Write your name, centre number and candidate number in the boxes below.

Surname	Other names

Centre number | | | | | |

Candidate number | | | | |

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Plotting curves and graphical solutions

Time allowed: 1 hour 10 minutes

Subject code **0580**

Mathematics

Questions from Paper 1, Paper 2, Paper 3 and Paper 4

You must have: a ruler marked in centimetres and millimetres, a protractor, compasses, a pen, an HB pencil and an eraser.
Question 9 (Paper 1): no calculator.
Questions 1-2, 4-5, 7-8 (Paper 2): calculator allowed.
Questions 3, 6 (Paper 3): calculator allowed.
Question 10 (Paper 4): calculator allowed.

Total marks

/ 57

Instructions

- Answer every question in the space provided on this paper.
- Write in black or dark blue ink. Pencil may be used for diagrams and graphs.
- Fill in your name, centre number and candidate number above.
- Show your working: a correct method can earn marks even if the answer is wrong.
- Unless a question says otherwise, give answers that are not exact to 3 significant figures, and angles in degrees to 1 decimal place.

Information

- This paper has 10 questions worth 57 marks in total.
- The marks for each question or part are shown in brackets, for example [3].

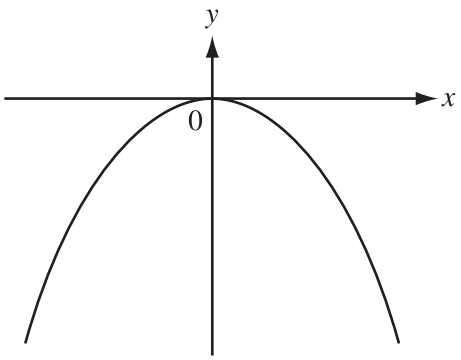
Advice

- Read every question through once before you write anything.
- Use the marks in brackets to judge how long to spend on each part.
- If you finish early, go back and check your working.

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Print at 100% (Actual size) so diagrams keep their real measurements.

1



NOT TO SCALE

The sketch shows the graph of $y = ax^n$ where a and n are integers.

Write down a possible value for a and a possible value for n.

Answer $a =$ .....

$n =$ ..... [2]

Plotting curves and graphical solutions Click for more variations

1	a any negative integer n any even (positive) integer	**2**	**B1** for one correct

2 A graph with equation $y = x^2 + bx + c$ has a minimum point at $(-5, 12)$.

Find the value of b and the value of c.

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$b =$ .....

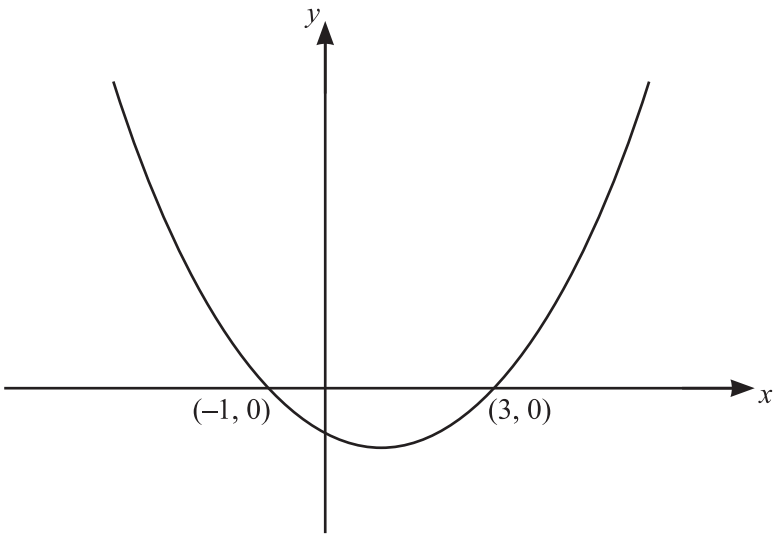
$c =$ ..... [3]

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2	[b =] 10 [c =] 37	**3**	**B2** for $b = 10$ or $c = 37$ OR **M1** for correct method for b e.g. • $(x + 5)^2 + 12$ • $2x + b = 0$ oe • $\frac{-b}{2[1]} = -5$ **M1** for correct method for c e.g. • $x^2 + 5x + 5x + 25$ [+ 12] oe • $12 = (-5)^2 + \textit{their } b \times -5 + c$ oe • $c - \frac{(\textit{their } b)^2}{4[1]} = 12$ oe

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3



NOT TO SCALE

The sketch shows the graph of $y = x^2 - 2x - 3$.
The graph crosses the x-axis at $(-1, 0)$ and $(3, 0)$.

