

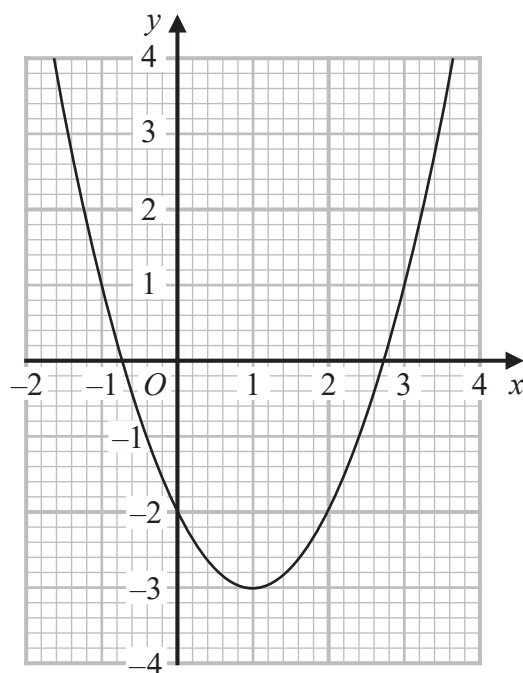
**1** Write down the coordinates of the turning point on the graph of  $y = (x + 12)^2 - 7$

(..... , .....)

**(Total for Question 1 is 1 mark)**

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2 Here is the graph of  $y = x^2 - 2x - 2$



(a) Write down the coordinates of the turning point on the graph of  $y = x^2 - 2x - 2$

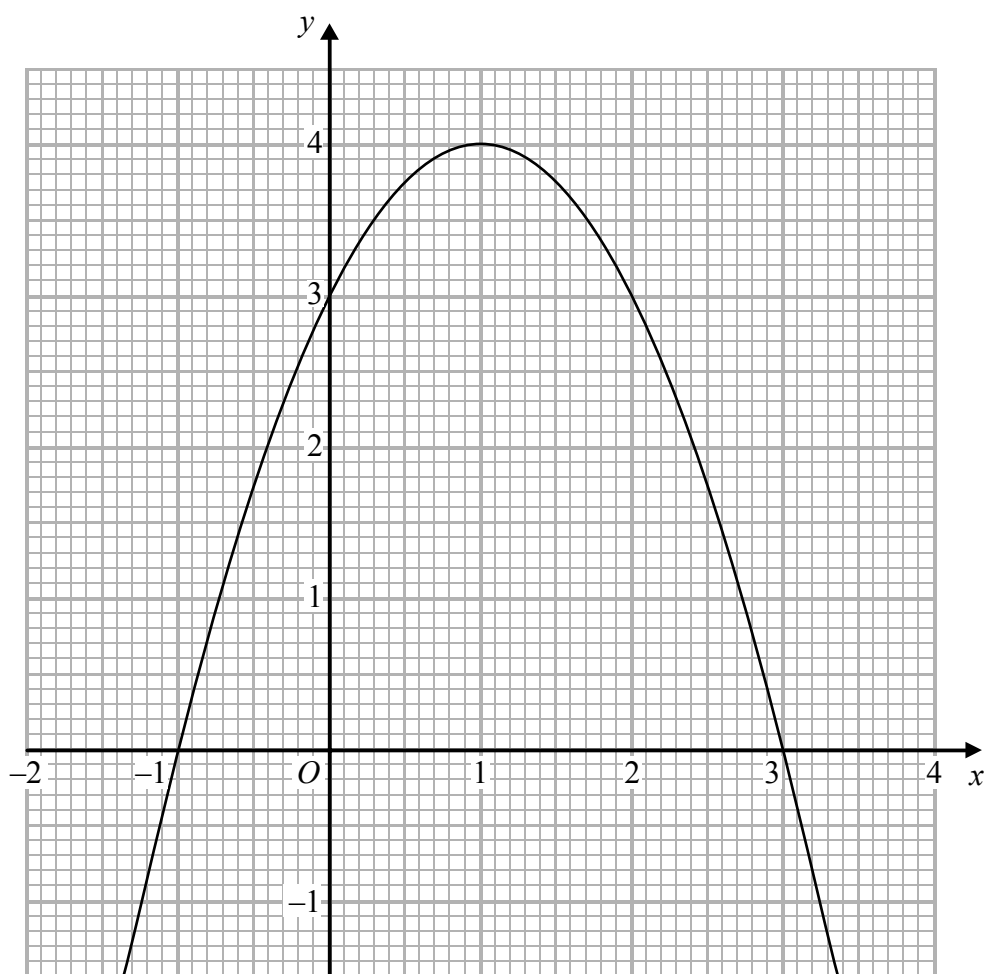
(....., .....)  
(1)

(b) Write down an estimate for one of the roots of  $x^2 - 2x - 2 = 0$

.....  
(1)

(Total for Question 2 is 2 marks)

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



(a) Write down the coordinates of the turning point of the graph.

