Name ANSWERS	Class

MATHS TEACHER HUB

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Nonlinear graphs

(9 – 1) Topic booklet

Higher

These questions have been collated from previous years GCSE Mathematics papers.

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser.	Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- Diagrams are NOT accurately drawn, unless otherwise indicated.
- You must **show all your working out.**
- If the question is a **1H** question you are not allowed to use a calculator.
- If the question is a **2H** or a **3H** question, you may use a calculator to help you answer.

Information

- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

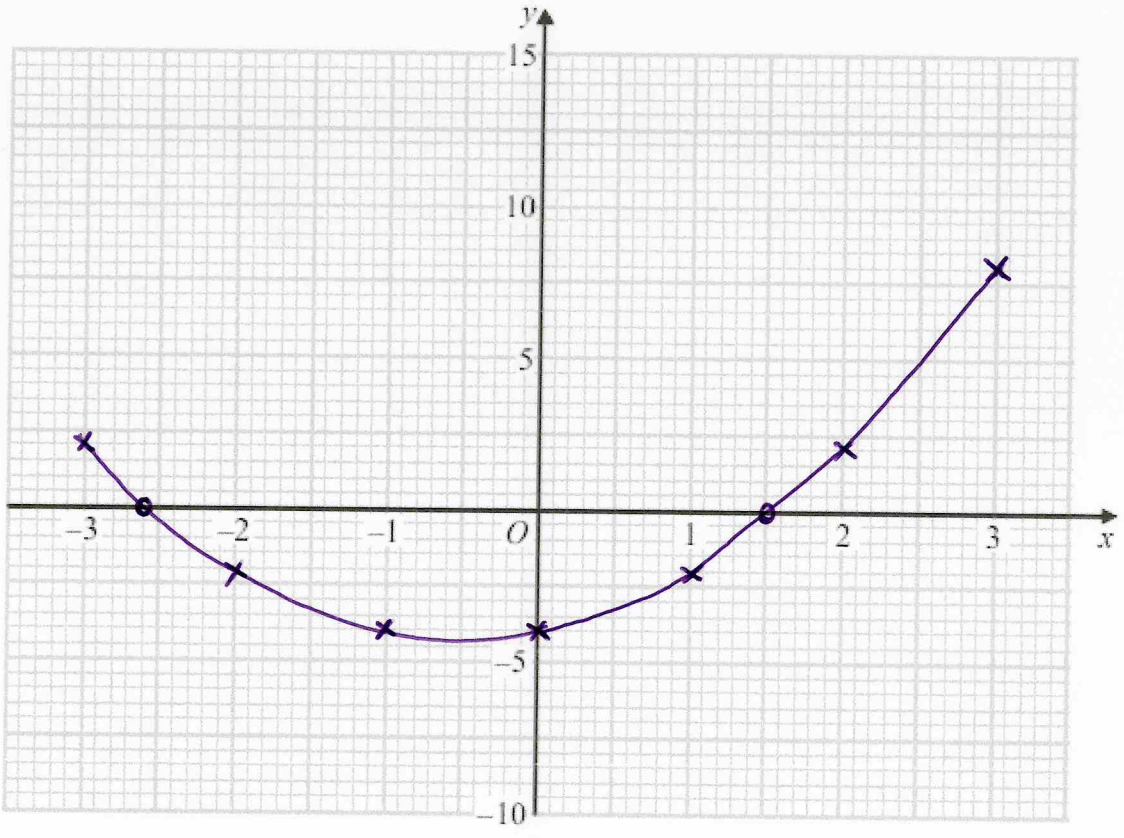
Answer ALL questions
Write your answers in the space provided.
You must write down all the stages in your working.

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

x	–3	–2	–1	0	1	2	3
y	2	–2	–4	–4	–2	2	8

(2)

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



(2)

(c) Use the graph to estimate a solution to $x^2 + x - 4 = 0$

–2.6 and 1.5

(1)

(Total for Question 3 is 5 marks)

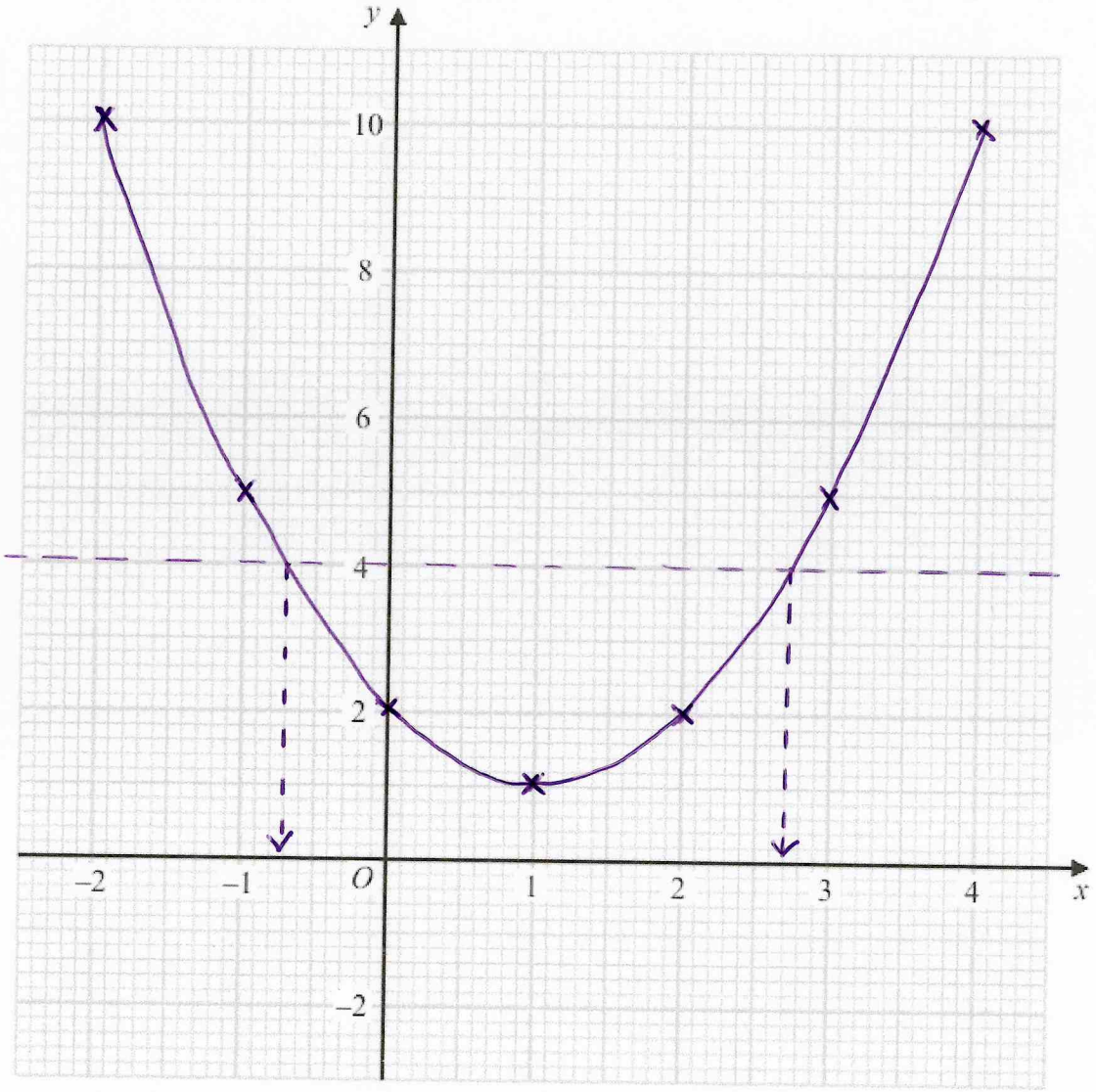
4 (a) Complete the table of values for $y = x^2 - 2x + 2$

