

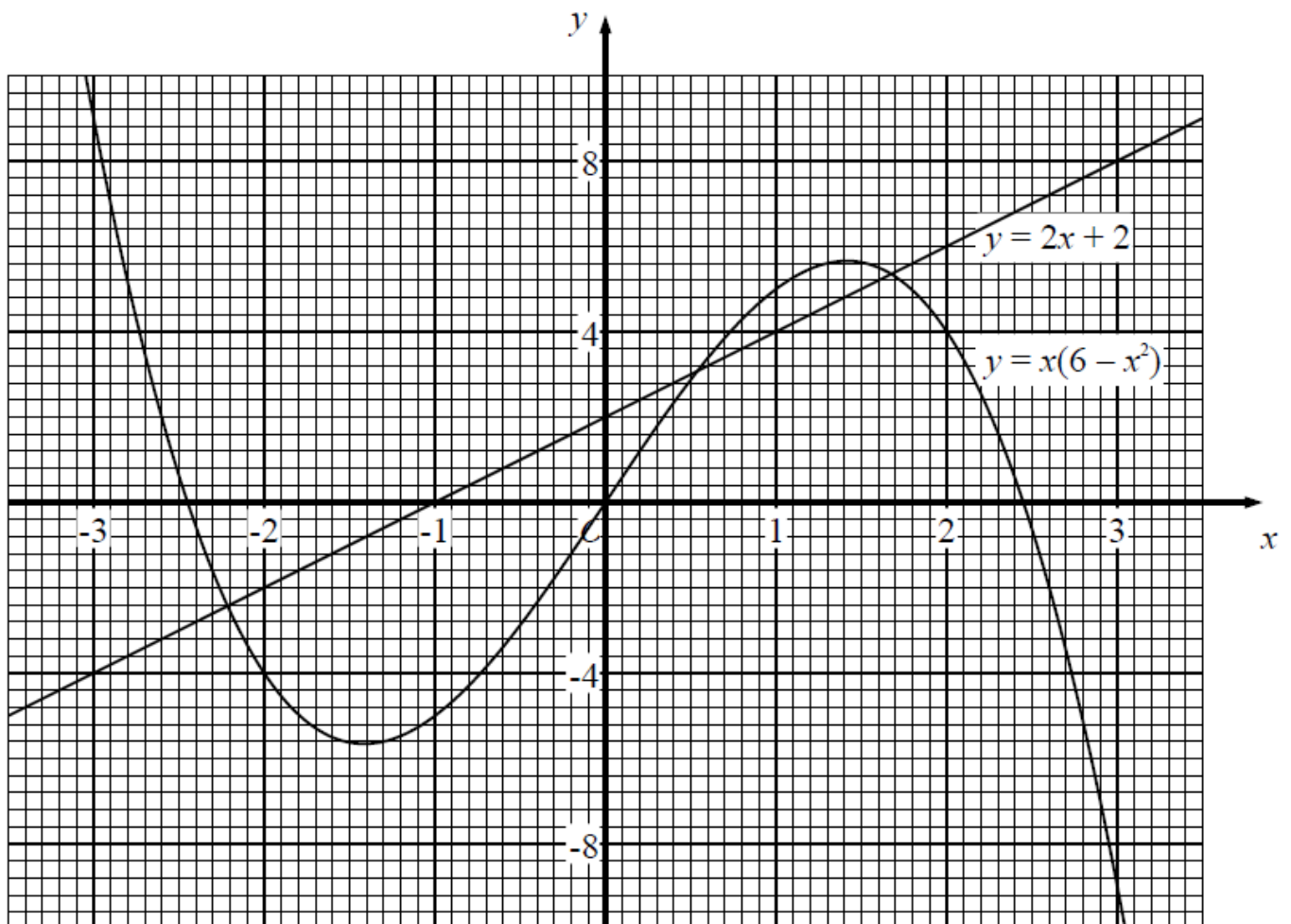
## Level 3 Algebra – Graphs - Drawing and Using - Answers

