with equation $y = 3x^2 - 12x + 7$

Using your answer to part (a) or otherwise, write down an equation of **L**.

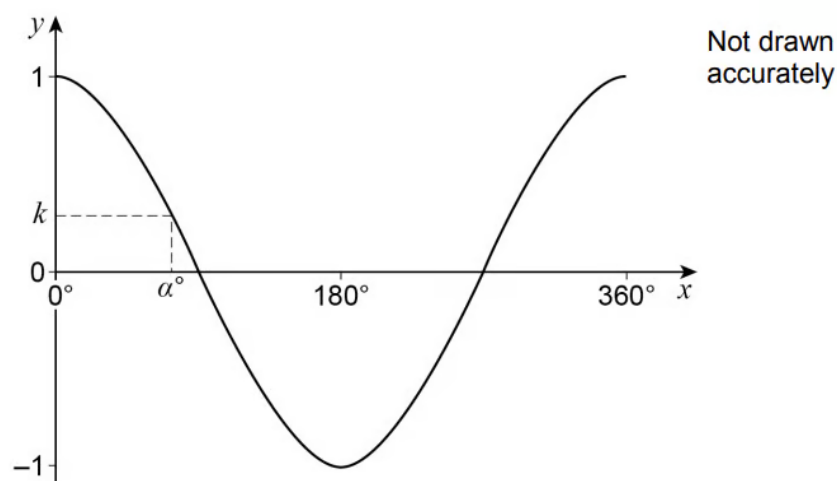
(1 mark)

13 Choose the point that lies on the curve $y = x^2 - 4x + 1$

- A.** $(-1, 4)$
- B.** $(-1, -4)$
- C.** $(-1, -2)$
- D.** $(-1, 6)$

(1 mark)

14 (a) Here is a sketch of $y = \cos x$ for values of x from 0° to 360°



α° is an acute angle. $\cos \alpha^\circ = k$

Choose the value of $\cos (180^\circ - \alpha^\circ)$

- A.** $1 - k$
- B.** k
- C.** $-k$
- D.** $-1 - k$

(1 mark)

(b) Circle the value of $\cos (360^\circ + \alpha^\circ)$

$k - 1$	$k + 1$	$-k$	k
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(1 mark)

15 (a) The number of gannets on an island is assumed to follow this exponential growth model.

$$N = 0.45 \times 1.07^x$$

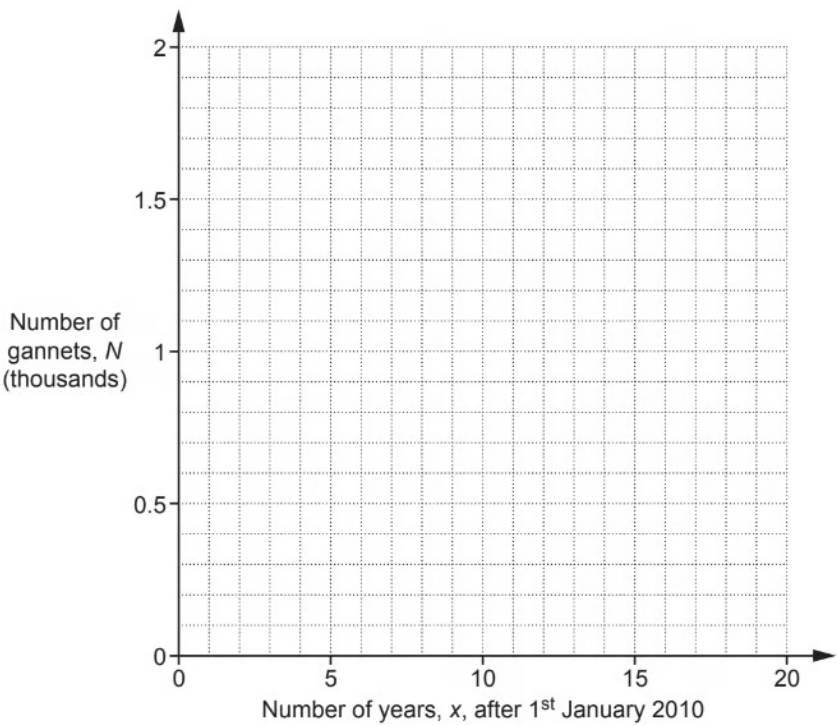
N is the number of gannets, in thousands. x is the number of years after 1st January 2010.

Complete the table for $N = 0.45 \times 1.07^x$.

x	0	5	10	15	20
N	0.45	0.63		1.24	

(2 marks)

(b) Draw the graph of $N = 0.45 \times 1.07^x$

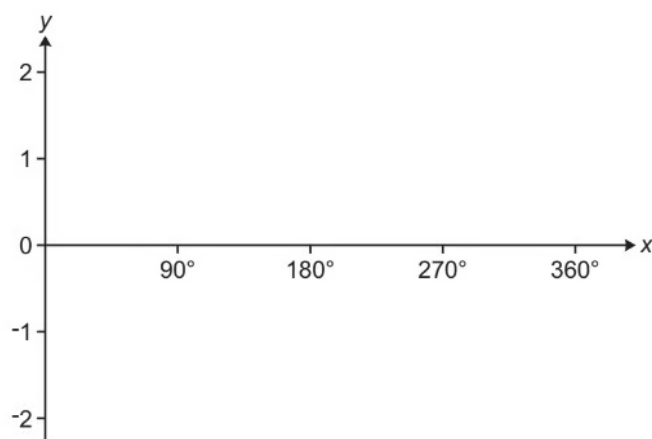


(2 marks)

(c) Use the graph to find **the year** when the gannet population is predicted to reach 1000.