x	–2	–1	0	1	2	3	4
y	10	5	2	1	2	5	10

(2)

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

(2)



(c) Use your graph to find estimates of the solutions of the equation $x^2 - 2x + 2 = 4$

–0.7 and 2.7

(2)

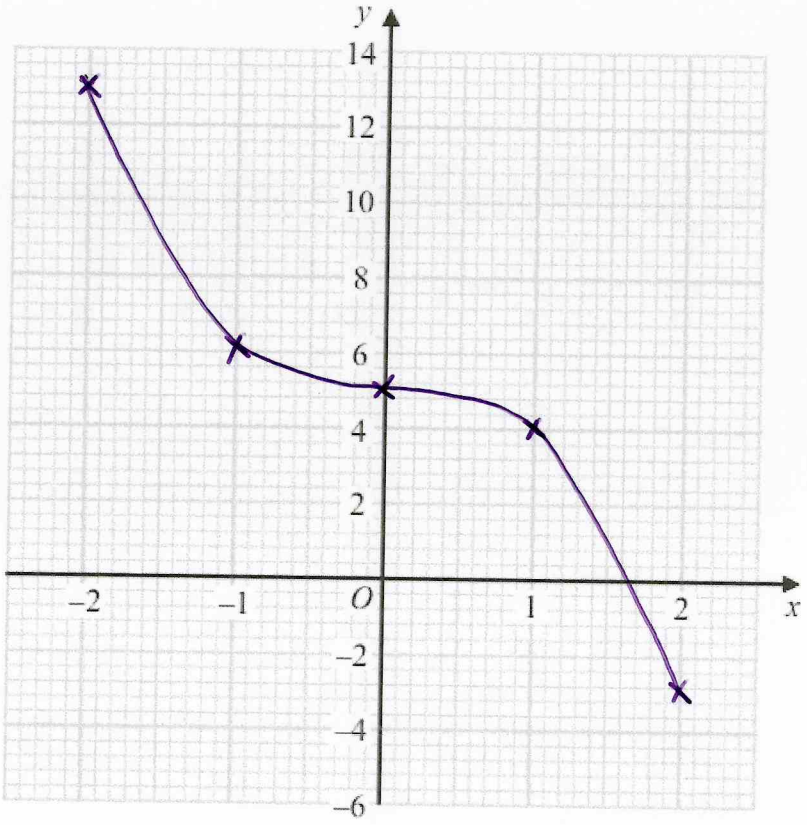
(Total for Question 4 is 6 marks)

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

x	–2	–1	0	1	2
y	13	6	5	4	-3

(2)

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



(2)