(a) Find the equation of the line of symmetry of the graph.

..... [1]

(b) **(i)** The point A with coordinates $(6, k)$ lies on the graph.

Show that the value of k is 21.

[1]

(ii) The point B with coordinates $(p, 21)$ also lies on the graph.

Find the value of p.

$p =$ ..... [1]

(c) Write down the y-coordinate of the point where the graph crosses the y-axis.

..... [1]

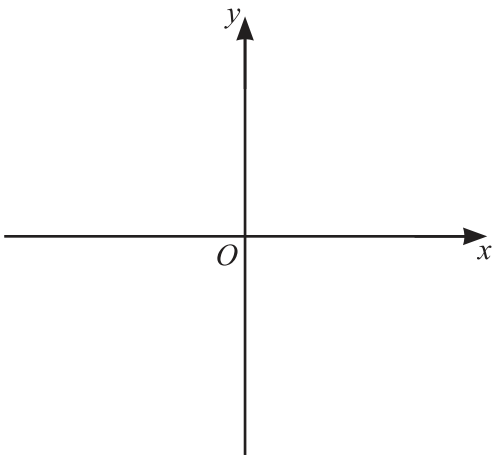
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(a) Plotting curves and graphical solutions (b)(i) Substitution (b)(ii) Plotting curves and graphical solutions (c) Plotting curves and graphical solutions Click for more variations

3(a)	$x = 1$ oe	**1**	
3(b)(i)	$6^2 - 2 \times 6 - 3$ [leading to 21]	**1**	
3(b)(ii)	–4	**1**	
3(c)	–3	**1**	

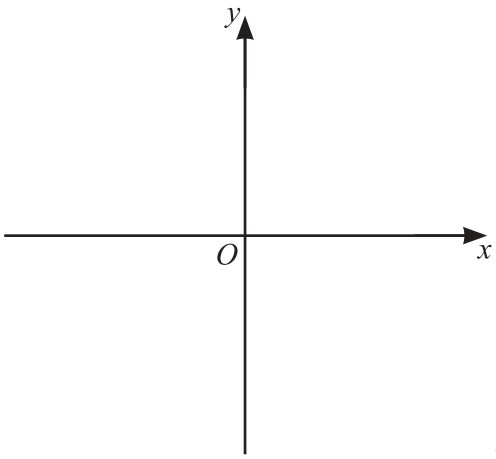
4 On the axes, sketch the graph of each of these functions.

(a) $y = \frac{2}{x}$



[2]

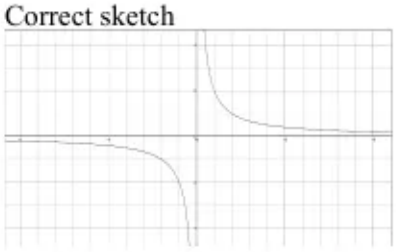
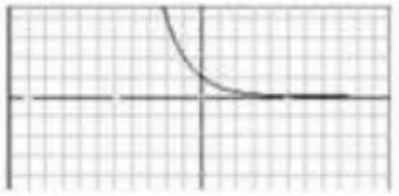
(b) $y = 2^{-x}$



[2]