(2 marks)

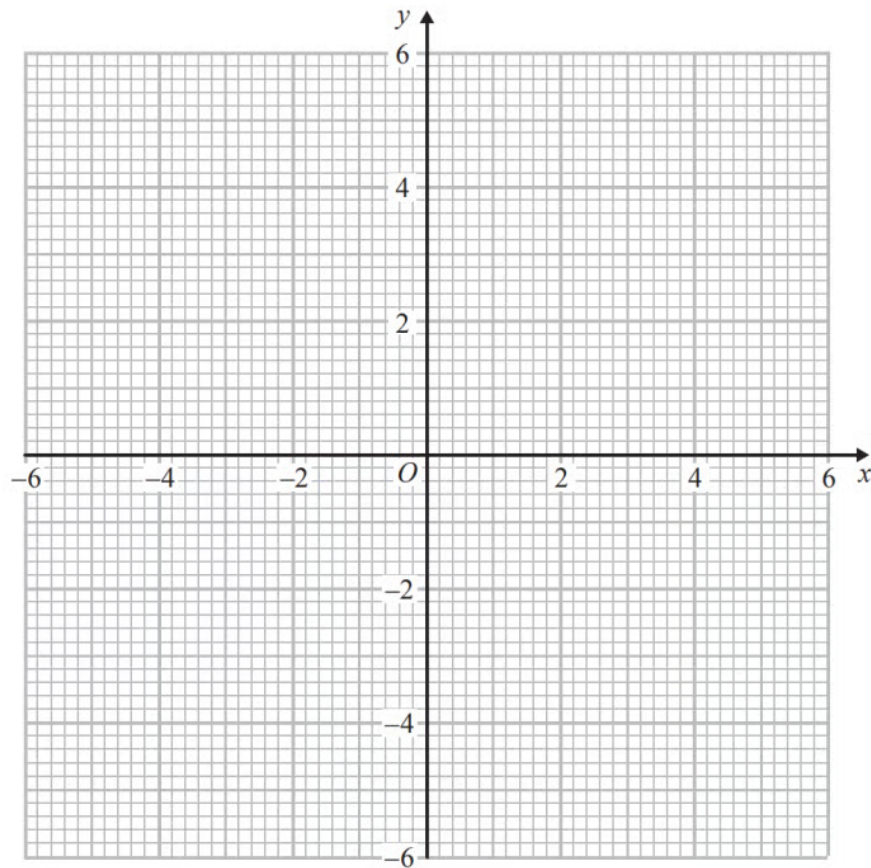
16 Sketch the graph of $y = \sin x$ for $0^\circ < x < 360^\circ$



(2 marks)

Hard Questions

1 (a) On the grid, construct the graph of $x^2 + y^2 = 16$



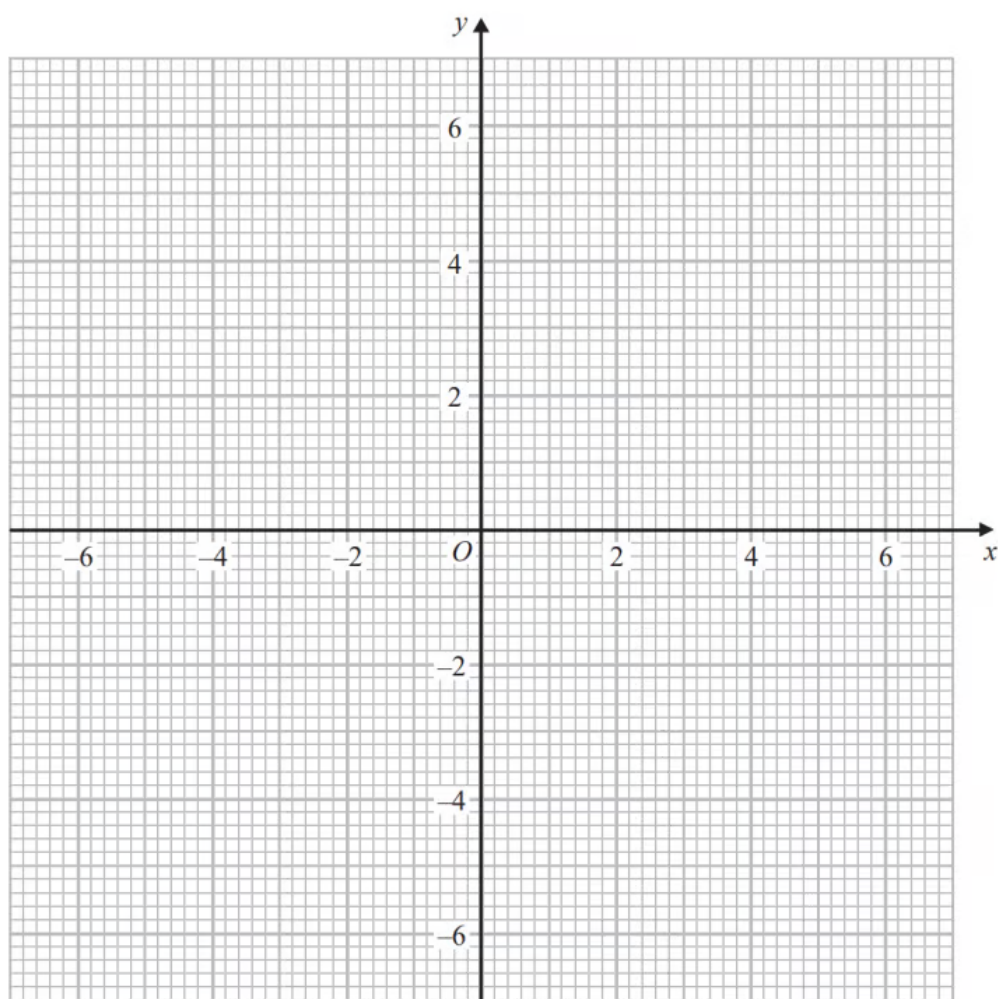
(2 marks)

(b) Find estimates for the solutions of the simultaneous equations

$$\begin{aligned}x^2 + y^2 &= 16 \\y &= 2x + 1\end{aligned}$$

(3 marks)

2 (a) On the grid, draw the graph of $x^2 + y^2 = 12.25$



(2 marks)

(b) Hence find estimates for the solutions of the simultaneous equations

$$x^2 + y^2 = 12.25$$

$$2x + y = 1$$

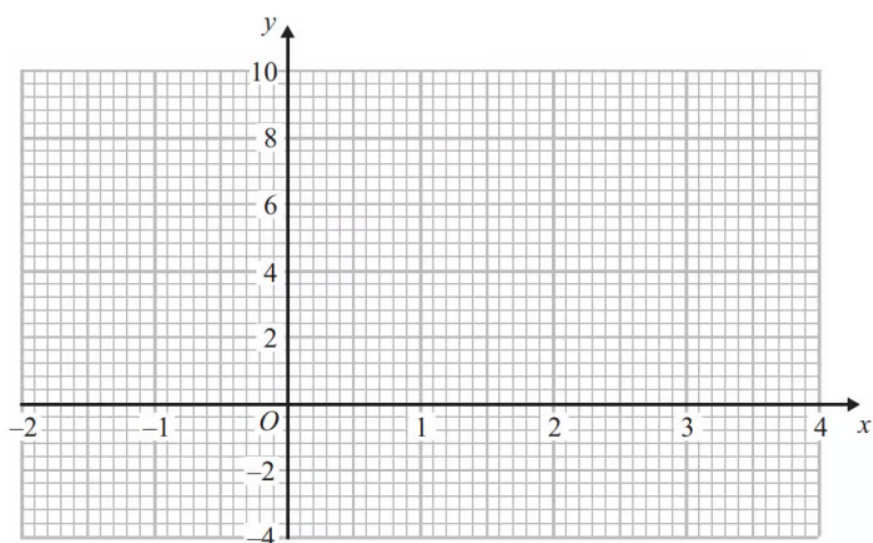
(3 marks)