## June 2013 - Question 12

12	(a)(i)		Tangent drawn	3	B1 for tangent to curve drawn at (1, 2) (professional judgement)
	(ii)	$1 + x - x^2 = 0$ $2 + x - x^2 = 1$	-0.6, 1.6		M1 for correct use of graph, eg line from 1 on y axis across to graph or sight of $2 + x - x^2 = 1$ A1 for both values, accept values in the range -0.55 to -0.65 and 1.55 to 1.65
	(b)		Crosses at (-1, 4) and (1, -3)	1	B1 for crosses at (-1, 4) and (1, -3) (use professional judgement)

## Jan 2014 - Question 19

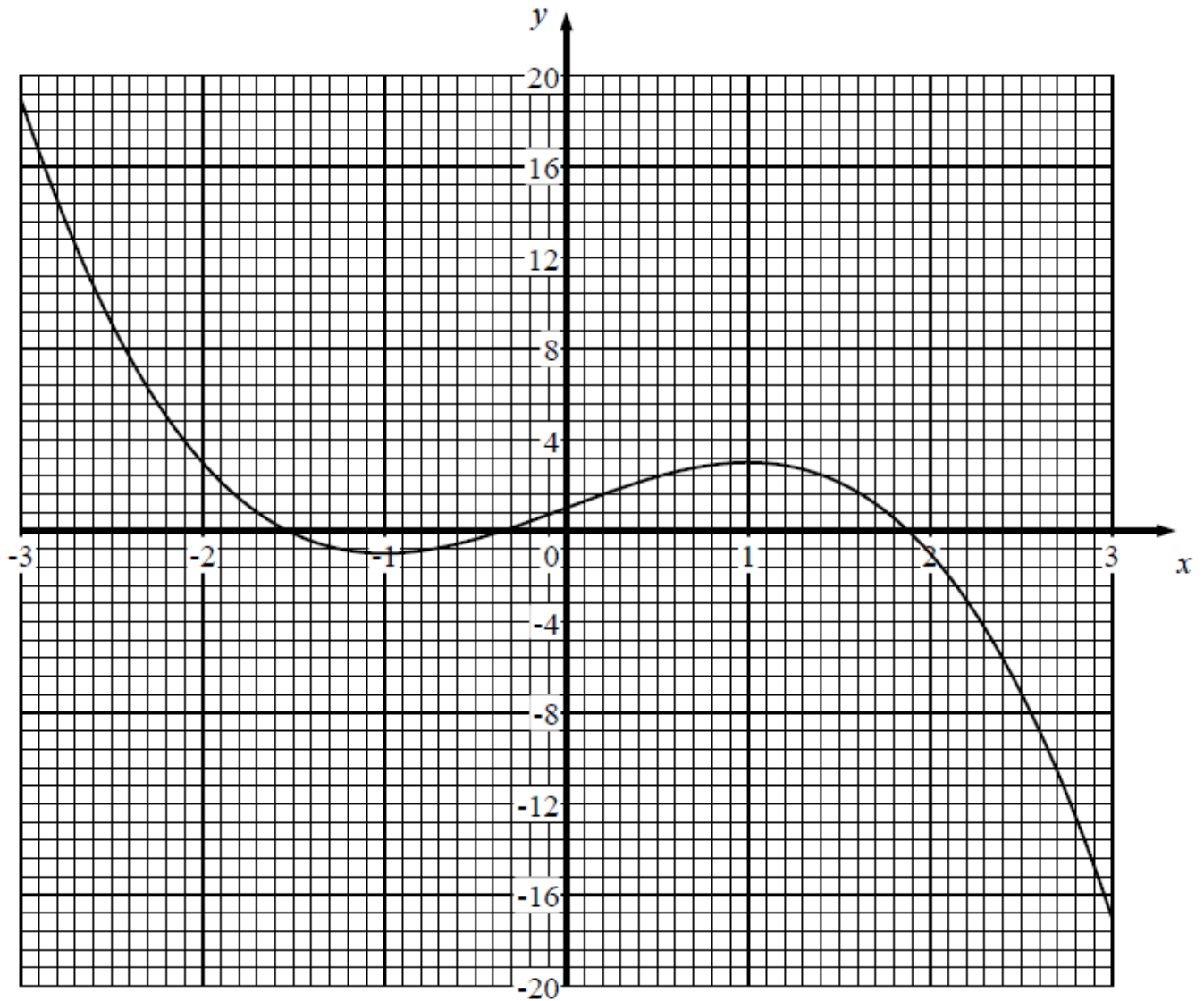
Question	Working	Answer	Mark	Notes
19	(a)	Cubic graph drawn	4	M1 for calculating points for values of $x$ from $x = -3$ to $+3$ with at least 4 correct values of $y$ B1 for drawing suitable axes on grid for their points A1 for all points correct A1 for drawing smooth curve through the correct points
	(b)	-2.5, 0.1, 2.4	1	B1ft for all three values, accept values in the range -2.5 to -2.6, 0.1 to 0.2 and 2.3 to 2.4
	(c)	-2.2, 0.5, 1.6	2	M1 for equation written in the form $6x - x^3 = 2x + 2$ or line $y = 2x + 2$ drawn on graph or equation $y = 2x + 2$ seen A1 ft for all three values, accept values in the range -2.2 to -2.3, 0.5 to 0.6 and 1.6 to 1.7



