

**TEST 12**

**INSTRUCTIONS TO CANDIDATES**

Section B (40 marks)

Time: 45 minutes

1. Answer all the questions in this section.
2. Calculators may be used in this section.
3. All working must be clearly shown. Omission of essential working will result in loss of marks.
4. The marks for each question is shown in brackets [ ] at the end of each question.

10 The variables  $x$  and  $y$  are connected by the equation  $y = x^2 - 5x + 3$  and some corresponding values are given in the table below.

$x$	-1	0	1	2	3	4	5
$y$	$a$	3	-1	-3	$b$	-1	3

- (a) Find the values of  $a$  and  $b$ .
- (b) Using a scale of 2 cm to represent 1 unit on the  $x$ -axis and 1 cm to represent 1 unit on the  $y$ -axis, draw the graph of  $y = x^2 - 5x + 3$  for  $-1 \leq x \leq 5$  on the graph paper provided.
- (c) From your graph, find
  - (i) the values of  $y$  when  $x^2 = \frac{1}{4}$ .
  - (ii) the minimum value of  $y$ .
- (d) Write down the equation of the line of symmetry of the graph  $y = x^2 - 5x + 3$ .

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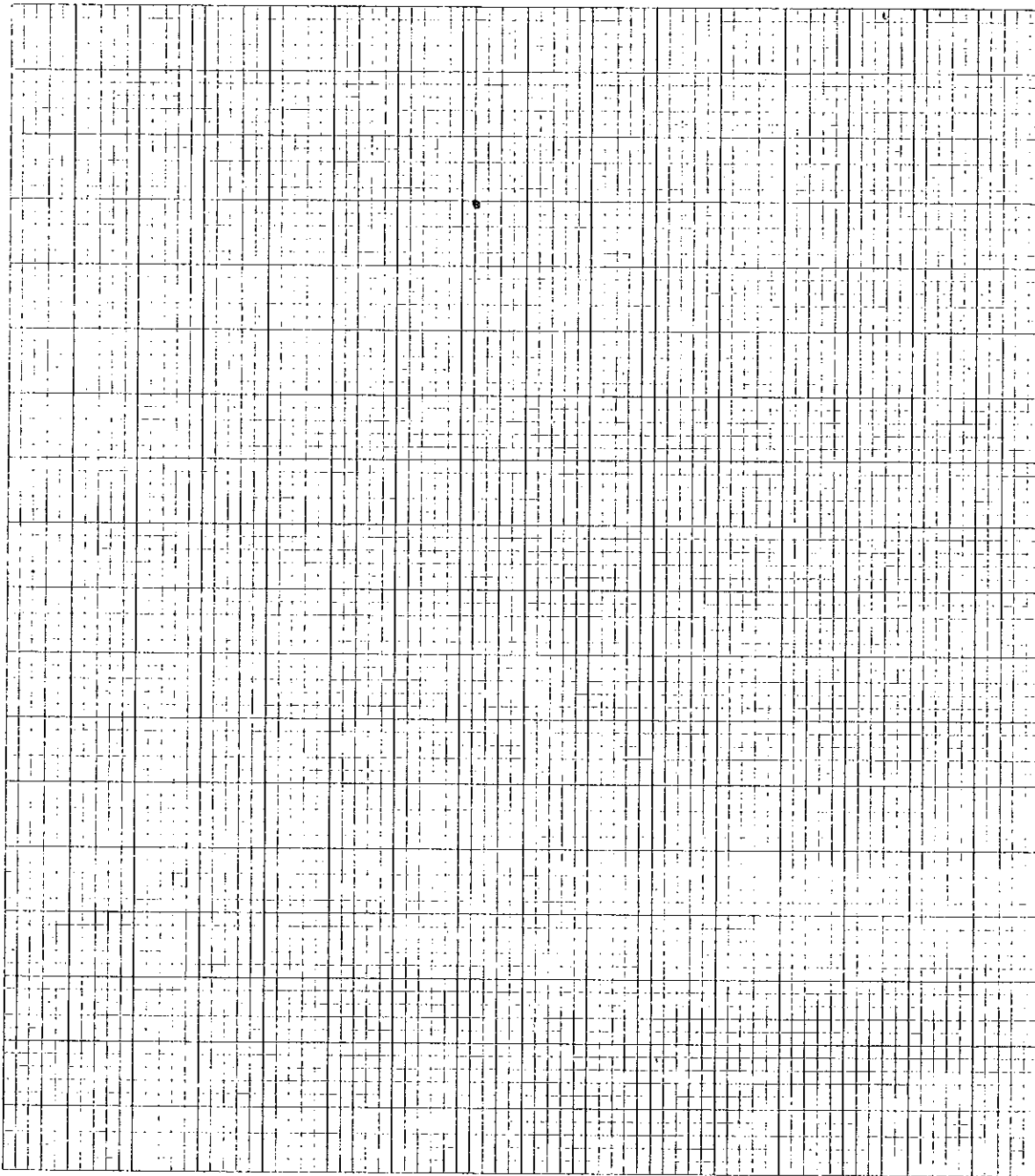
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Answer (b)