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

x	-2	-1	0	1	2	3	4
y		3	0			3	

(2 marks)

(b) On the grid, draw the graph of $y = x^2 - 2x$ for values of x from -2 to 4



(2 marks)

(c) Solve $x^2 - 2x - 2 = 1$

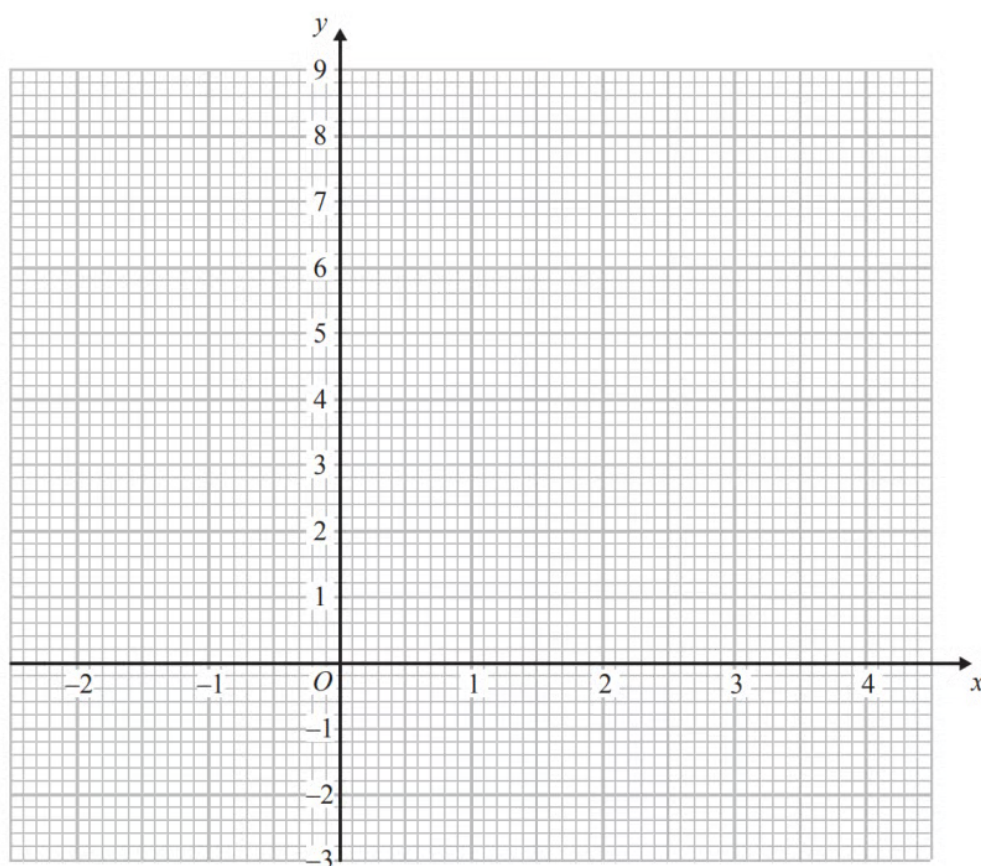
(2 marks)

4 (a) Complete the table of values for $y = x^2 - 2x - 1$

x	-2	-1	0	1	2	3	4
y	7			-2	-1		

(2 marks)

(b) On the grid, draw the graph of $y = x^2 - 2x - 1$ for values of x from -2 to 4

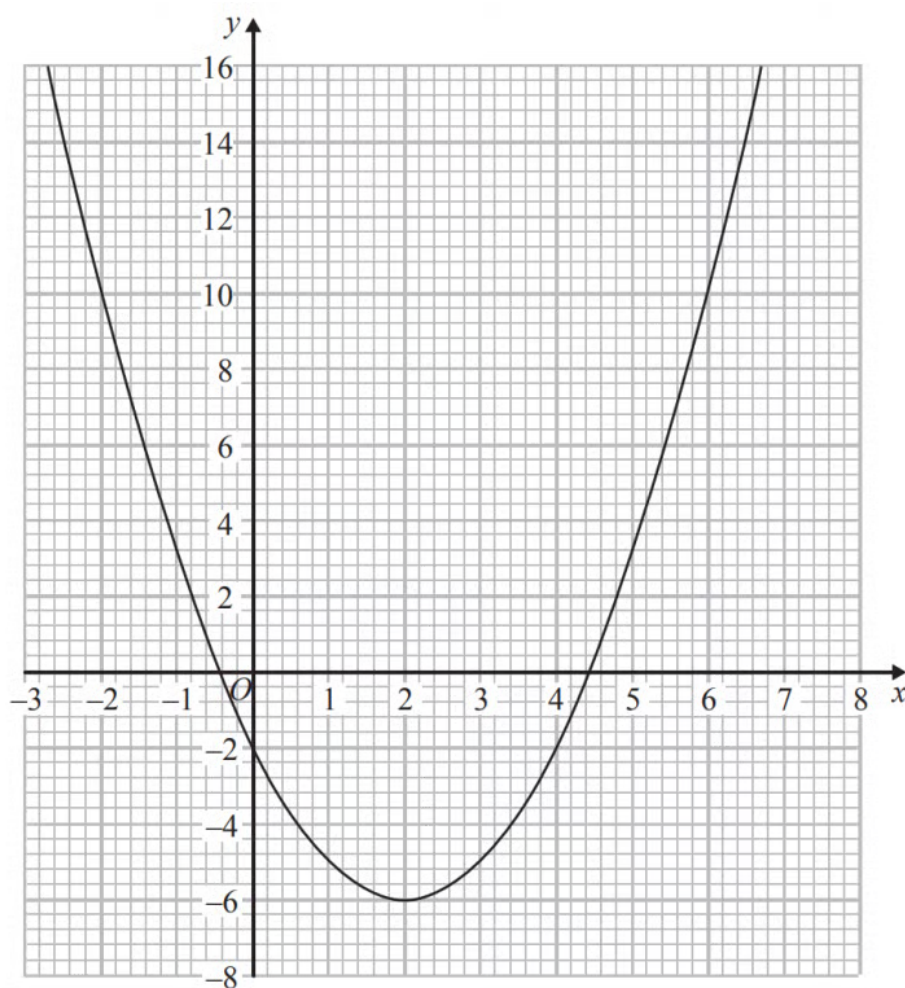


(2 marks)