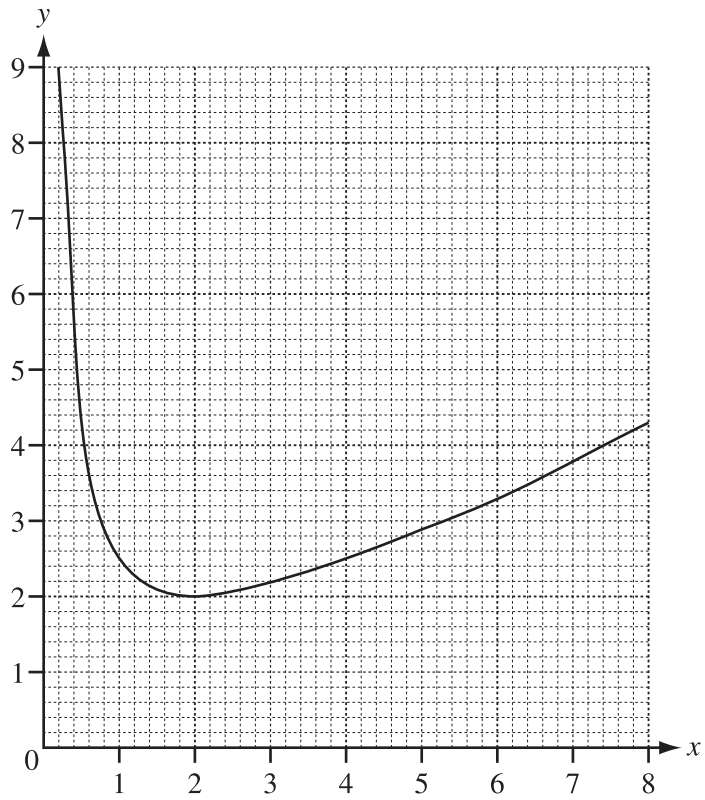
Questions 25 and 26 are printed on the next page.

(a) Sketching graphs (b) Sketching graphs Click for more variations
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4(a)	Correct sketch 	**2**	**B1** for one correct branch or attempt at correct shape
4(b)	Correct sketch 	**2**	**B1** for correct shape but crossing x-axis or for correct shape but just drawn in one quadrant

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5



The diagram shows the graph of $y = \frac{x}{2} + \frac{2}{x}$, for $0 < x \leqslant 8$.

(a) Use the graph to solve the equation $\frac{x}{2} + \frac{2}{x} = 3$.

Answer (a) $x =$ ..... or $x =$ ..... [2]

(b) By drawing a suitable tangent, work out an estimate of the gradient of the graph where $x = 1$.

Answer(b) ..... [3]

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(a) Plotting curves and graphical solutions (b) Drawing a tangent to a curve Click for more variations

5 (a)	0.7 to 0.8 and 5.2 to 5.4	**2**	**B1 B1**
(b)	–2 to –1 but must have a tangent at $x = 1$ for full marks	**3**	**M1** drawing tangent at $x = 1$ **M1** for using $y$step/$x$step on their tangent wherever it is drawn