(....., .....)  
(1)

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

.....  
(1)

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

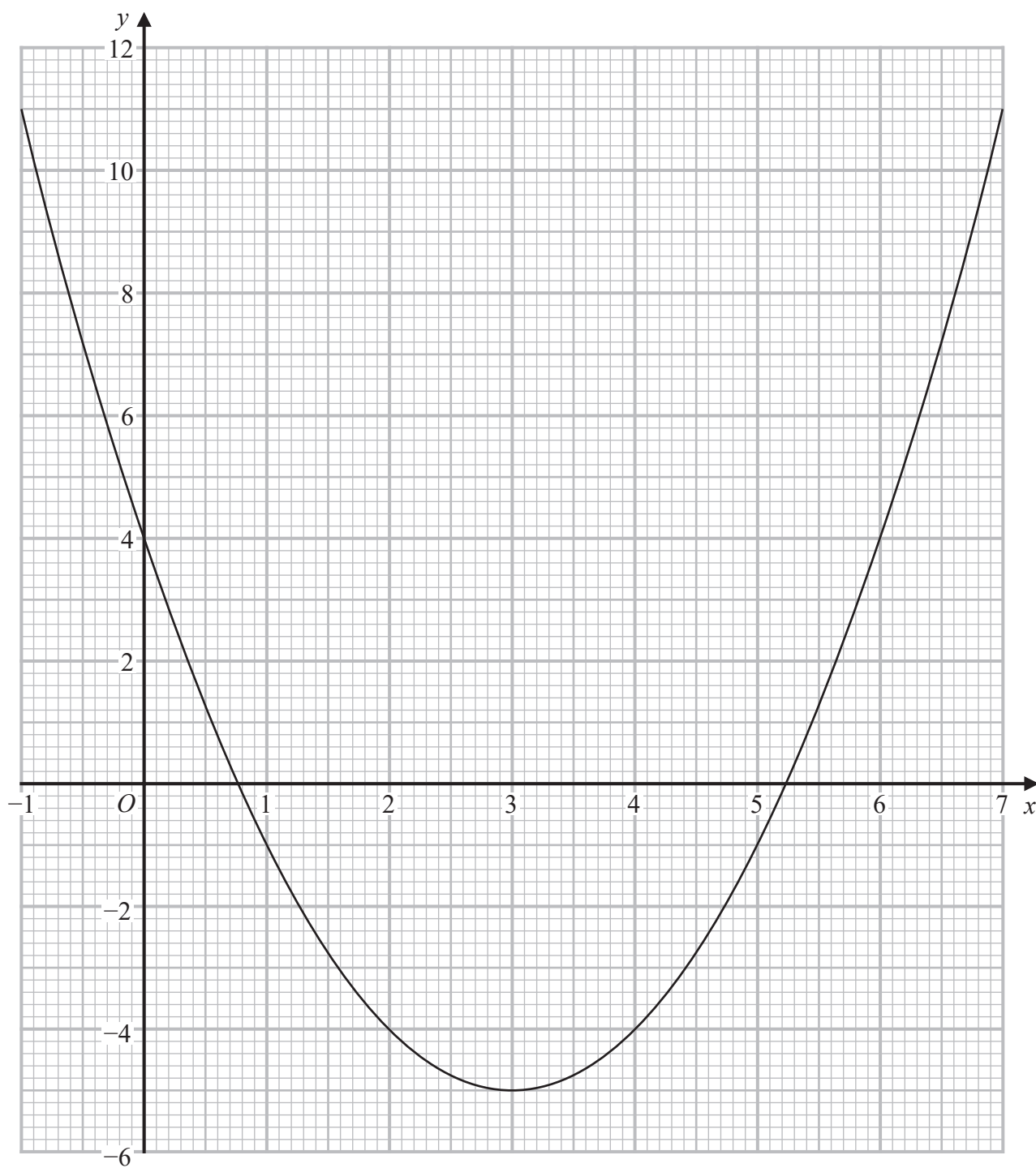
.....  
(1)

(Total for Question 3 is 3 marks)

- 4 (a) The equation of the curve is  $y = x^2 + ax + b$  where  $a$  and  $b$  are integers.

The points  $(3, -5)$  and  $(0, 4)$  lie on the curve.

Find the values of  $a$  and  $b$ .