(c) Solve $x^2 - 2x - 1 = x + 3$

(2 marks)

5 (a) The diagram shows the graph of $y = x^2 - 4x - 2$



Use the graph to find estimates for the solutions of

i) $x^2 - 4x - 2 = 0$

[1]

ii) $x^2 - 4x - 6 = 0$

[2]

(3 marks)

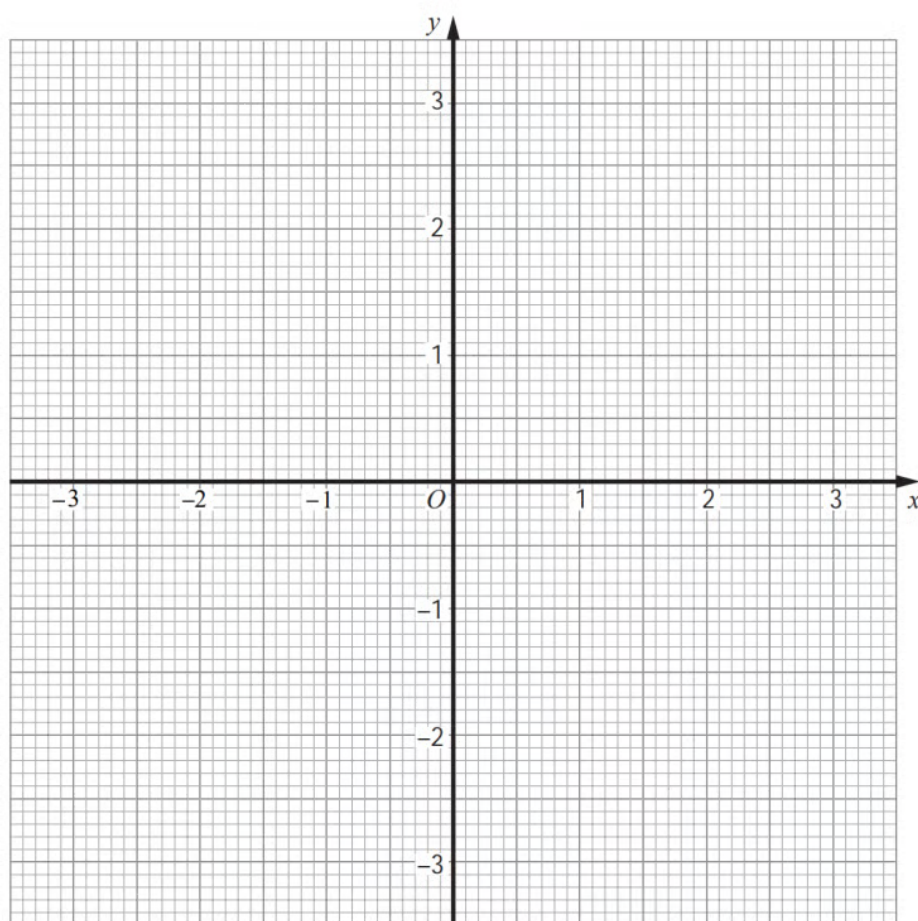
(b) Use the graph to find estimates for the values of x that satisfy the simultaneous equations

$$y = x^2 - 4x - 2$$

$$x + y = 6$$

(3 marks)

6 (a) Construct the graph of $x^2 + y^2 = 9$



(2 marks)

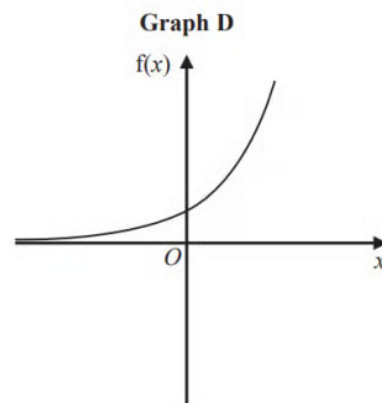
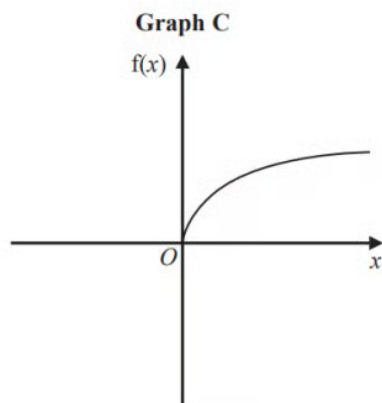
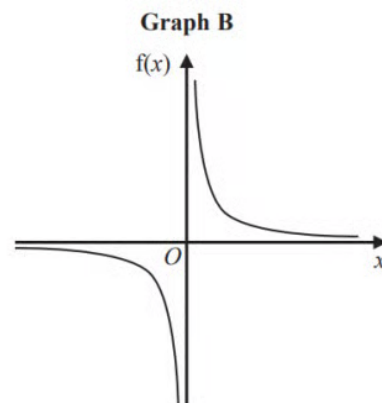
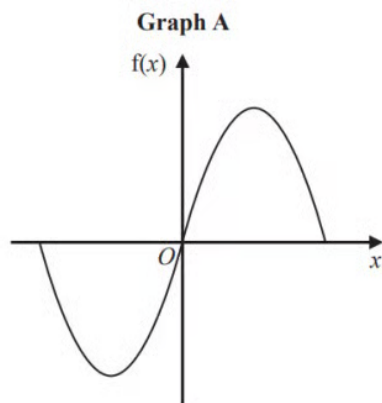
(b) By drawing the line $x + y = 1$ on the grid, solve the equations

$$x^2 + y^2 = 9$$

$$x + y = 1$$

(3 marks)