## Jan 2015 - Question 12

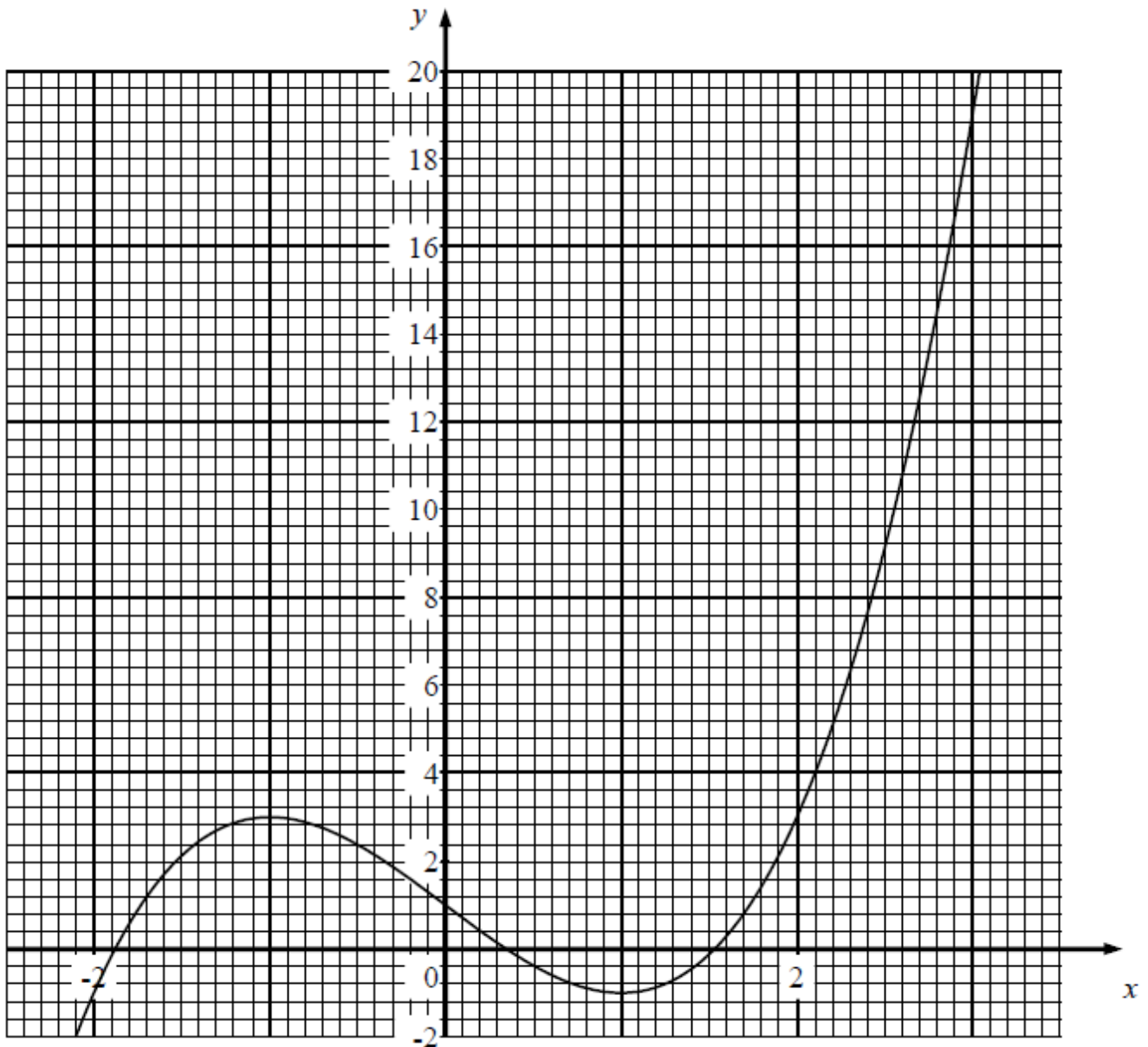
12	(a)	<table border="1"> <tr> <td><math>x</math></td> <td>-3</td> <td>-2</td> <td>-1</td> <td>0</td> <td>1</td> <td>2</td> <td><math>x</math> cubic graph</td> </tr> <tr> <td><math>y</math></td> <td>19</td> <td>3</td> <td>-1</td> <td>1</td> <td>3</td> <td>-1</td> <td>-17</td> </tr> </table>	$x$	-3	-2	-1	0	1	2	$x$ cubic graph	$y$	19	3	-1	1	3	-1	-17	4	<p>B1 for drawing suitable axes on grid</p> <p>M1 for calculating points for values of <math>x</math> from <math>x = -3</math> to 3 with at least 4 correct</p> <p>A1 for all points correct</p> <p>A1 for drawing a smooth cubic curve through their correct points</p>
	$x$	-3	-2	-1	0	1	2	$x$ cubic graph												
$y$	19	3	-1	1	3	-1	-17													
(b)	-1.7, 0, 1.7	solutions	2	<p>M1 for correct use of cubic graph, eg line from 1 on <math>y</math>-axis across to graph or sight of <math>1 + 3x - x^3 = 1</math></p> <p>A1 ft from a cubic curve</p>																