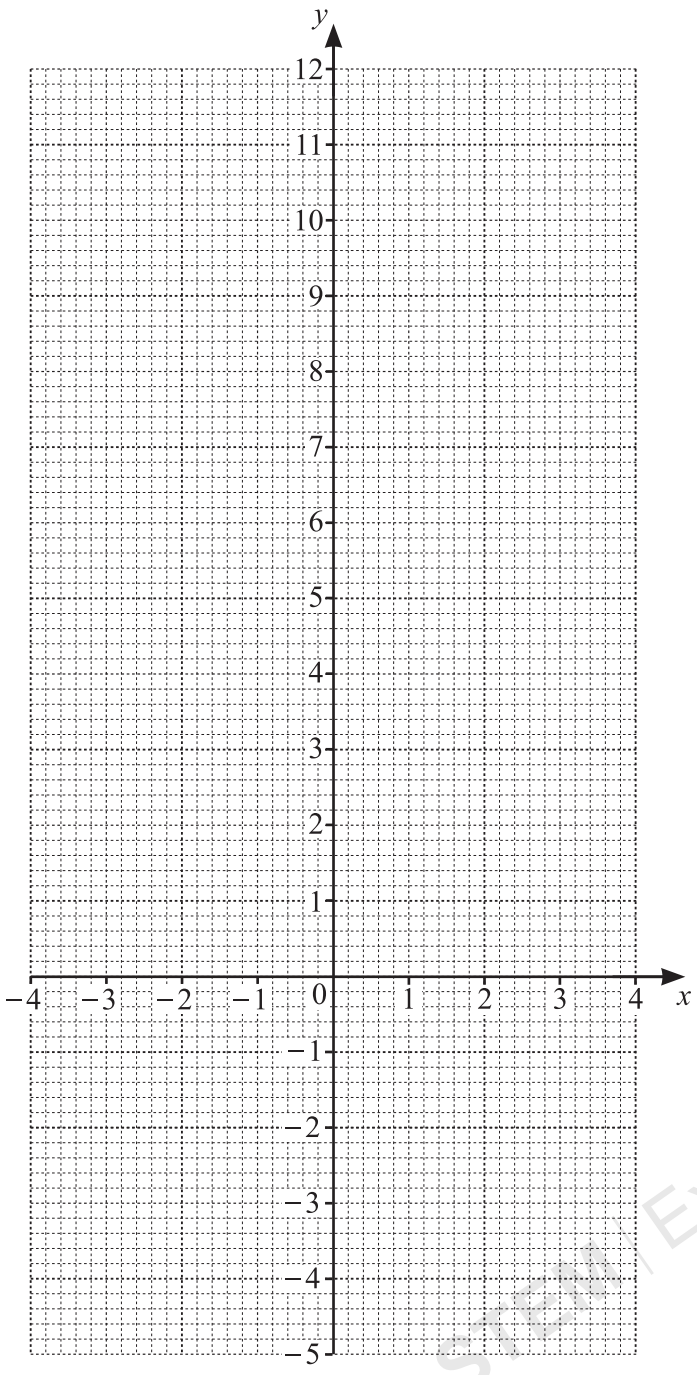
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6 **(a)** Complete the table of values for $y = x^2 - 4$.

x	–4	–3	–2	–1	0	1	2	3	4
y	12		0	–3		–3	0		12