[3]



Answer (a)  $a = \dots\dots\dots$ ,  $b = \dots\dots\dots$  [1]

(c) (i)  $y = \dots\dots\dots$ ,  $\dots\dots\dots$  [2]

(ii)  $y = \dots\dots\dots$  [1]

(d)  $\dots\dots\dots$  [1]

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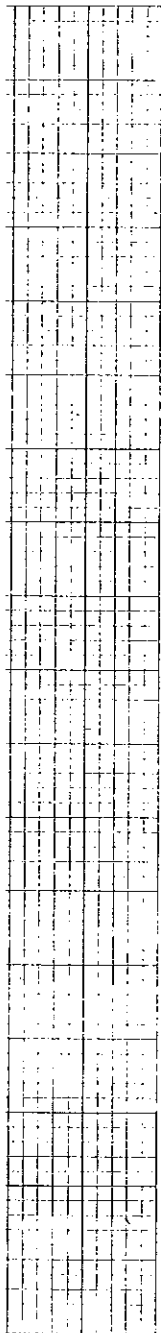
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(a)

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(b)

(c)

[3]



- 11 The variables  $x$  and  $y$  are connected by the equation  $y = 3 - 3x - x^2$  and some corresponding values are given in the table below.  
 (a) Complete the table below.

Answer (a)

[2]

$x$	-5	-4	-3	-2	-1	0	1	2
$y$		-1	3		5			-7

- (b) Using a scale of 2 cm to represent 1 unit on the  $x$ -axis and 1 cm to represent 1 unit on the  $y$ -axis, draw the graph of  $y = 3 - 3x - x^2$  for  $-5 \leq x \leq 2$  on the graph paper provided.  
 (c) From your graph, find  
 (i) the values of  $x$  when  $y = -3$ ,  
 (ii) the value of  $y$  when  $x = -2.6$ ,  
 (iii) the maximum value of  $y$ .