12(a)



June 2015 - Question 9

9	(a)	<table border="1"> <tr> <td>-2</td> <td>-1</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>-1</td> <td>3</td> <td>1</td> <td>-1</td> <td>3</td> <td>19</td> </tr> </table>	-2	-1	0	1	2	3	-1	3	1	-1	3	19	Correct curve	4	B1 for drawing suitable axes on grid M1 for 4 or 5 points calculated for values of $x$ , $-2 \leq x \leq 3$ A1 for 6 points calculated for values of $x$ , $-2 \leq x \leq 3$ A1 for correct curve drawn
	-2	-1	0	1	2	3											
-1	3	1	-1	3	19												
(b)		-1.5 to -1.6 -0.3 to -0.4 1.8 to 1.9	2	M1 for correct use of cubic graph, e.g draw $y = 2$ or sight of $x^3 - 3x + 1 = 2$ A1 for at least one correct answer or ft from cubic graph (if M0, SCB1 for one correct coordinate pair)													

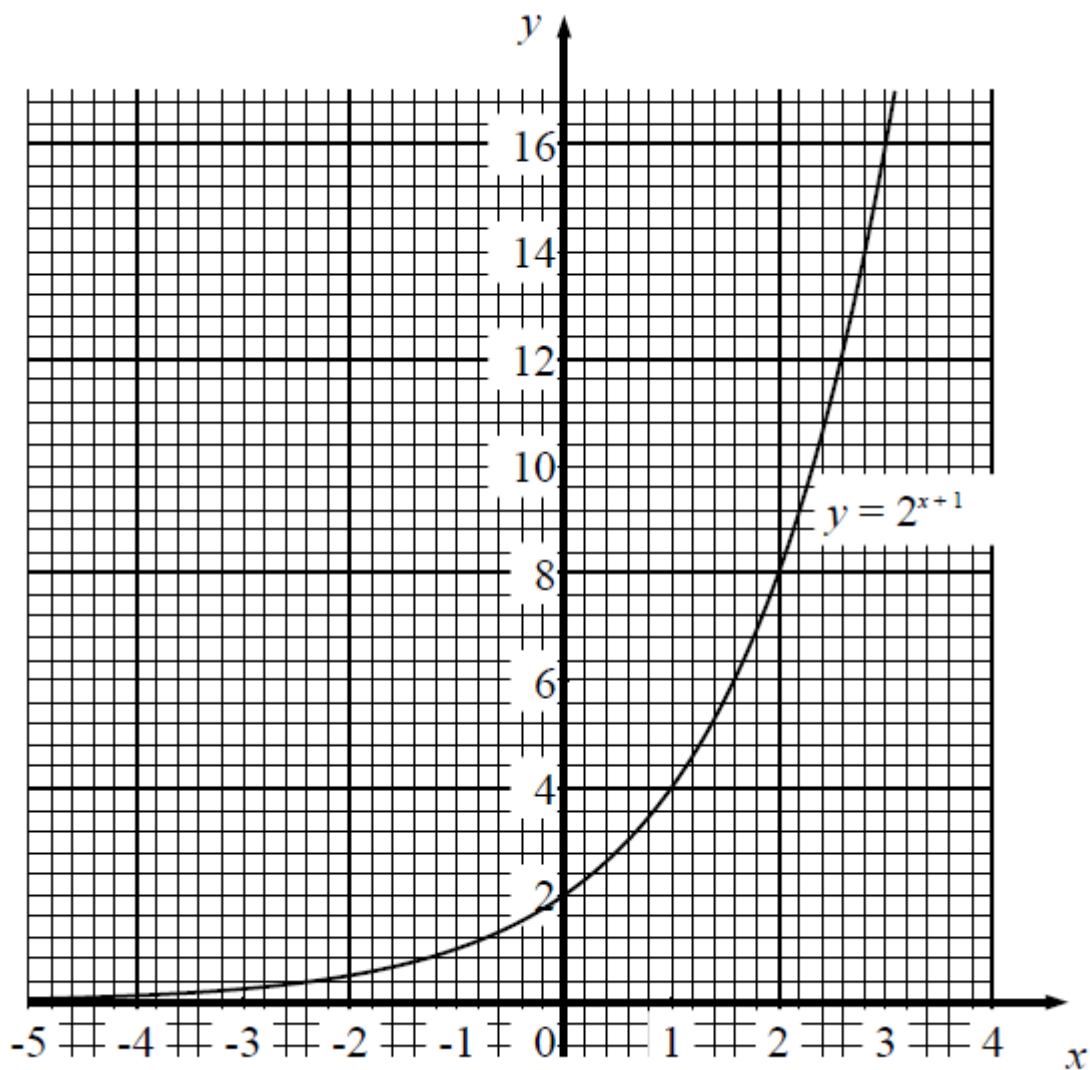


Jan 2016 - Question 13

13	(a)	-10, (-4.875), -2, -0.625, (0), (0.625), 2, (4.875), 10	-10, -2, -0.625, 2, 10	2	B2 for all values correct (B1 for 2, 3 or 4 correct values)
	(b)		Graph	2	M1 (dep B1) for all points correctly plotted A1 cao
	(c)		1.2	2	M1 for $y = 3$ used or marked on the graph A1