[2]

(b) On the grid, draw the graph of $y = x^2 - 4$ for $-4 \leqslant x \leqslant 4$.



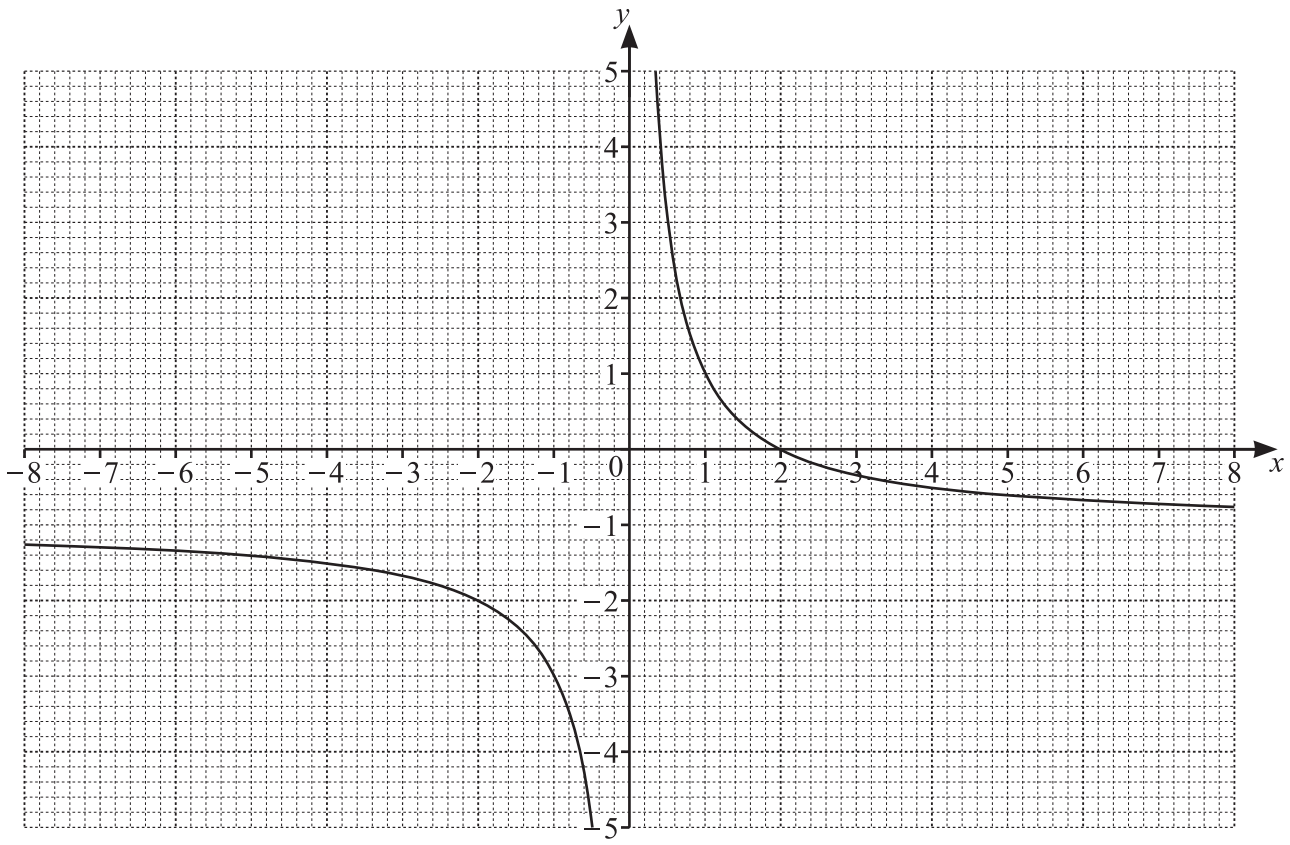
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[4]