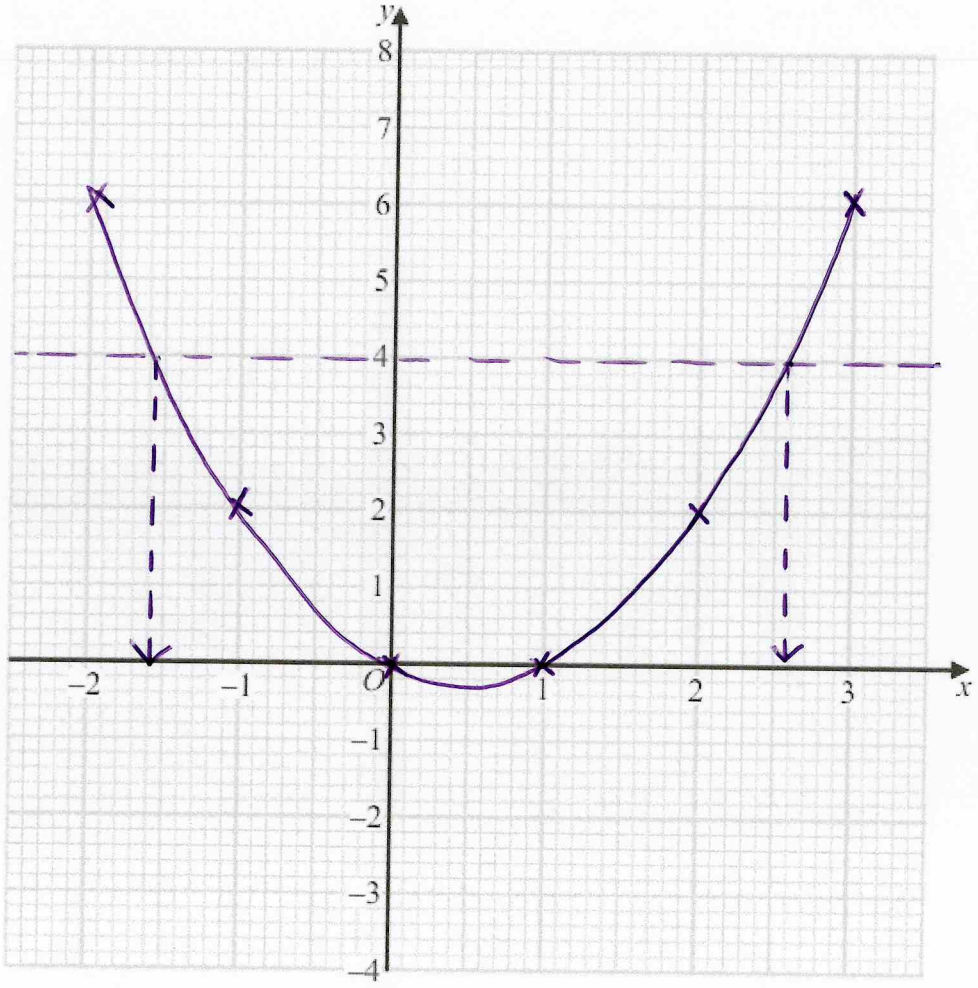
(Total for Question 4 is 4 marks)

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

x	–2	–1	0	1	2	3
y	6	2	0	0	2	6

(2)

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



(2)

(c) Use your graph to find estimates for the solutions of the equation $x^2 - x = 4$

–1.6 and 2.6

(2)

(Total for Question 5 is 6 marks)

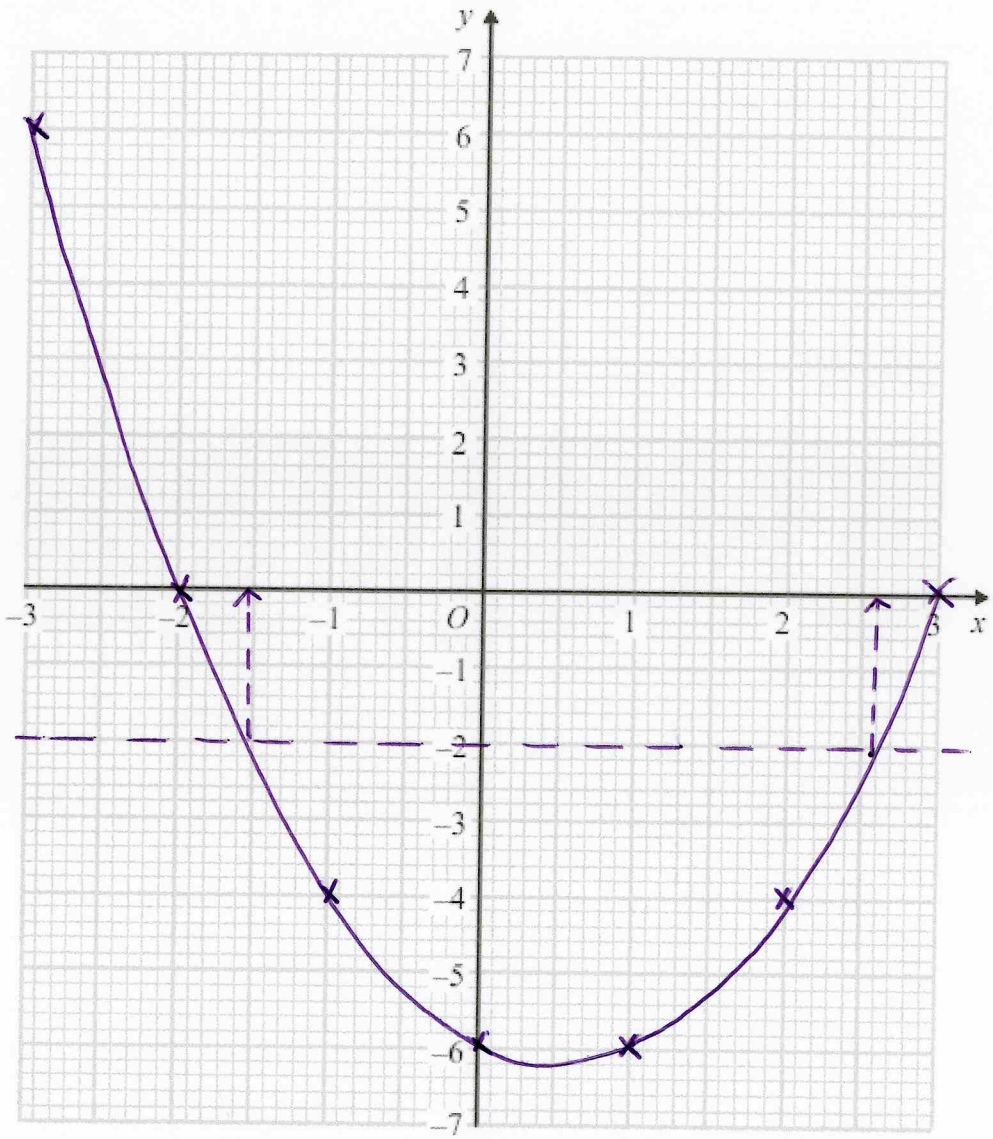
5 (a) Complete the table of values for $y = x^2 - x - 6$

x	–3	–2	–1	0	1	2	3
y	6	0	-4	-6	-6	-4	0

(2)