7 Here are four graphs.



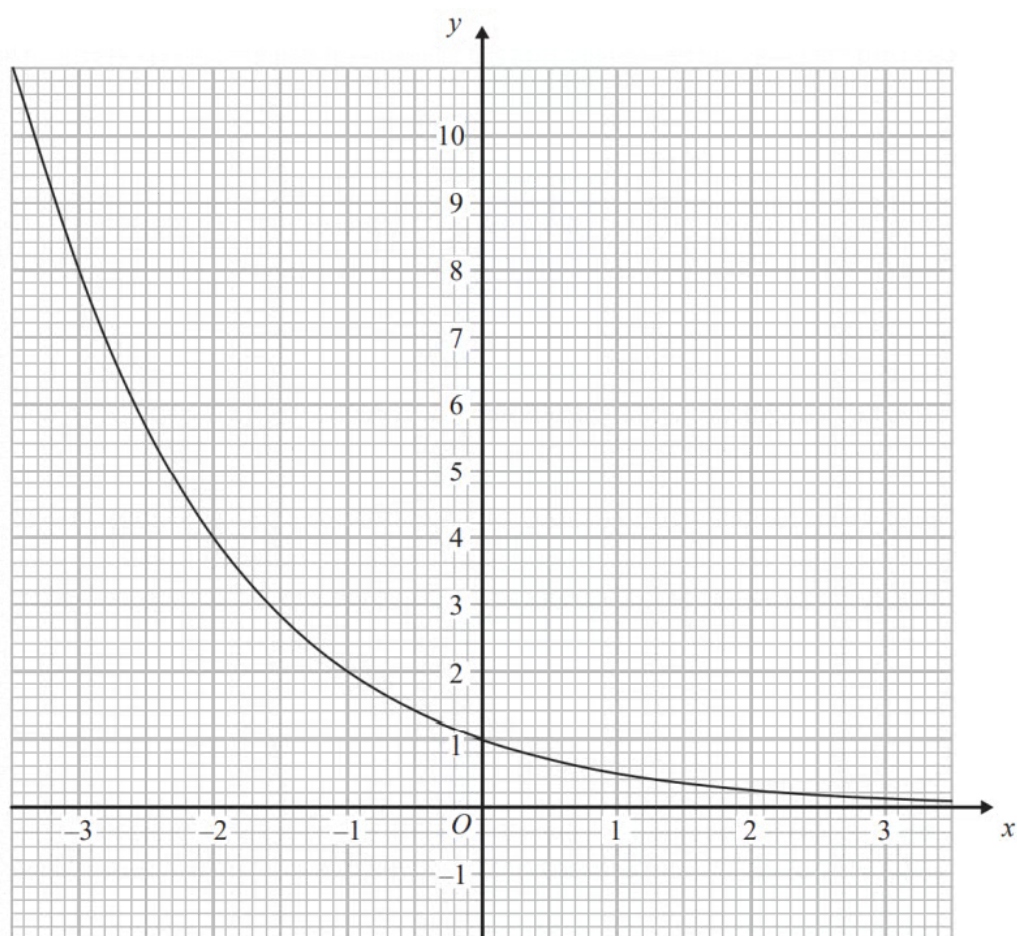
The graphs represent four different types of function f .

Match each description of the function in the table to the letter of its graph.

Description of function	Graph
$f(x)$ is inversely proportional to x	
$f(x)$ is a trigonometrical function	
$f(x)$ is an exponential function	
$f(x)$ is directly proportional to $\sqrt{x}$	

(2 marks)

8 (a)

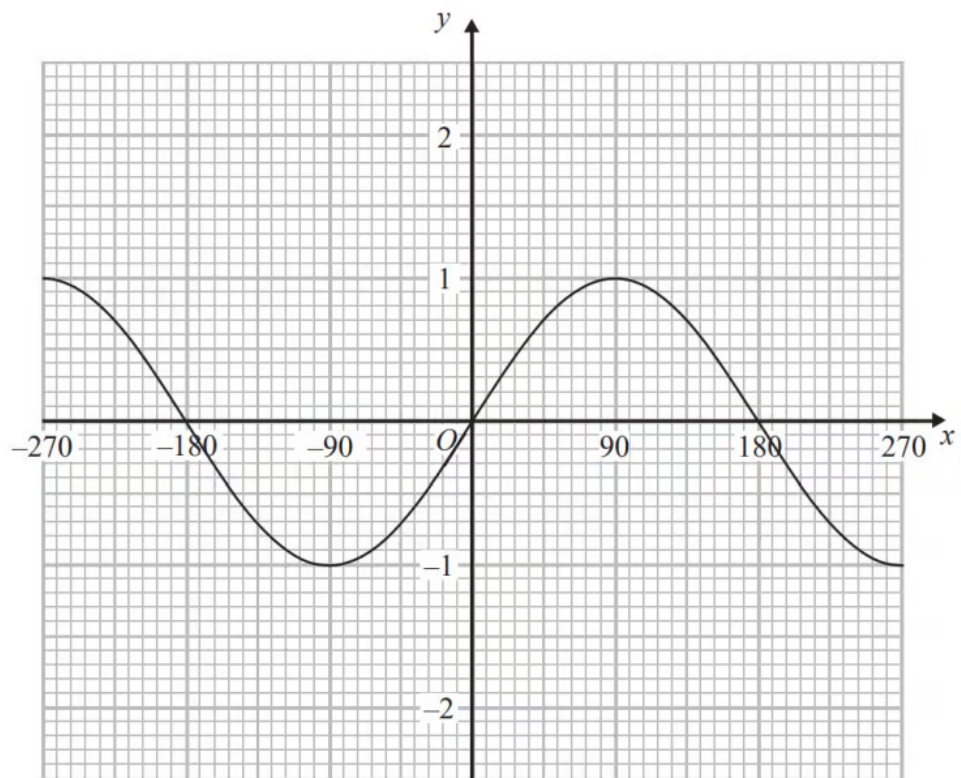


The graph of $y = k^x$, where k is a positive constant, is shown above.

Find the value of k .

(2 marks)

(b)



The graph of $y = \sin x^\circ$ for values of x from -270 to $+270$ is shown above.

On the same axes, draw the graph of $y = 1 - \sin x^\circ$ for values of x from -270 to $+270$

(2 marks)

9 (a) The curve C has equation $y = f(x)$ where $f(x) = 9 - 3(x + 2)^2$

The point A is the maximum point on C .

Write down the coordinates of A .

(1 mark)

(b) The curve C is transformed to the curve S by a translation of $\begin{pmatrix} 4 \\ 0 \end{pmatrix}$

Find an equation for the curve S .

(1 mark)

(c) The curve C is transformed to the curve T . The curve T has equation $y = 3(x + 2)^2 - 9$

Describe fully the transformation that maps curve C onto curve T .