(a) Plotting curves and graphical solutions (b) Plotting curves and graphical solutions Click for more variations

6(a)	5 −4 5	**2**	**B1** for 2 correct
6(b)	Correct curve	**4**	**B3FT** for 8 points correctly plotted **B2FT** for 6 points correctly plotted **B1FT** for 4 points correctly plotted

7



The diagram shows the graph of $y = \frac{2}{x} - 1$.

(a) Write down the coordinates of the point where the graph crosses the x-axis.

(..... , ...) [1]

(b) Write down the equation of each asymptote.

.....

.....

[2]

(c) By drawing a suitable straight line on the grid, solve $\frac{2}{x} - x - 1 = 0$.

$x =$ ..... or $x =$ ..... [3]

(a) Coordinates (b) Plotting curves and graphical solutions (c) Plotting curves and graphical solutions

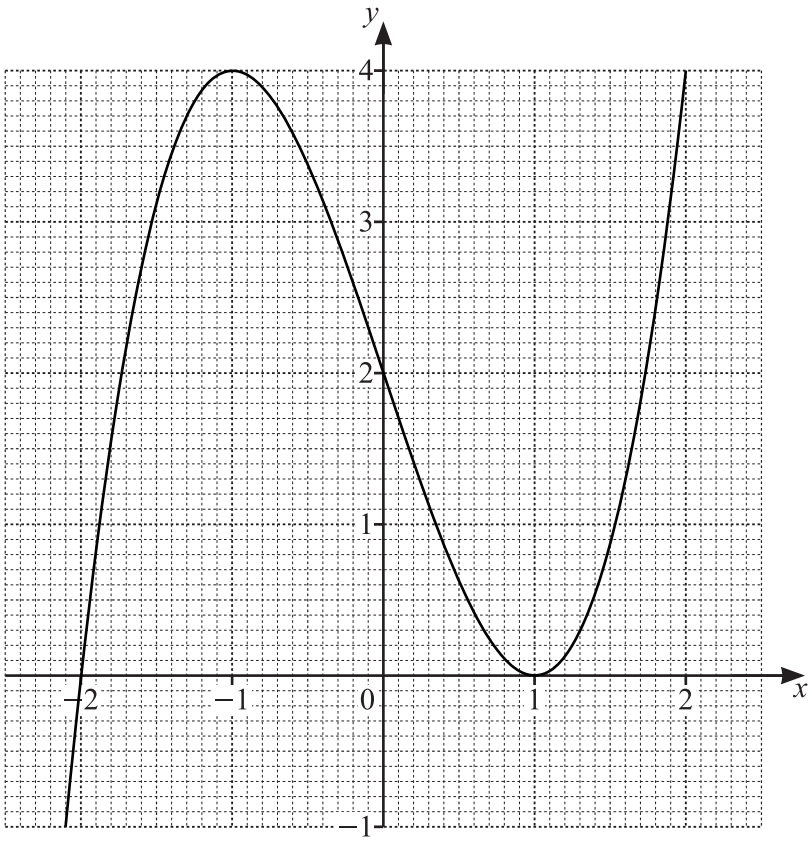
Click for more variations

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7(a)	(2, 0)	**1**	
7(b)	$x = 0$, $y = -1$	**2**	**B1** for each
7(c)	$y = x$ ruled	**B1**	
	$x = -2$ and $x = 1$	**B2**	**B1** for one correct or for two correct answers FT from *their* line