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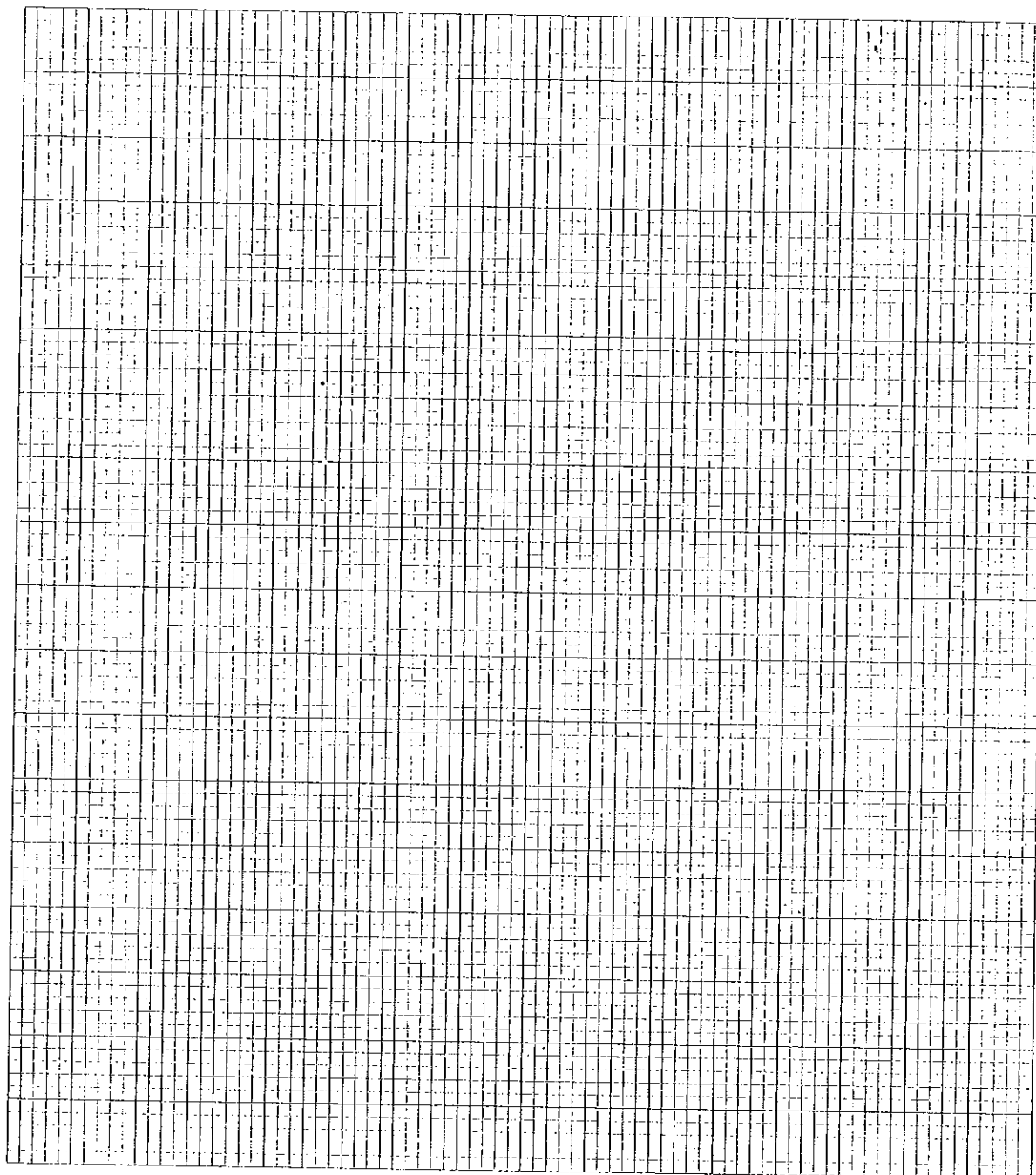
, ..... [2]

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Answer (b)

[3]



Answer (c) (i)  $x = \dots\dots\dots, \dots\dots\dots$  [2]

(ii)  $y = \dots\dots\dots$  [1]

(iii)  $y = \dots\dots\dots$  [1]

[3]

- 12 The variables  $x$  and  $y$  are connected by the equation  $y = 3x^2 - 4x - 25$  and some corresponding values are given in the table below.

$x$	-3	-2	-1	0	1	2	3	4
$y$	14	-5	-18	-25	-26	-21	-10	7

- (a) Using a scale of 2 cm to represent 1 unit on the  $x$ -axis and 2 cm to represent 10 units on the  $y$ -axis, draw the graph of  $y = 3x^2 - 4x - 25$  for  $-3 \leq x \leq 4$  on the graph paper provided.
- (b) Use your graph to find
- the least value of  $y$ ,
  - the value of  $y$  when  $x = 2.6$ ,
  - the values of  $x$  when  $y = 0$ .