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

(2)



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

-1.5 and 2.6

(2)

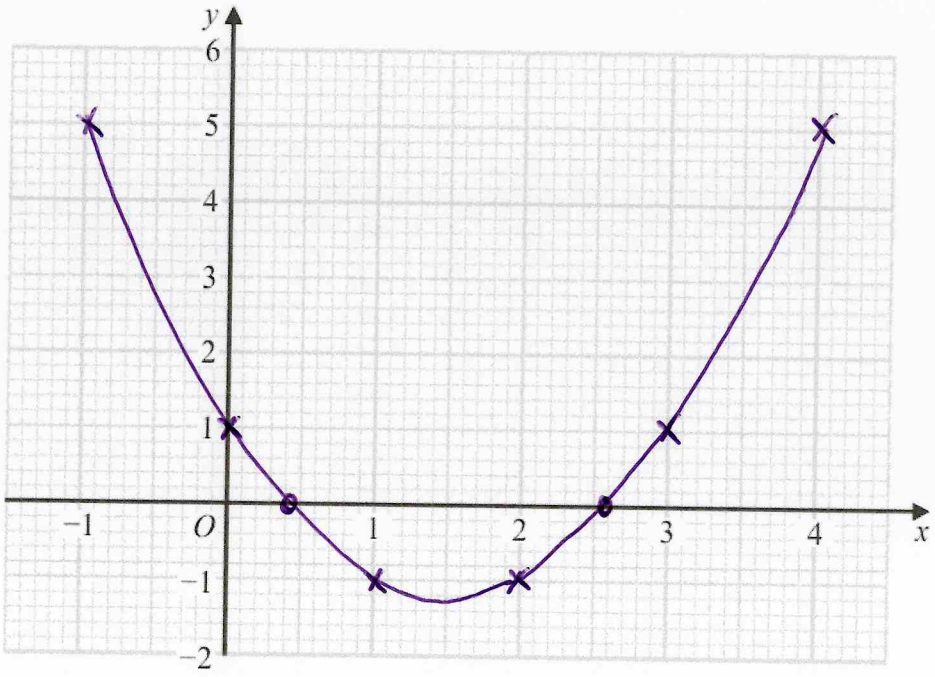
(Total for Question 5 is 6 marks)

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

x	−1	0	1	2	3	4
y	5	1	−1	−1	1	5

(2)

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



(2)

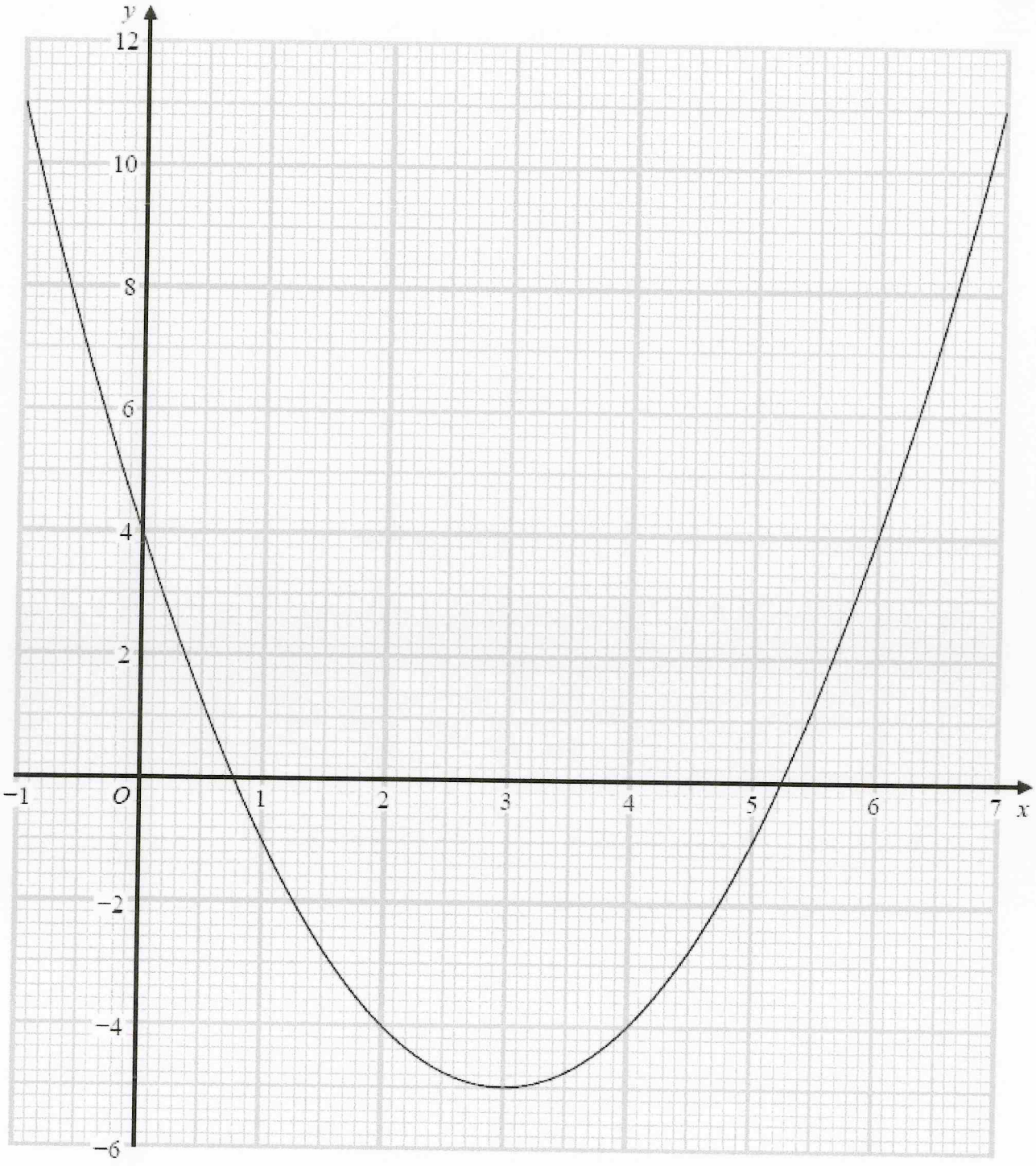
(c) Using your graph, find estimates for the solutions of the equation $x^2 - 3x + 1 = 0$