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8 The graph of $y = (x+2)(x-1)^2$ is shown on the grid.



(a) Show that $y = (x+2)(x-1)^2$ can be written as $y = x^3 - 3x + 2$.

[2]

(b) By drawing a suitable straight line, solve the equation $2x^3 - 5x = 0$.

$x =$ ..... or $x =$ ..... or $x =$ ..... [4]

(a) Expanding triple brackets (b) Plotting curves and graphical solutions Click for more variations

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8(a)	$x^2 - x - x + 1$ or $x^2 + 2x - x - 2$	**M1**	
	A correct unsimplified expansion e.g. $x^3 + 2x^2 - x^2 - 2x - x^2 - 2x + x + 2$ oe leading to $[y =] \ x^3 - 3x + 2$	**A1**	
8(b)	$y = 2 - 0.5x$ ruled	**B2**	**B1** for $[y =] \ 2 - 0.5x$ soi or for $y = 2 - kx$ drawn or for $y = k - 0.5x$ drawn
	–1.5 to –1.6 0 1.5 to 1.6	**B2**	**B1** for two correct values

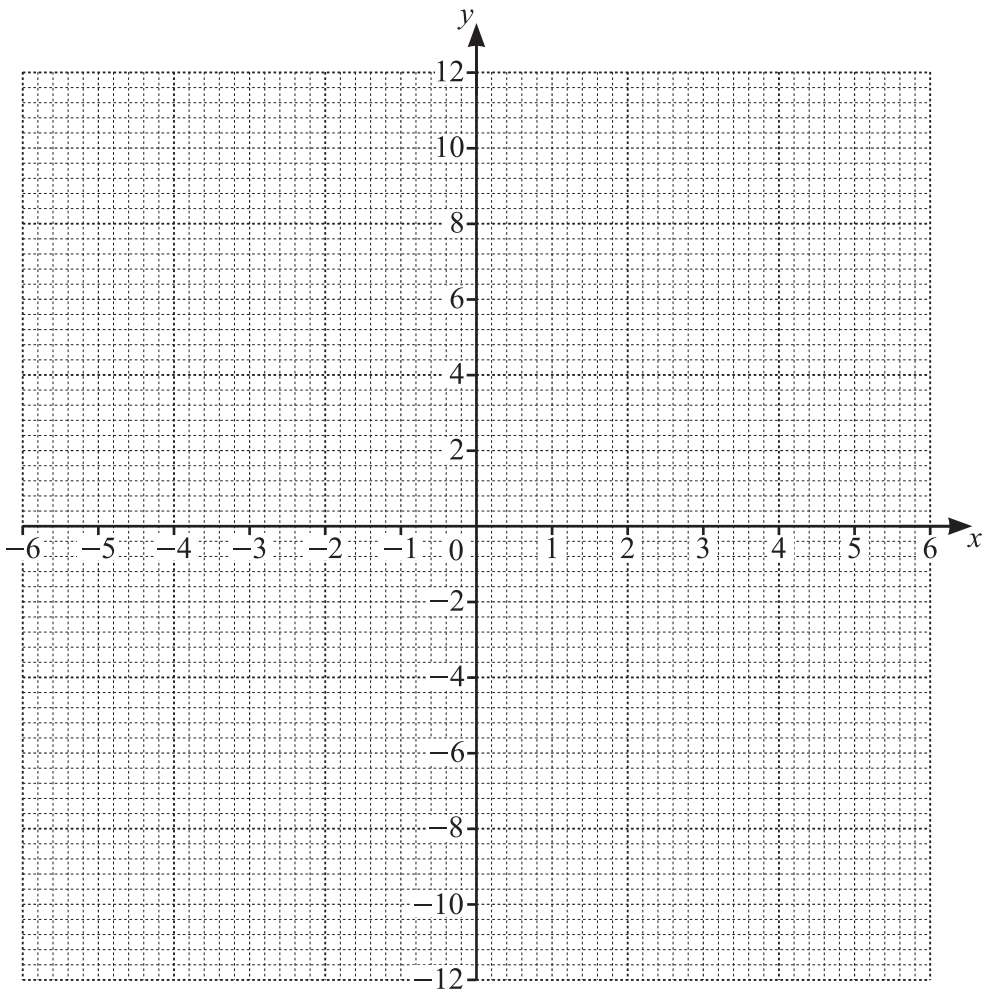
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9 **(a)** Complete the table of values for $y = \frac{12}{x}$.