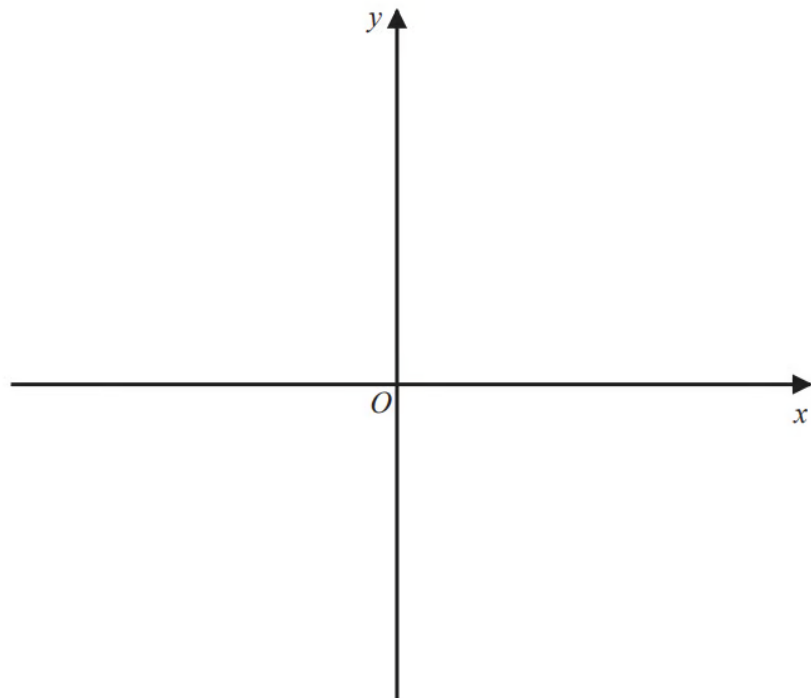
(1 mark)

10 The curve C has equation $y = 4(x - 1)^2 - a$ where $a > 4$

Using the axes below, sketch the curve C . On your sketch show clearly, in terms of a ,

i) the coordinates of any points of intersection of C with the coordinate axes,

ii) the coordinates of the turning point.



(4 marks)

11 (a) Express $7 + 12x - 3x^2$ in the form $a + b(x + c)^2$ where a , b and c are integers.

(3 marks)

(b) **C** is the curve with equation $y = 7 + 12x - 3x^2$
The point **A** is the maximum point on **C**

Use your answer to part (a) to write down the coordinates of **A**

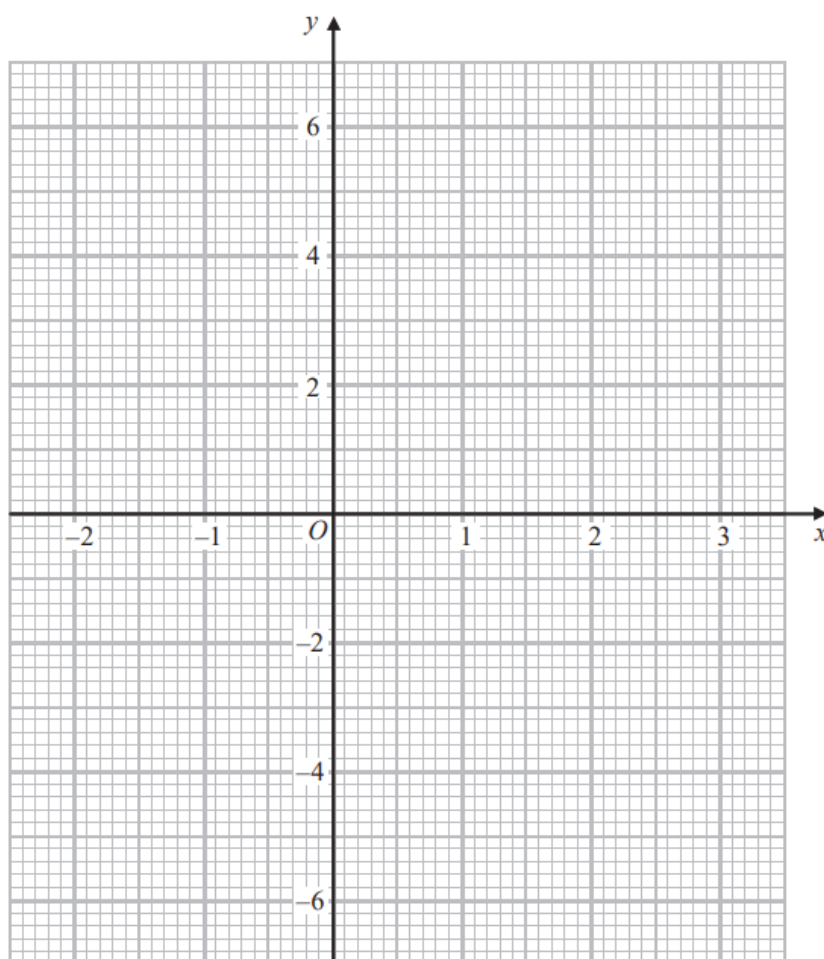
(1 mark)

12 (a) Complete the table of values for $y = x^3 - 2x^2 - 3x + 4$

x	-2	-1	-0.5	0	1	1.5	2	3
y			4.875	4		-1.625		

(2 marks)

(b) On the grid, draw the graph of $y = x^3 - 2x^2 - 3x + 4$ for values of x from -2 to 3



(2 marks)

- (c) By drawing a suitable straight line on the grid, find estimates for the solutions of the equation $x^3 - 2x^2 - x + 1 = 0$

Give your solutions correct to 1 decimal place.

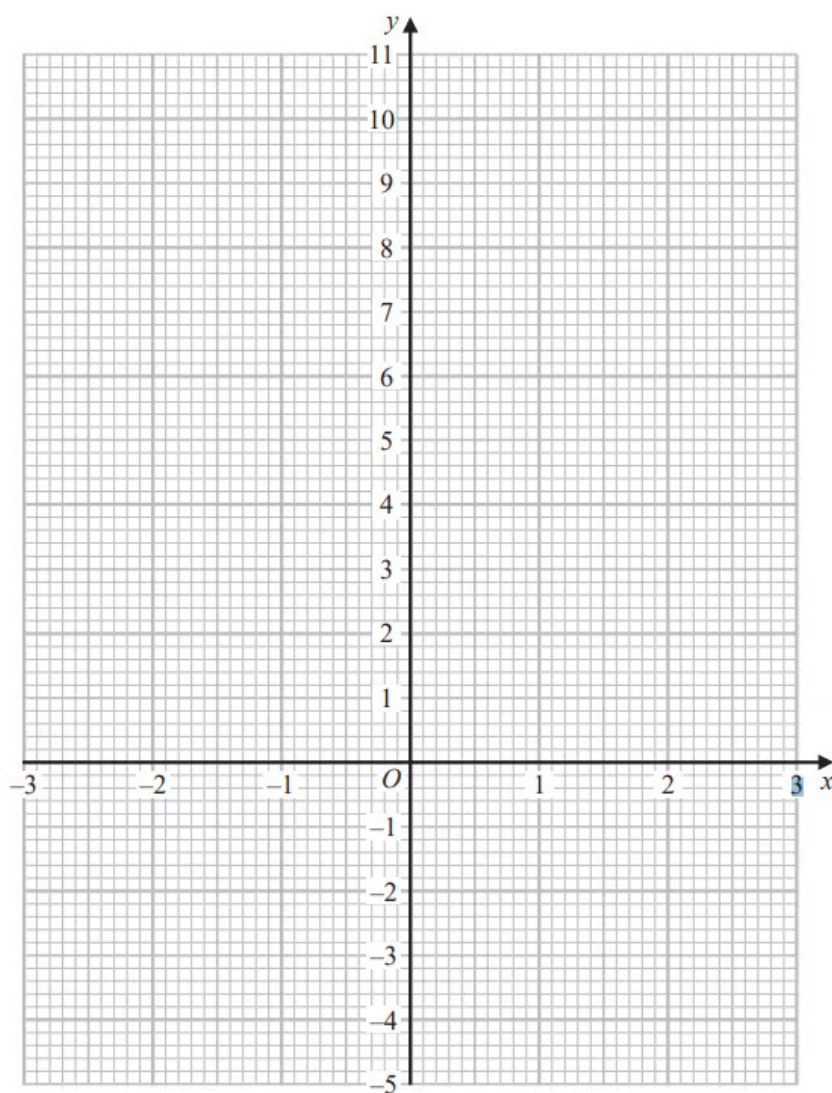
(4 marks)