0·4 and 2·6

(2)

(Total for Question 6 is 6 marks)

7 Here is the graph of $y = x^2 - 6x + 4$



(a) Write down the y intercept of the graph of $y = x^2 - 6x + 4$

4

(1)

(b) Write down the coordinates of the turning point of the graph of $y = x^2 - 6x + 4$

(3 , -5)

(1)

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

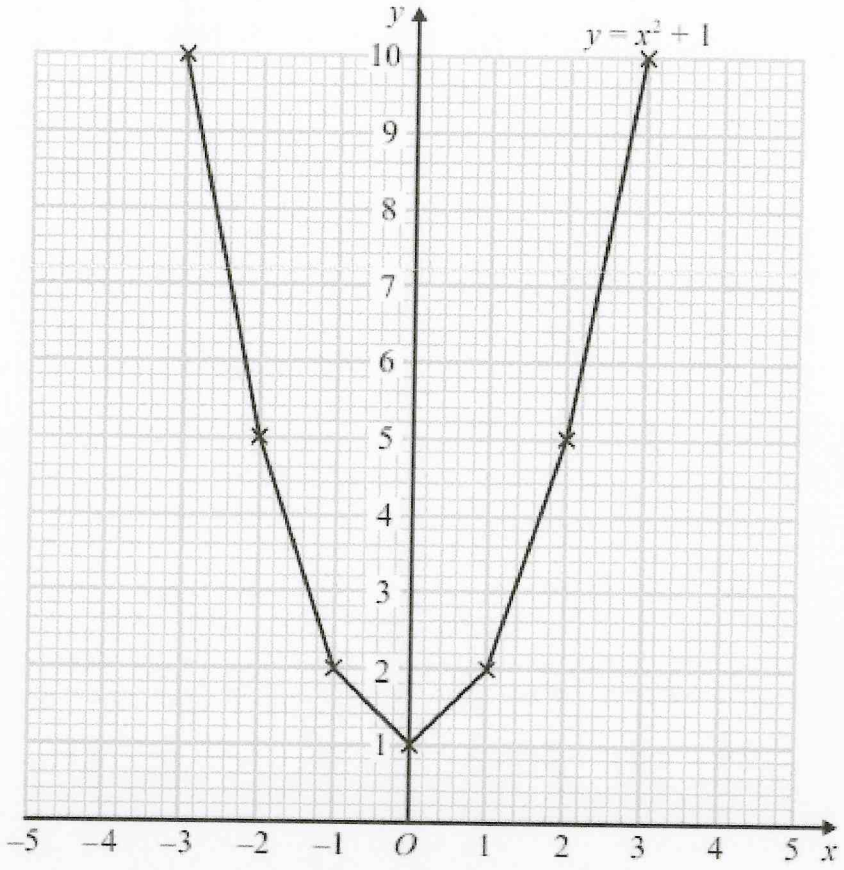
0·8 and 5·2

(2)

(Total for Question 7 is 4 marks)

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

Here is her graph.

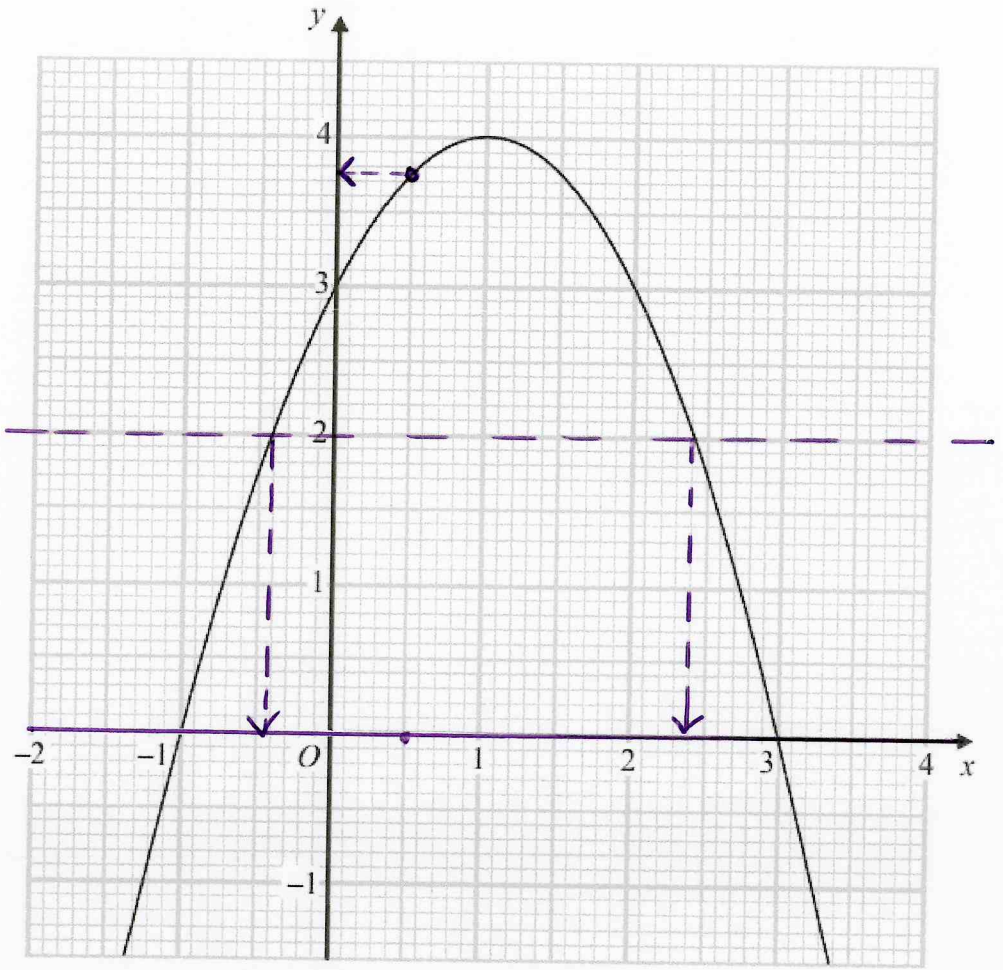


Write down one thing that is wrong with Brogan's graph.