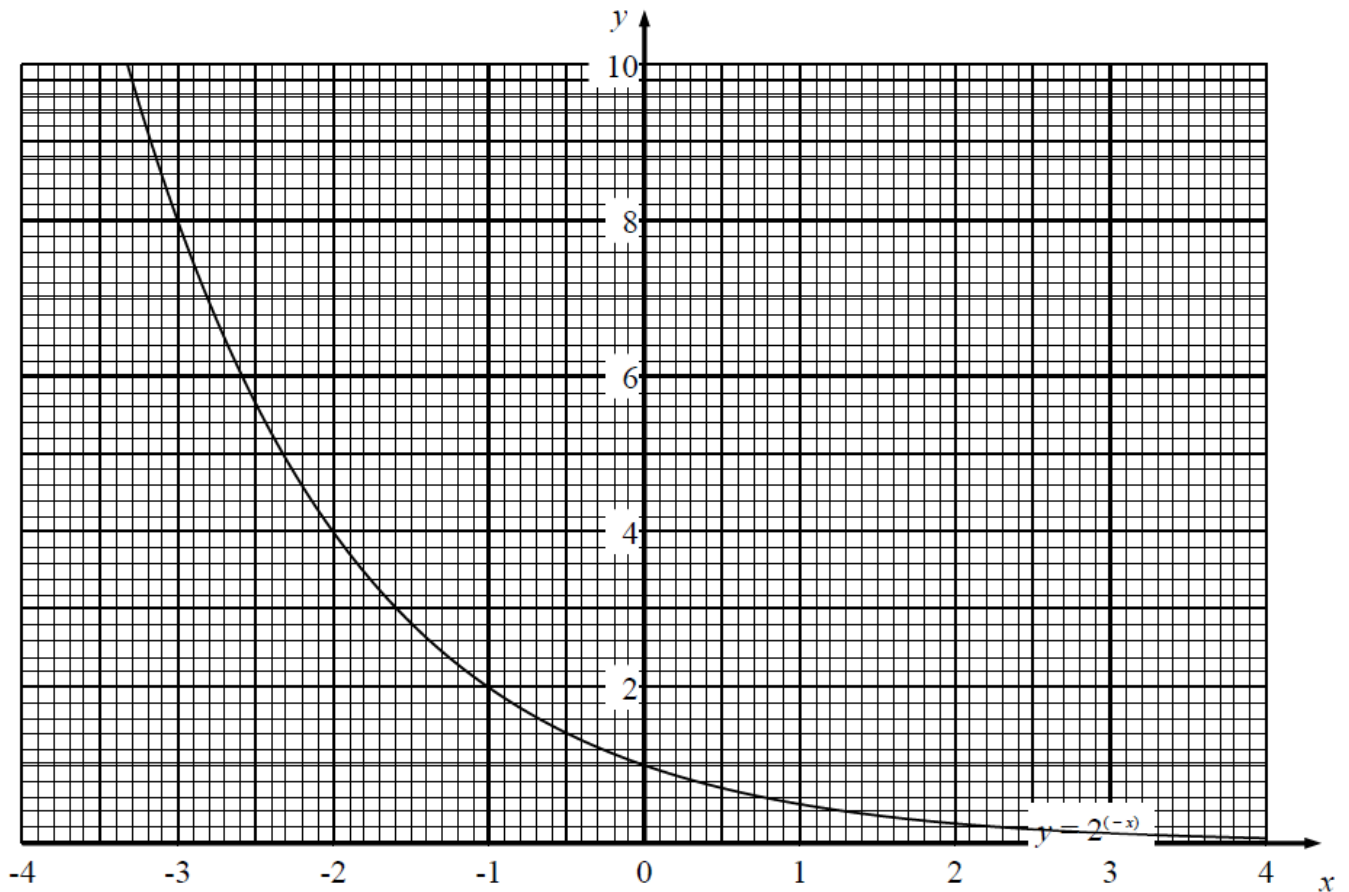
## June 2016 - Question 15

15	(a)	$(-4, \frac{1}{8})$ $(-3, \frac{1}{4})$ $(-2, \frac{1}{2})$ $(-1, 1)$ $(0, 2)$ $(1, 4)$ $(2, 8)$ $(3, 16)$	Correct curve	4	B1 for drawing suitable axes on grid M1 for calculating at least 4 points for values of $x$ from $x = -4$ to 3 A1 for all correct points calculated A1 for correct curve drawn
	(b)		2.5 - 2.7	1	B1