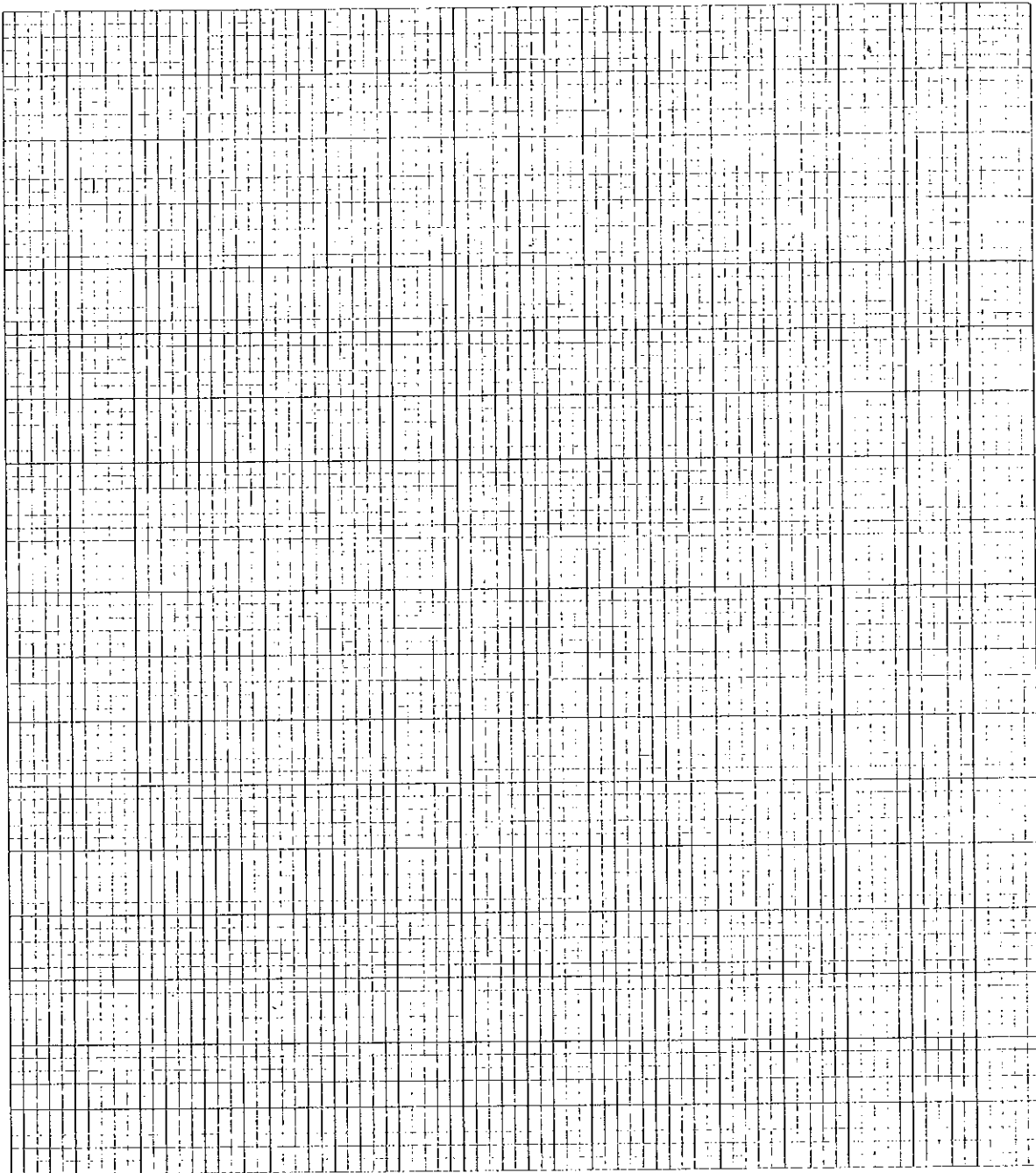
..... [2]

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Answer (a)

[3]



Answer (b) (i)  $y = \dots\dots\dots$  [1]

(ii)  $y = \dots\dots\dots$  [1]

(iii)  $x = \dots\dots\dots, \dots\dots$  [2]

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(a)  
(b)

(c)

(d)

[3]

- 13 The variables of  $x$  and  $y$  are connected by the equation  $y = x^2 - 3x - 4$  and some corresponding values are given in the table below.

$x$	-2	-1	0	1	2	3	4	5
$y$	6	$a$	-4	-6	-6	-4	0	6

- (a) Calculate the value of  $a$ .
- (b) Using a scale of 2 cm to represent 1 unit on the  $x$ -axis and 1 cm to represent 1 unit on the  $y$ -axis, draw the graph of  $y = x^2 - 3x - 4$  for the range  $-2 \leq x \leq 5$  on the graph paper provided.
- (c) From your graph, find
- the value of  $y$  when  $x = 2.5$ ,
  - the minimum value of  $y$ ,
  - the equation of the line of symmetry of the graph  $y = x^2 - 3x - 4$ .
- (d) From your graph, find also the values of  $x$  when  $7 - 2y = 1$ .