The points should be joined with a smooth curve.

November 2017 – Paper 1H **(Total for Question 7 is 1 mark)**

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



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

(1 , 4)

(1)

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

-0.4 and 2.4

(1)

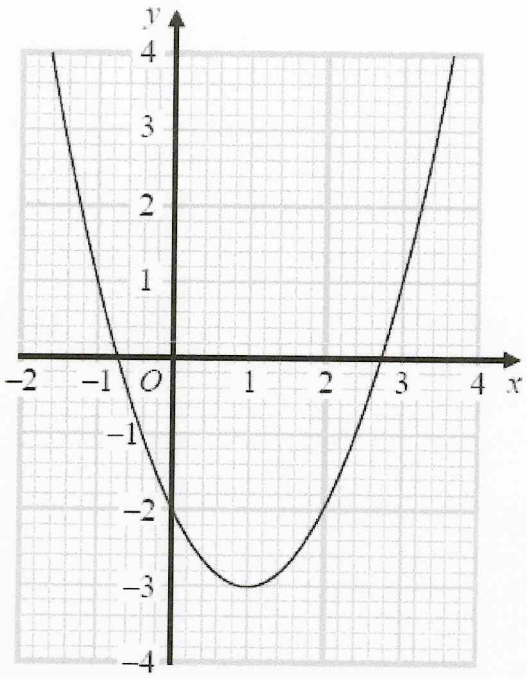
(c) Write down the value of f(0.5)

3.75

(1)

(Total for Question 7 is 3 marks)

7 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 , -3)

(1)

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

-0.8 and 2.7

(1)

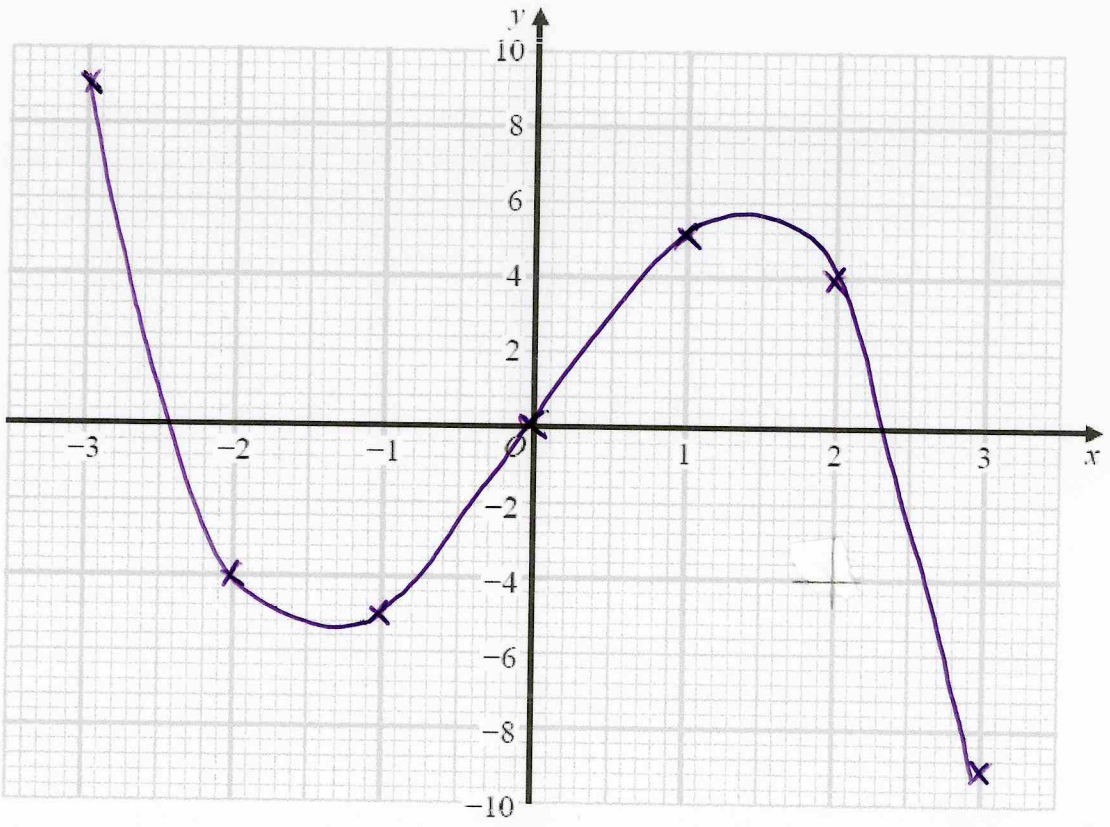
(Total for Question 7 is 2 marks)

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

x	−3	−2	−1	0	1	2	3
y	9	-4	-5	0	5	4	−9

(2)