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

[3]

(b) On the grid, draw the graph of $y = \frac{12}{x}$ for $-6 \leqslant x \leqslant -1$ and $1 \leqslant x \leqslant 6$.



[4]

(c) On the grid, draw the line $y = -9$. [1]

(d) Use your graph to solve $\frac{12}{x} = -9$.

$x =$ ..... [1]

(a) Plotting curves and graphical solutions (b) Plotting curves and graphical solutions (c) Drawing straight-line graphs (d) Plotting curves and graphical solutions Click for more variations

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9(a)	-2 -4 -12 12 4 2	**3**	**B2** for 4 correct or **B1** for 1 correct
9(b)	Correct curve	**4**	**B3FT** for 9 points correctly plotted or **B2FT** for 7 points correctly plotted or **B1FT** for 5 points correctly plotted
9(c)	$y = -9$ correctly drawn, ruled	**1**	
9(d)	-1.4 to -1.2	**1**	FT *their* curve and $y = -9$

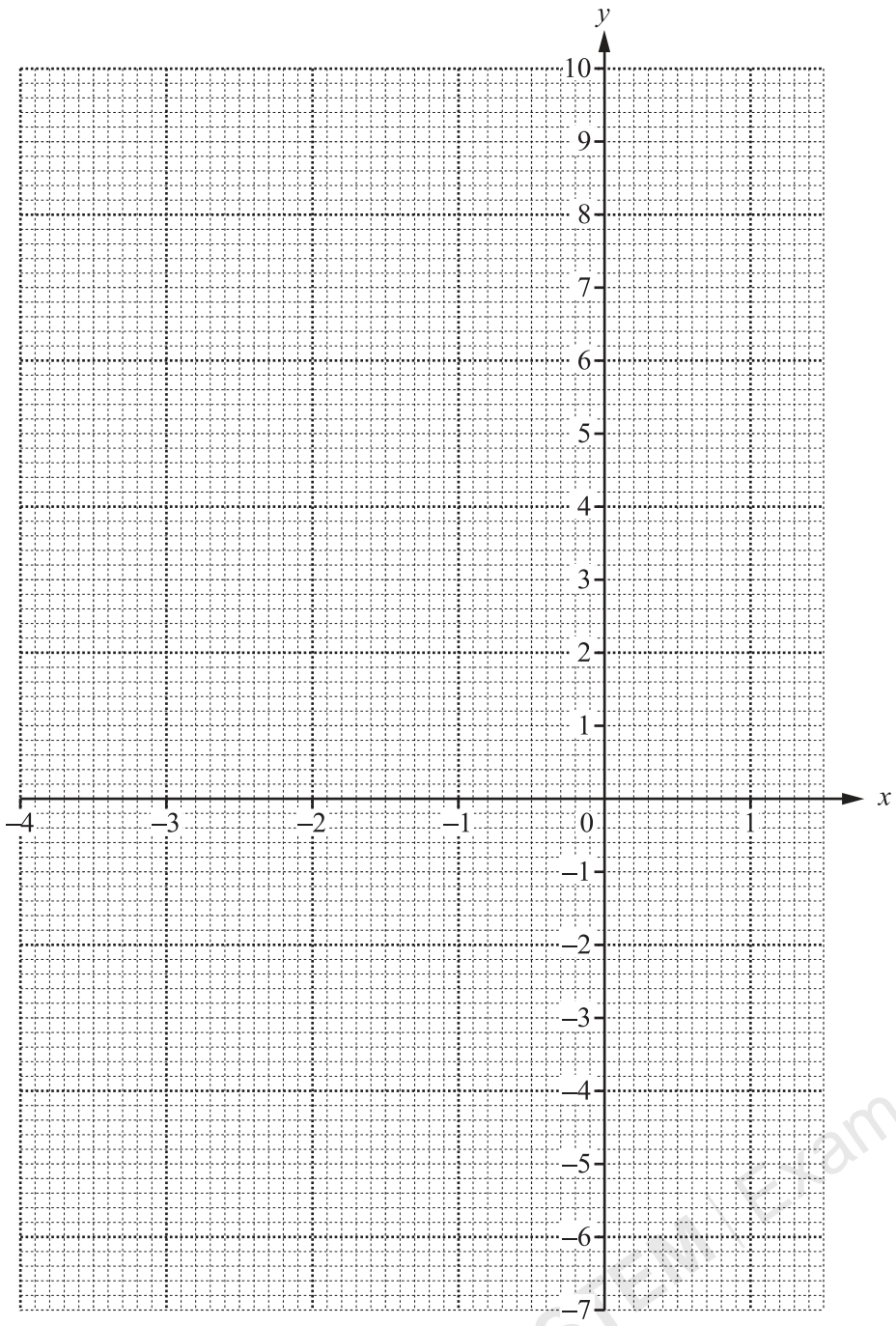
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10 The table shows some values of $y = 2x^2 + 5x - 3$ for $-4 \leqslant x \leqslant 1.5$.

x	-4	-3	-2	-1	0	1	1.5
y		0	-5		-3	4	

(a) Complete the table. [3]

(b) On the grid, draw the graph of $y = 2x^2 + 5x - 3$ for $-4 \leqslant x \leqslant 1.5$.



[4]

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(c) Use your graph to solve the equation $2x^2 + 5x - 3 = 3$.

$x =$ ..... or $x =$ ..... [2]

(d) $y = 2x^2 + 5x - 3$ can be written in the form $y = 2(x+a)^2 + b$.

Find the value of a and the value of b.

$a =$ .....

$b =$ ..... [3]

(a) Plotting curves and graphical solutions (b) Plotting curves and graphical solutions
(c) Plotting curves and graphical solutions (d) Completing the square Click for more variations

10(a)	9, – 6, 9	**3**	**B1** for each
10(b)	Correct graph	**4**	**B3FT** for 6 or 7 correct points or **B2FT** for 4 or 5 correct points or **B1FT** for 2 or 3 correct points
10(c)	–3.5 to –3.35 and 0.8 to 0.9..	**2FT**	**FT** *their* graph **B1FT** for either
10(d)	$a = \frac{5}{4}$ or $1\frac{1}{4}$ or 1.25 $b = -\frac{49}{8}$ or $-6\frac{1}{8}$ or –6.125	**3**	**B2** for either correct or **M1** for [2] $\left(x+\frac{5}{4}\right)^2$ seen isw or for $2x^2 + 4ax + 2a^2 + b$

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