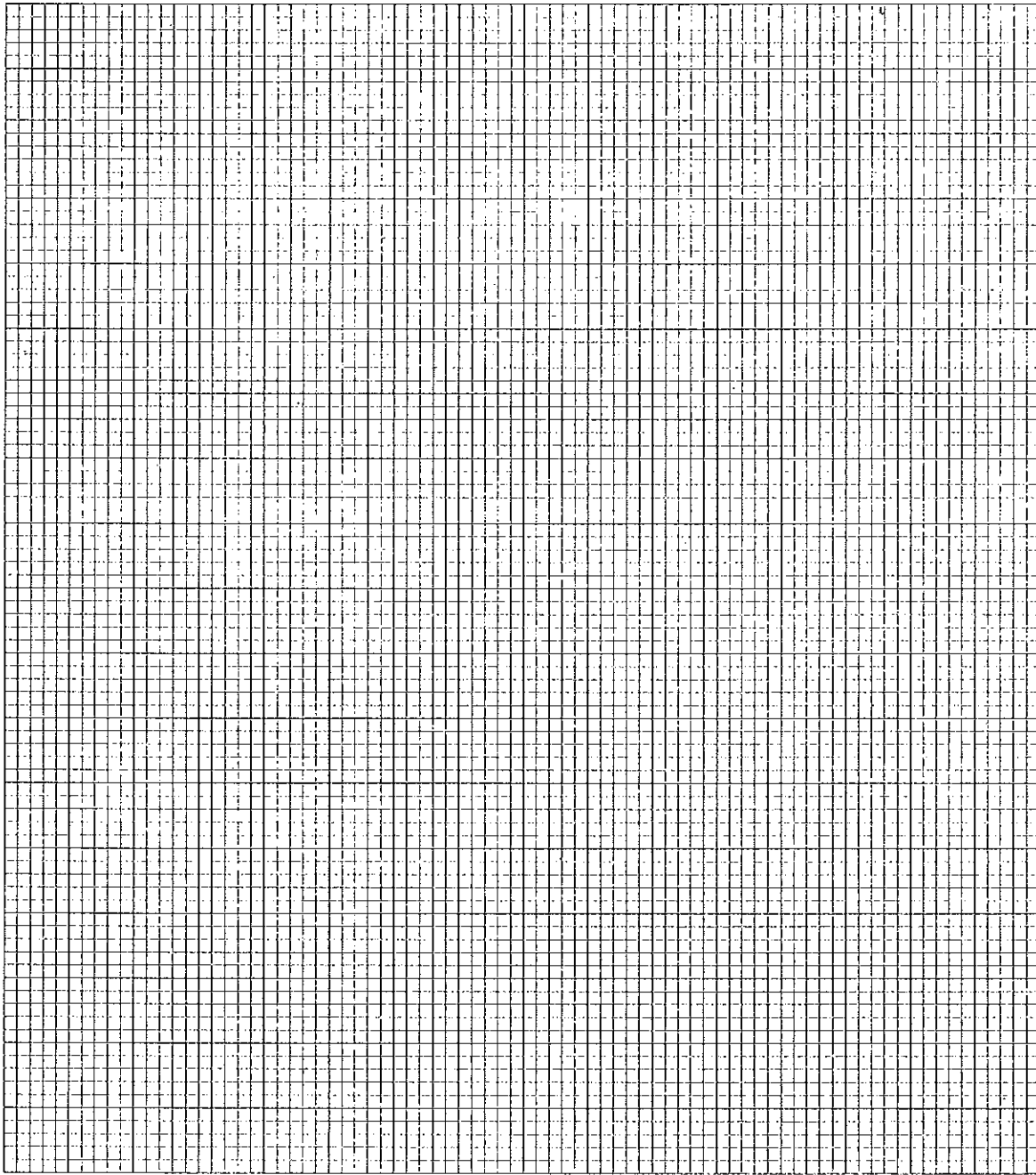
..... [3]

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Answer (b)

[3]



Answer (a)  $a = \dots\dots\dots$  [1]

(c) (i)  $y = \dots\dots\dots$  [1]

(ii)  $y = \dots\dots\dots$  [1]

(iii)  $\dots\dots\dots$  [1]

(d)  $x = \dots\dots\dots, \dots\dots\dots$  [2]

14 The  
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- (a)
- (b)
- (c)
- (d)
- (e)



[3]

- 14 The variables  $x$  and  $y$  are connected by the equation  $y = \frac{1}{2}x^2 - 2x - 3$  and some corresponding values are given in the table below.

$x$	-1	0	1	2	3	4	5	6
$y$	$a$	-3	-4.5	-5	-4.5	$b$	-0.5	3

- (a) Find the values of  $a$  and  $b$ .
- (b) Using a scale of 2 cm to represent 1 unit on each axis, draw the graph of  $y = \frac{1}{2}x^2 - 2x - 3$  for  $-1 \leq x \leq 6$  on the graph paper provided.
- (c) On the same axes, draw the graph of the straight line  $y = -1$ .
- (d) Use your graphs to find the solutions of  $\frac{1}{2}x^2 - 2x - 3 = -1$  in the range  $-1 \leq x \leq 6$ .
- (e) A vertical line divides the graph into two equal parts. Write down the equation of this vertical line.