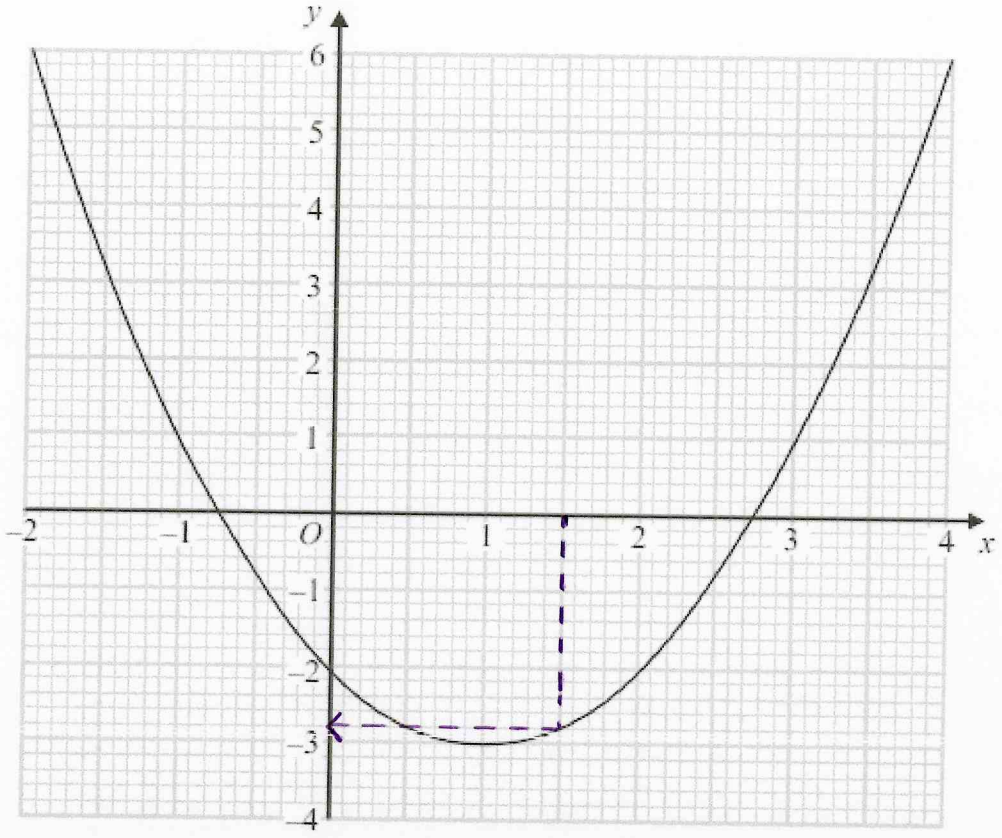
(b) On the grid, draw the graph of $y = 6x - x^3$ for values of x from −3 to 3



(2)

(Total for Question 9 is 4 marks)

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



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

(1 , -3)

(1)

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

-0.75 and 2.75

(1)

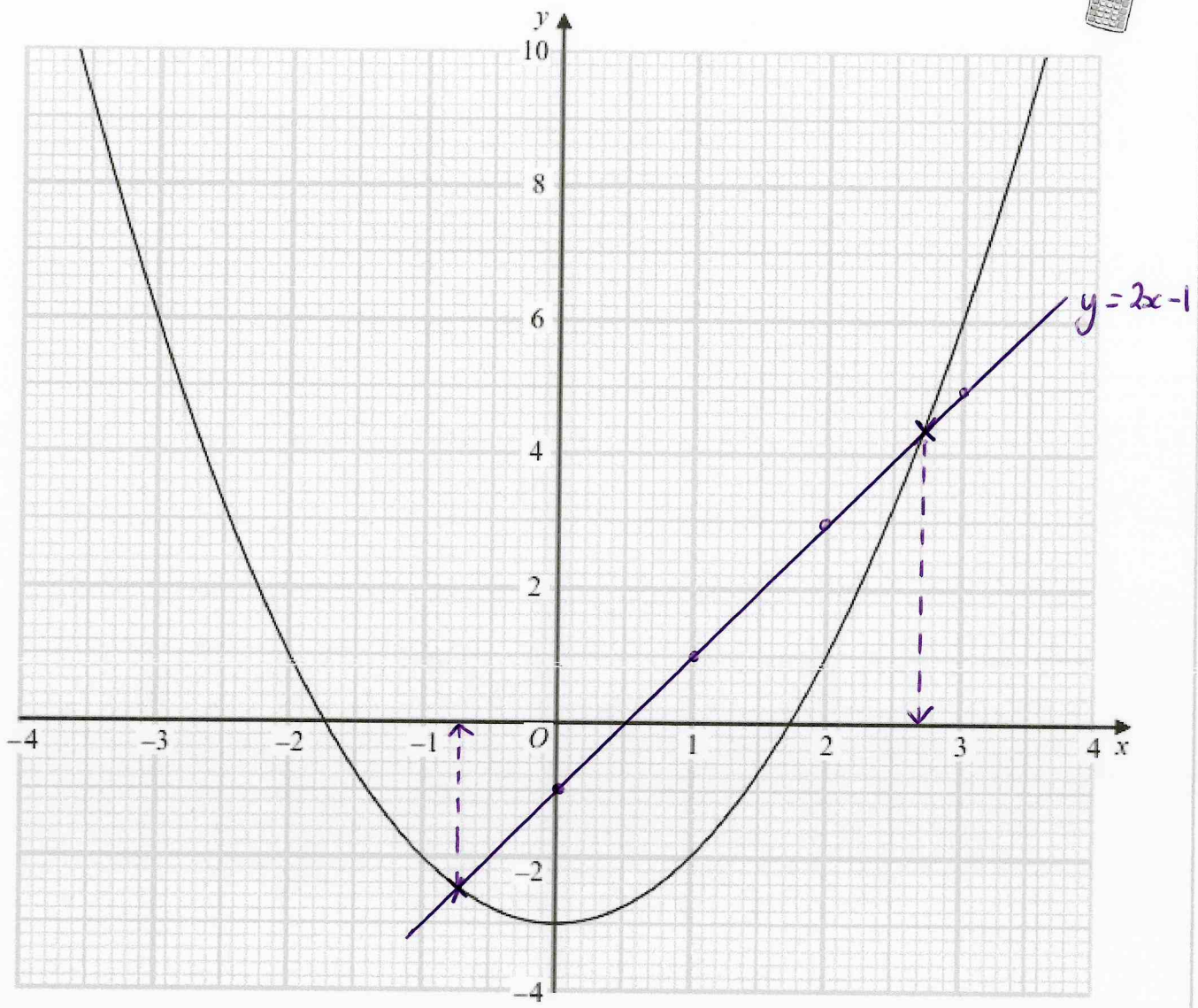
(c) Use the graph to find an estimate for $f(1.5)$

-2.8

(1)

(Total for Question 11 is 3 marks)

17 Here is the graph of $y = x^2 - 3$



Use the graph to find estimates for the solutions to the equation $x^2 - 2x - 2 = 0$
You must show how you get your solutions.