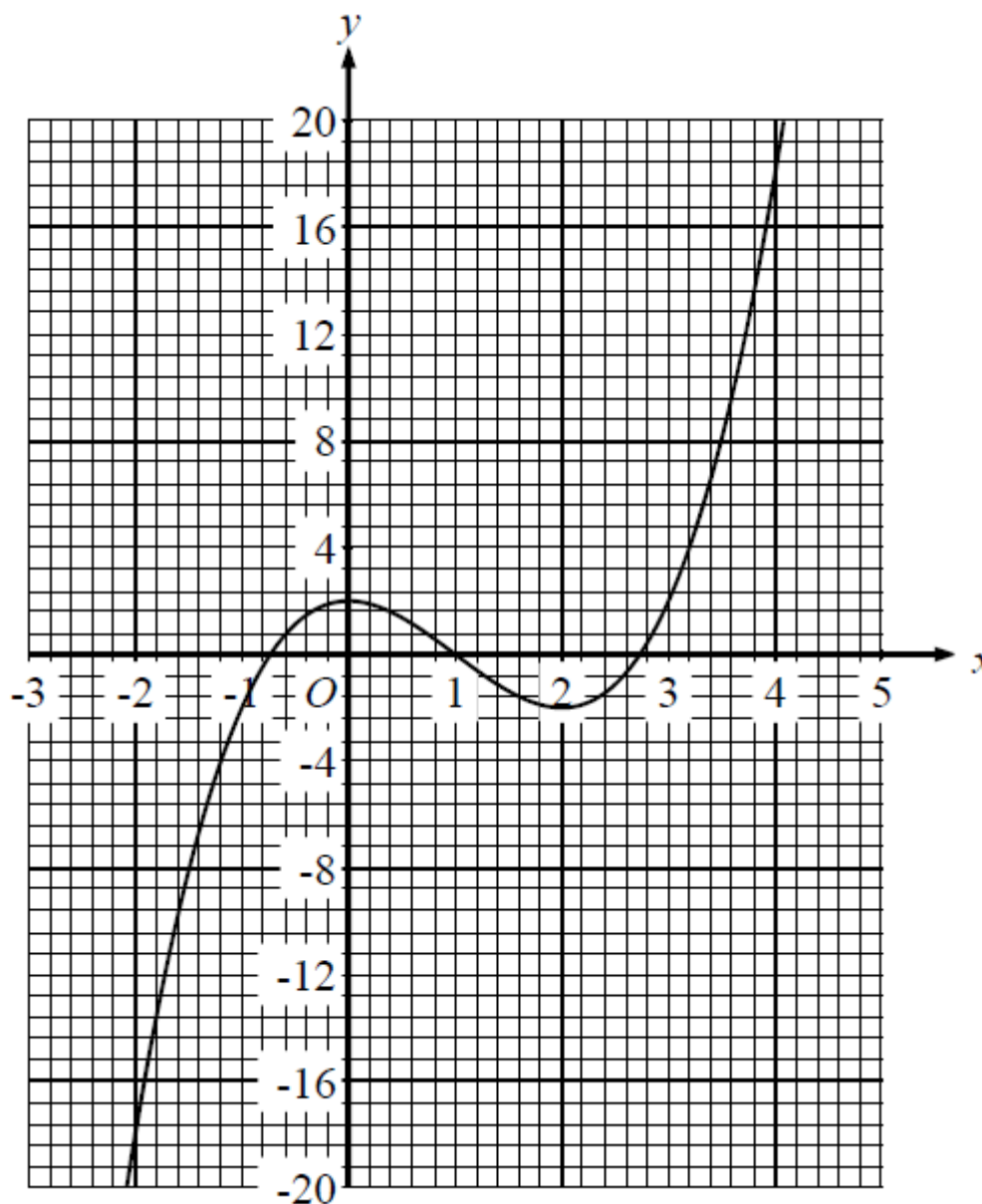
## Jan 2017 - Question 7

7	(a)	8, 4, 2, 1, 0.5, 0.25, 0.125	2	B2 for all values correct (B1 for 5 or 6 correct values)
	(b)	Graph	2	M1 (dep B1) for all their points correctly plotted A1 cao
	(c)	-2.3	2	M1 for $y = 5$ drawn or mark on the graph A1 ft correct curve in the second quadrant