13 (a) Complete the table of values for $y = \frac{1}{2}x^3 - 2x + 3$

x	-3	-2	-1	0	1	2	3
y	-4.5			3		3	

(2 marks)

(b) On the grid, draw the graph of $y = \frac{1}{2}x^3 - 2x + 3$ for $-3 \leq x \leq 3$



(2 marks)

- (c) By drawing a suitable straight line on the grid, find an estimate for the solution of the equation $\frac{1}{2}x^3 - x + 4 = 0$

$x = \dots\dots\dots$

(2 marks)

- 14 The curve **C** has equation $y = 3 - 5(x + 1)^2$
The point **A** is the maximum point on **C**.

Write down the coordinates of **A**.

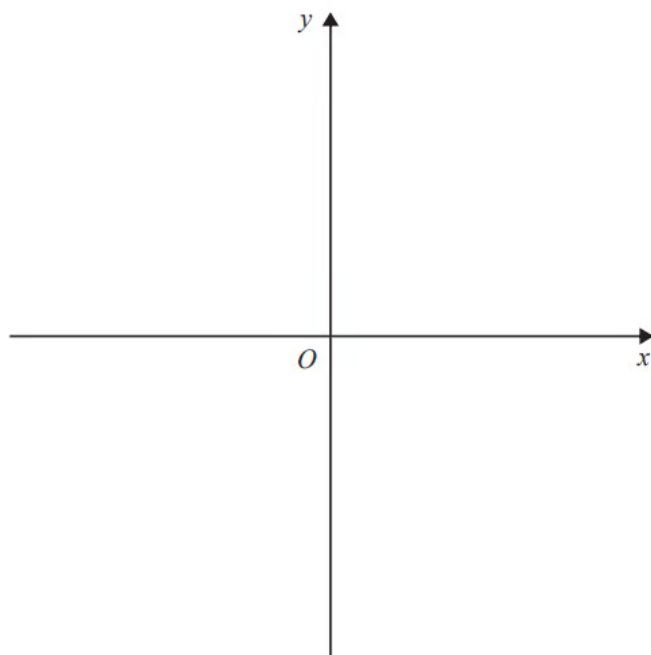
(1 mark)

- 15 The curve **C** has equation $y = x^2 - 6x + 4$

Using the axes below, sketch the curve **C**. On your sketch show clearly

- i) the exact coordinates of any points of intersection of **C** with the coordinate axes,

ii) the coordinates of the turning point.



(6 marks)

16 y is an obtuse angle.

Which statement is true? Tick **one** box.

☐	$\sin y > 0$ and $\cos y > 0$
☐	$\sin y > 0$ and $\cos y < 0$
☐	$\sin y < 0$ and $\cos y > 0$
☐	$\sin y < 0$ and $\cos y < 0$

(1 mark)

17 $f(x) = \sin(x - 90^\circ)$

Choose the value of $f(0^\circ)$

A. 1

B. 0

C. $-\frac{1}{2}$

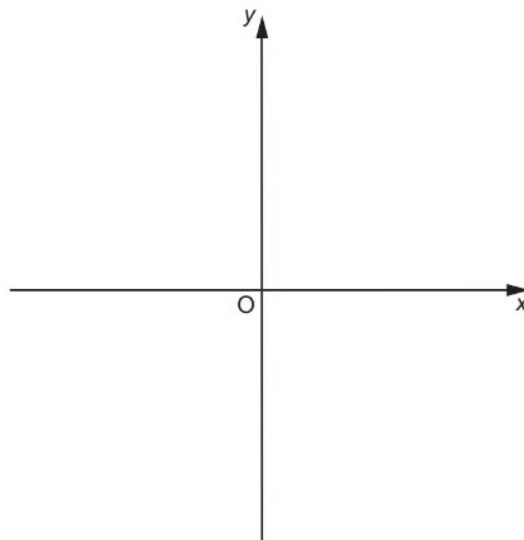
D. -1

(1 mark)

18 (a) Write $x^2 + 4x - 16$ in the form $(x + a)^2 - b$.

(3 marks)

(b) Sketch the graph of $y = x^2 + 4x - 16$, showing clearly the coordinates of any turning points.



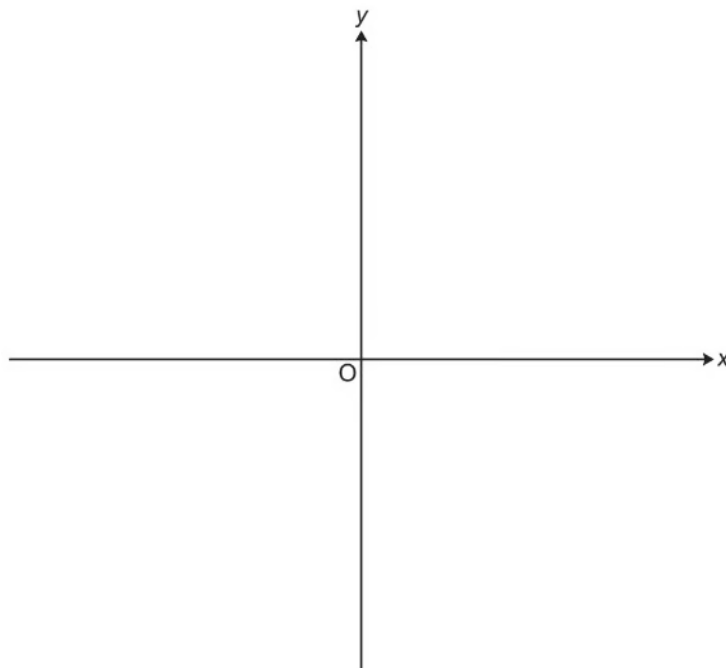
(3 marks)

19 (a) Write $x^2 - 10x + 22$ in the form $(x - a)^2 - b$.