$y = x^2 - 3$

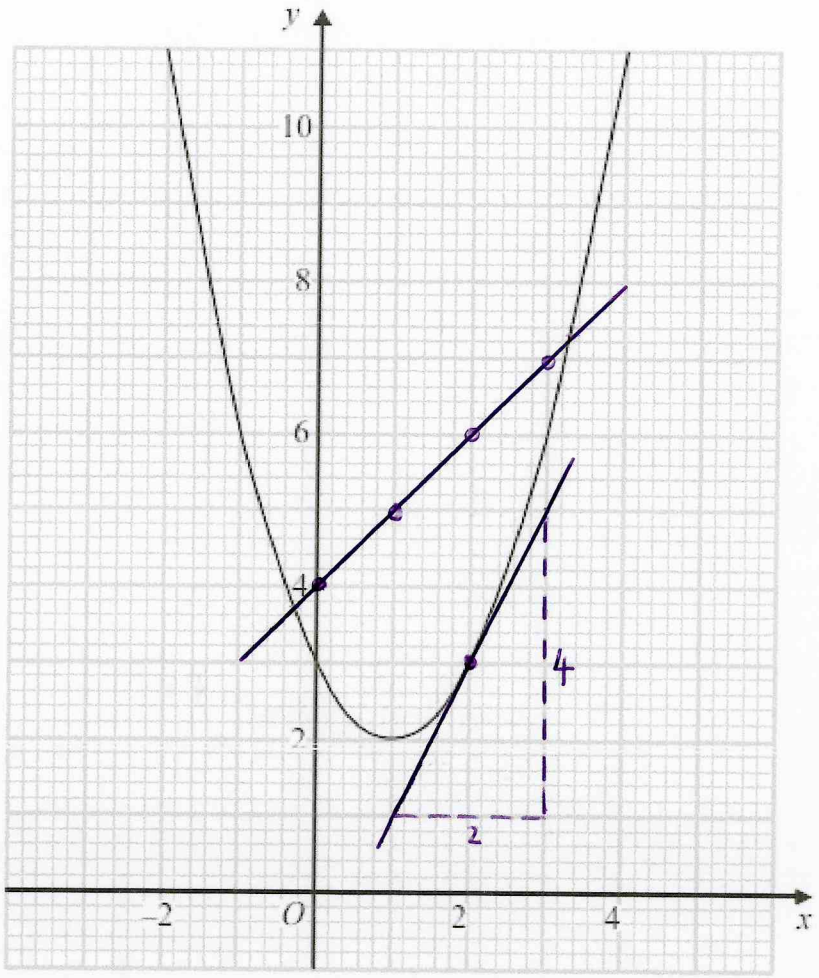
$y = 2x - 1$

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

$x = -0.7$ or $x = 2.7$

(Total for Question 17 is 4 marks)

20 The diagram shows part of the graph of $y = x^2 - 2x + 3$



(a) By drawing a suitable straight line, use your graph to find estimates for the solutions of $x^2 - 3x - 1 = 0$

$x^2 - 2x + 3 = x + 4$

$x = -0.3$ or $x = 3.2$

(2)

P is the point on the graph of $y = x^2 - 2x + 3$ where $x = 2$

(b) Calculate an estimate for the gradient of the graph at the point P.

$m = \frac{\Delta y}{\Delta x} = \frac{4}{2}$

2

(3)

(Total for Question 20 is 5 marks)

21 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.

Turning point

$$y = 2\left[x^2 - 4x - \frac{5}{2}\right]$$

$$= 2\left[(x-2)^2 - 6.5\right]$$

$$= 2(x-2)^2 - 13$$

$$= (2, -13) \text{ Turning point}$$

x intercepts

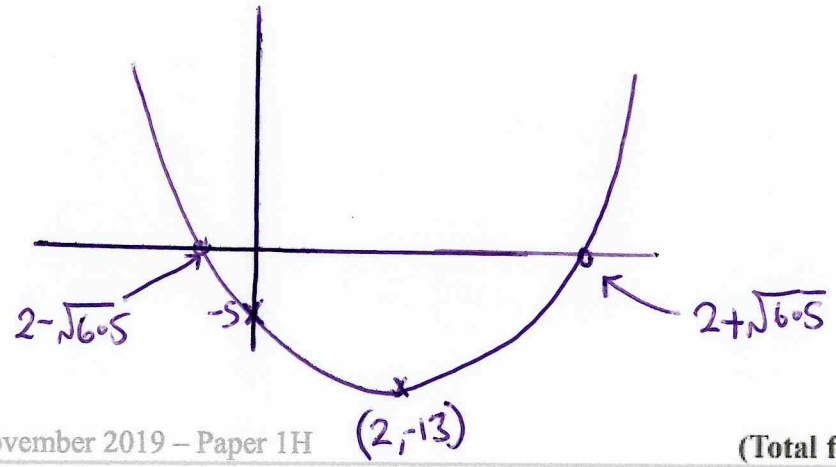
$$2(x-2)^2 - 13 = 0$$

$$2(x-2)^2 = 13$$

$$(x-2)^2 = 6.5$$

$$x - 2 = \pm\sqrt{6.5}$$

$$x = 2 \pm \sqrt{6.5}$$



(Total for Question 21 is 5 marks)