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

$$b = \dots\dots\dots$$

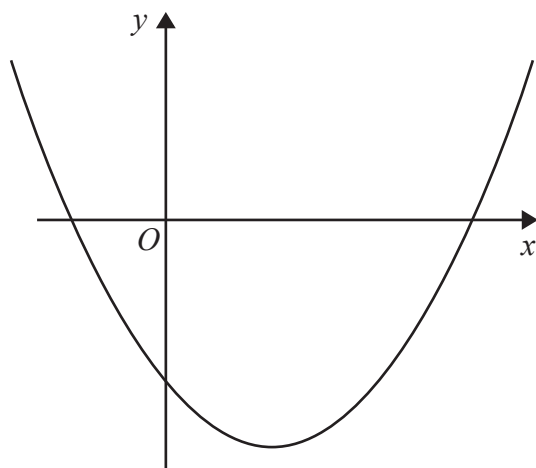
(3)

(b) Use the graph to find estimates for the roots of  $x^2 - 6x + 4 = 0$

(2)

**(Total for Question 4 is 5 marks)**

5 Here is a sketch of a curve.



The equation of the curve is  $y = x^2 + ax + b$  where  $a$  and  $b$  are integers.

The points  $(0, -5)$  and  $(5, 0)$  lie on the curve.

Find the coordinates of the turning point of the curve.

(....., .....)

(Total for Question 5 is 4 marks)

- 6 Find the coordinates of the turning point on the curve with equation  $y = 9 + 18x - 3x^2$   
You must show all your working.

(..... , .....)

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**(Total for Question 6 is 4 marks)**

7 Solve  $x^2 - 6x - 8 = 0$

Write your answer in the form  $a \pm \sqrt{b}$  where  $a$  and  $b$  are integers.

.....  
**(Total for Question 7 is 3 marks)**

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8 Given that  $x^2 - 6x + 1 = (x - a)^2 - b$  for all values of  $x$ ,

(i) find the value of  $a$  and the value of  $b$ .

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

$$b = \dots\dots\dots$$

(2)

(ii) Hence write down the coordinates of the turning point on the graph of  $y = x^2 - 6x + 1$

$$(\dots\dots\dots, \dots\dots\dots)$$

(1)

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**(Total for Question 8 is 3 marks)**

9 (a) (i) Write  $x^2 - 8x + 3$  in the form  $(x - a)^2 - b$  where  $a$  and  $b$  are integers.

.....  
(2)

(ii) Hence, write down the coordinates of the turning point on the graph of  $y = x^2 - 8x + 3$

(..... , .....)  
(1)

(b) Solve  $7x^2 + 8x - 5 = 0$   
Give your solutions correct to 3 significant figures.

.....  
(3)

Alex has to find the solutions of the quadratic equation  $3k^2 + 10k - 8 = 0$   
Here is his working and answer.

$$(3k - 2)(k + 4) = 0$$

$$k = 2 \text{ or } k = -4$$

(c) What mistake has Alex made?

.....  
.....  
.....  
(1)

(Total for Question 9 is 7 marks)

**10**

The equation of a curve is  $y = 4x^2 - 56x$

The curve has one turning point.

By completing the square, show that the coordinates of the turning point are  $(7, -196)$

You must show all your working.

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**(Total for Question 10 is 3 marks)**

**11** (a) Write  $2x^2 + 16x + 35$  in the form  $a(x + b)^2 + c$  where  $a$ ,  $b$ , and  $c$  are integers.

.....  
(3)

(b) Hence, or otherwise, write down the coordinates of the turning point of the graph of  $y = 2x^2 + 16x + 35$

.....  
(1)

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**(Total for Question 11 is 4 marks)**

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

.....  
(4)

The curve **C** has equation  $y = 7 + 12x - 3x^2$   
The point  $A$  is the turning point on **C**.

(b) Using your answer to part (a), write down the coordinates of  $A$ .

(..... , .....)  
(1)

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(Total for Question 12 is 5 marks)

**13** Sketch the graph of

$$y = 2x^2 - 8x - 5$$

showing the coordinates of the turning point and the exact coordinates of any intercepts with the coordinate axes.

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**(Total for Question 13 is 5 marks)**

- 14** 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**.

(a) Write down the coordinates of **A**.

(..... , .....)  
(1)

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

(b) Find an equation for the curve **S**.

.....  
(1)

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

(c) Describe fully the transformation that maps curve **C** onto curve **T**.

.....  
(1)

(Total for Question 14 is 3 marks)

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

.....  
(3)

The curve **C** has equation  $y = 2(x + 4)^2 - 12(x + 4) + 3$

The point  $M$  is the minimum point on **C**

(b) Find the coordinates of  $M$

(..... , .....)  
(2)

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(Total for Question 15 is 5 marks)



**16** (a) Express  $7 - 4x - x^2$  in the form  $p - (x + q)^2$  where  $p$  and  $q$  are constants.

.....  
(2)

(b) Use your answer to part (a) to solve the equation  $7 - 4(y + 3) - (y + 3)^2 = 0$

Give your solutions in the form  $e \pm \sqrt{f}$  where  $e$  and  $f$  are integers.

.....  
(3)

The curve **C** has equation  $y = 3 - 5(x + 1)^2$

The point  $A$  is the maximum point on **C**.

(c) Write down the coordinates of  $A$ .

(..... , .....)  
(1)

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(Total for Question 16 is 6 marks)