..... [1]

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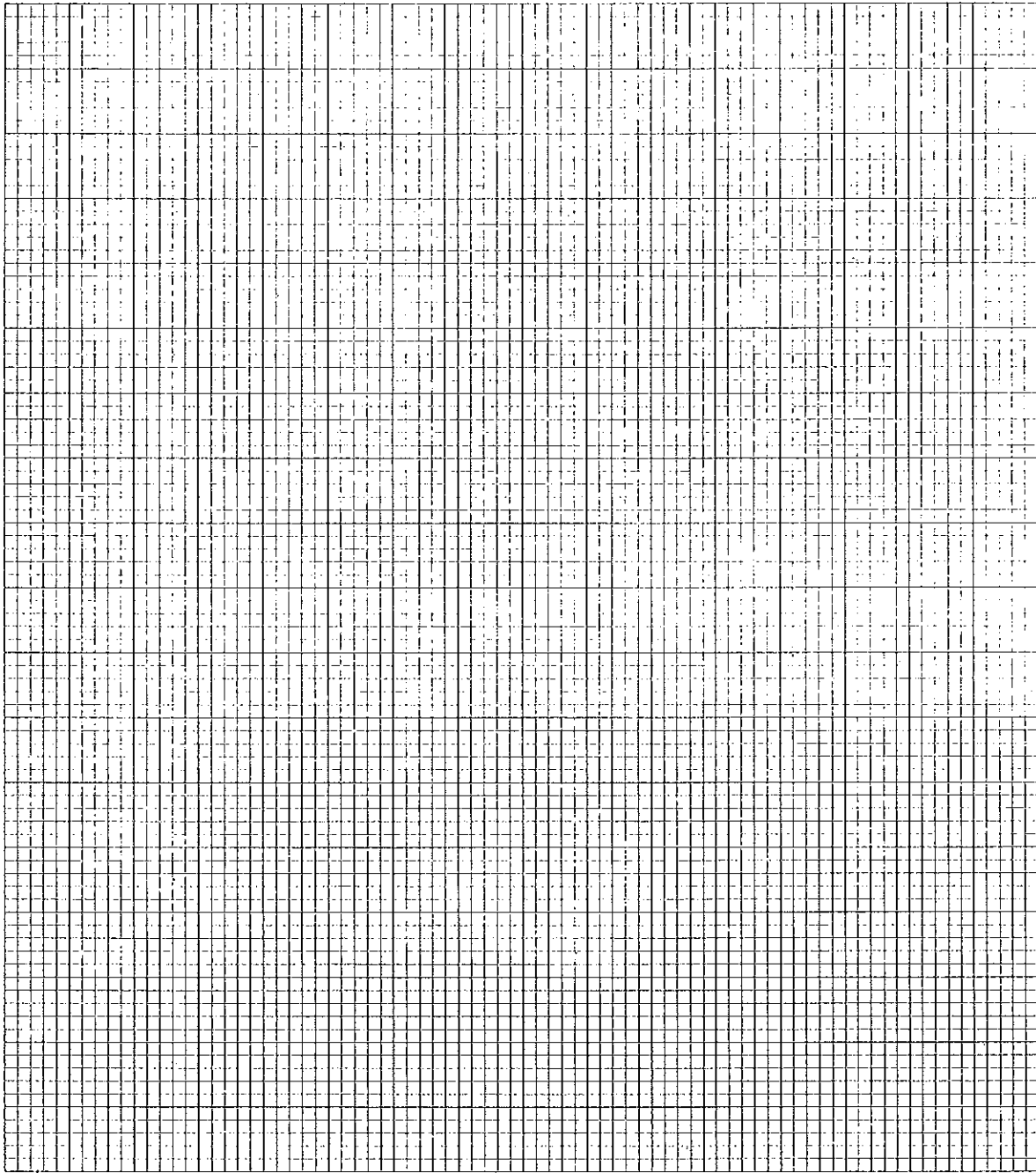
..... [1]

..... [1]

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Answer (b), (c)

[4]



Answer (a)  $a = \dots\dots\dots$ ,  $b = \dots\dots\dots$  [1]

(d)  $\dots\dots\dots$  [1]

(e)  $\dots\dots\dots$  [1]

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Section

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(a)