(3 marks)

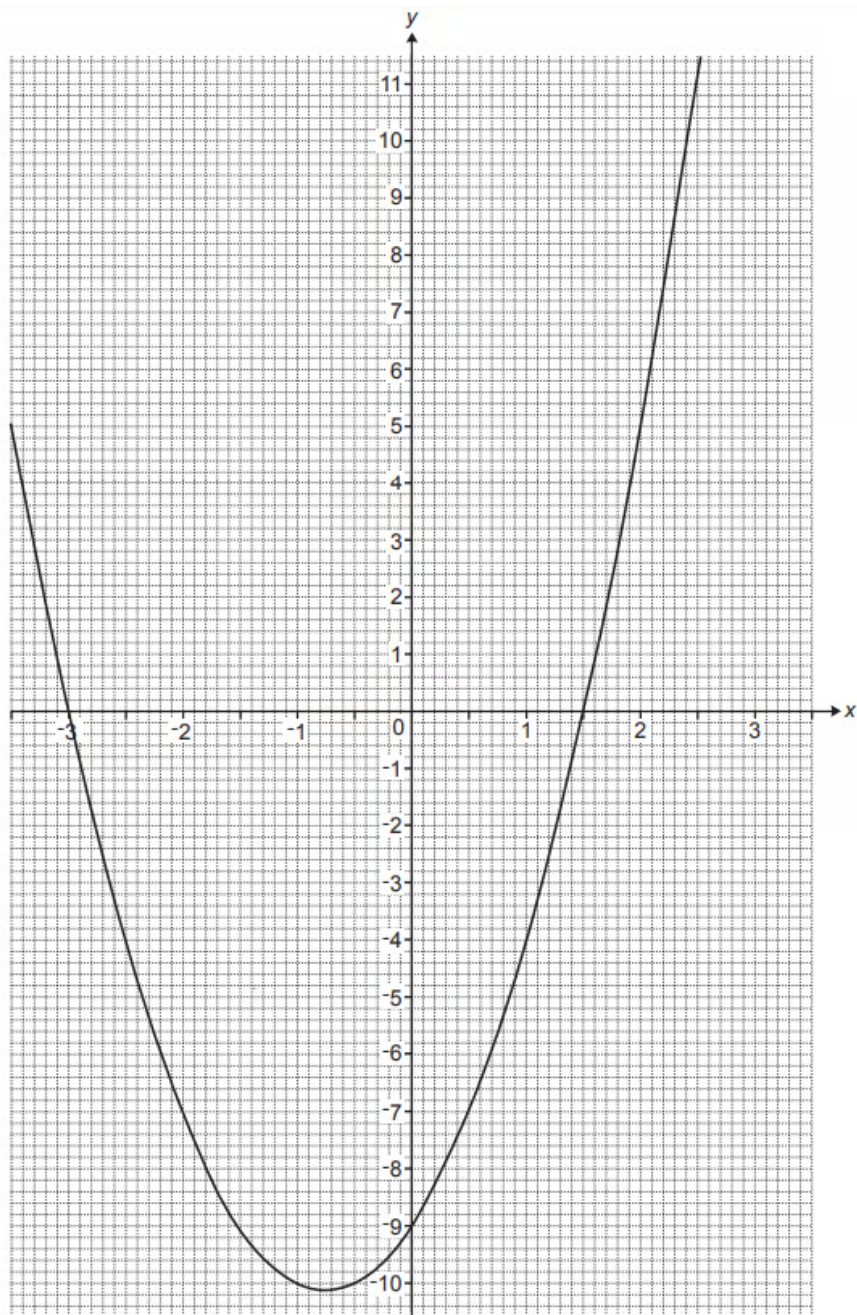
(b) Sketch the graph of $y = x^2 - 10x + 22$.

Show clearly the coordinates of any turning points and the value of the y -intercept.



(4 marks)

20 (a) The graph of $y = 2x^2 + 3x - 9$ is drawn below.



Use the graph to solve $2x^2 + 3x - 9 = 0$.

$x = \dots\dots\dots$ or

$x = \dots\dots\dots$

(2 marks)

- (b) The equation $2x^2 + x - 4 = 0$ can be solved by finding the intersection of the graph of $y = 2x^2 + 3x - 9$ and the line $y = ax + b$.

i) Find the value of a and the value of b .

$$a = \dots\dots\dots$$

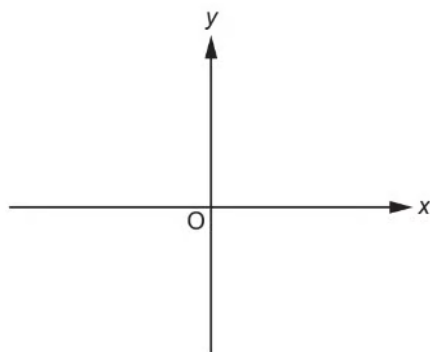
$$b = \dots\dots\dots [2]$$

ii) Hence use the graph to solve the equation $2x^2 + x - 4 = 0$.

$$x = \dots\dots\dots \text{ or } x = \dots\dots\dots [3]$$

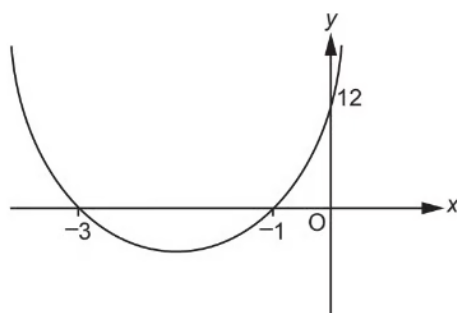
(2 marks)

- 21 (a)** Sketch the graph of $y = (x - 2)^2 - 3$.
Show the coordinates of any turning points.



(3 marks)

- (b)** The sketch shows part of a graph which has equation $y = ax^2 + bx + c$.



Not to scale

Find the values of a , b and c .

$a =$

$b =$

$c =$

(5 marks)