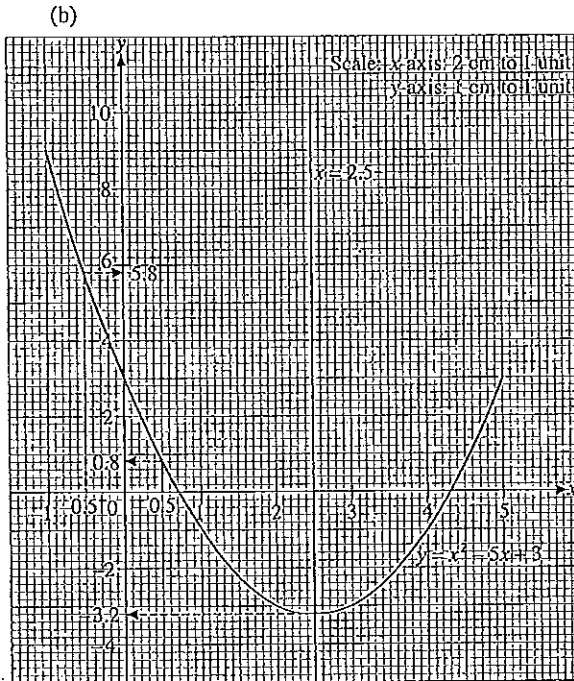
(b)  
(c)

A

# TEST 12 ANSWERS

## Section B

10. (a)  $y = x^2 - 5x + 3$   
 $a = (-1)^2 - 5(-1) + 3 = 9$   
 $b = (3)^2 - 5(3) + 3 = -3$



(c) (i)  $x^2 = \frac{1}{4}$

$$x = \sqrt{\frac{1}{4}} = \pm \frac{1}{2} \text{ or } \pm 0.5.$$

From the graph, when  $x = 0.5$ ,  $y \approx 0.8$  and when  $x = -0.5$ ,  $y \approx 5.8$ .

(ii) From the graph, the minimum value of  $y$  is  $-3.2$ .

(d) Equation of the line of symmetry is  $x = 2.5$ .

11. (a)  $y = 3 - 3x - x^2$

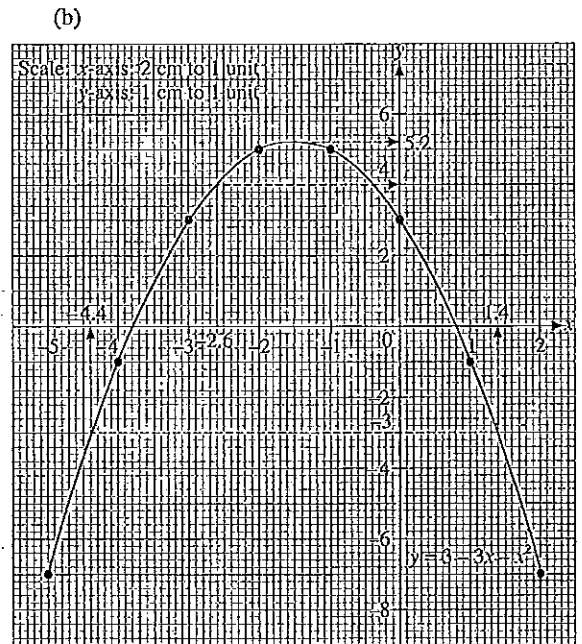
When  $x = -5$ ,  $y = 3 - 3(-5) - (-5)^2 = -7$

When  $x = -2$ ,  $y = 3 - 3(-2) - (-2)^2 = 5$

When  $x = 0$ ,  $y = 3 - 3(0) - (0)^2 = 3$

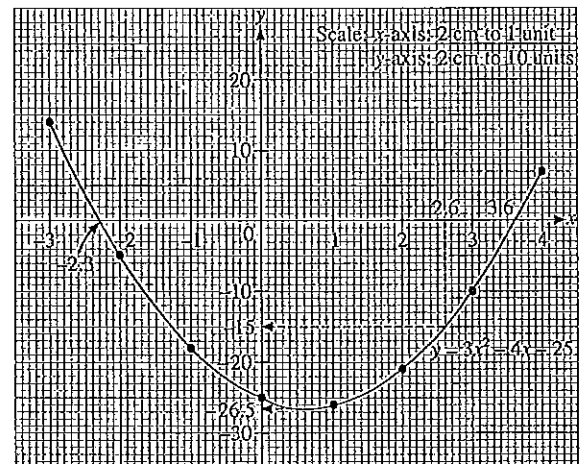
When  $x = 1$ ,  $y = 3 - 3(1) - 1^2 = -1$

$x$	-5	-4	-3	-2	-1	0	1	2
$y$	-7	-1	3	5	5	3	-1	-7



- (c) (i) From the graph, when  $y = -3$ ,  $x \approx -4.4$  and  $x \approx 1.4$ .  
 (ii) From the graph, when  $x = -2.6$ ,  $y = 4$ .  
 (iii) From the graph, the maximum value of  $y$  is  $5.2$ .

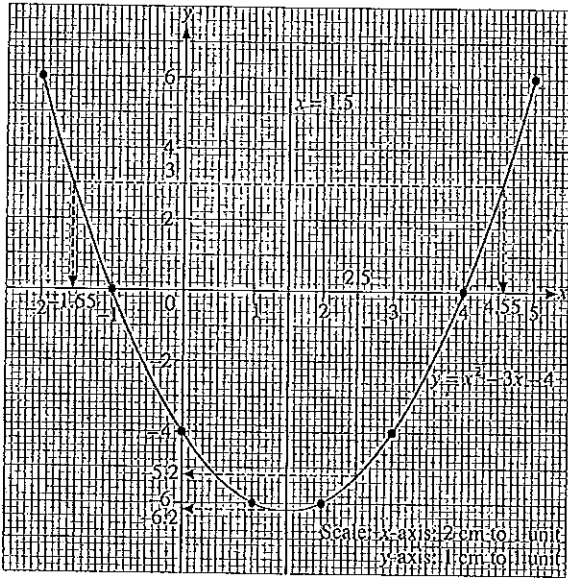
12. (a)



- (b) (i) From the graph, the least value of  $y$  is  $-26.5$ .  
 (ii) From the graph, when  $x = 2.6$ ,  $y = -15$ .  
 (iii) From the graph, when  $y = 0$ ,  $x \approx -2.3$  and  $x \approx 3.6$ .

13. (a)  $y = x^2 - 3x - 4$   
 $a = (-1)^2 - 3(-1) - 4 = 0$

(b)



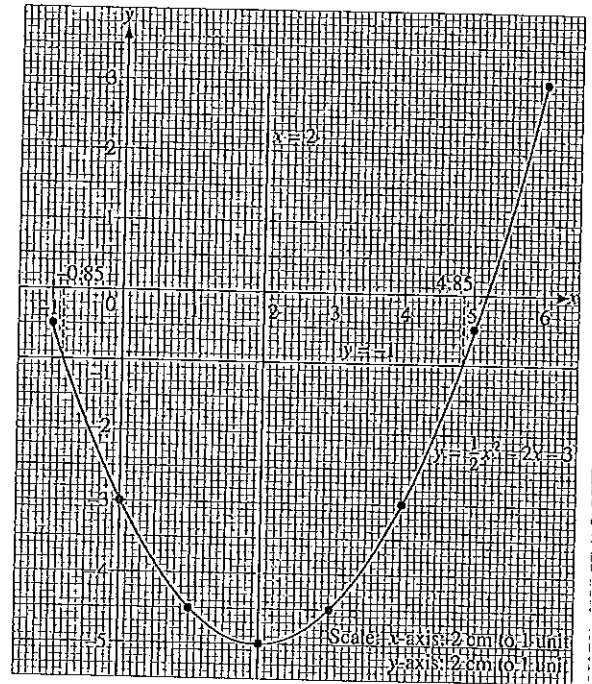
- (c) (i) From the graph,  
when  $x = 2.5$ ,  $y \approx -5.2$ .
- (ii) From the graph, the minimum value of  $y$  is  $-6.2$ .
- (iii) Equation of the line of symmetry is  $x \approx 1.5$ .

(d)  $7 - 2y = 1$   
 $2y = 6$   
 $y = 3$

From the graph,  
when  $y = 3$ ,  $x \approx -1.55$  and  $x \approx 4.55$ .

14. (a)  $y = \frac{1}{2}x^2 - 2x - 3$   
 $a = \frac{1}{2}(-1)^2 - 2(-1) - 3 = -0.5$   
 $b = \frac{1}{2}(4)^2 - 2(4) - 3 = -3$

(b), (c)



- (d) The solutions are  
 $x \approx -0.85$  and  $x \approx 4.85$ .
- (e) The equation of the vertical line is  $x = 2$ .

The line of symmetry is the vertical line dividing the graph into 2 equal parts.