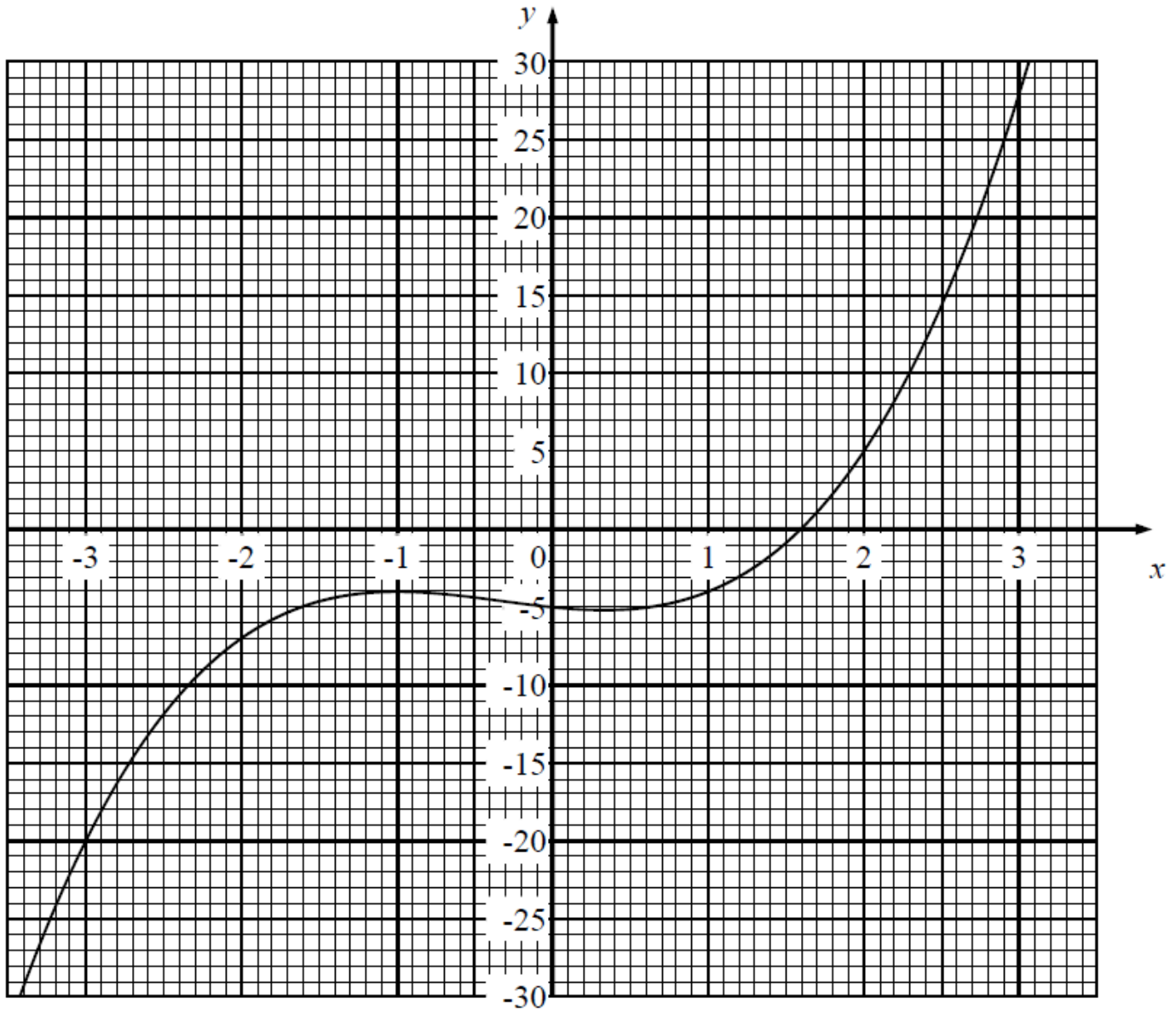
## June 2017 - Question 9

Question	Working	Answer	Mark	Notes
9 (a)	-18, -2, 2, 0, -2, 2, 18	Correct curve	4	M1 for calculating points for values of $x$ from $x = -2$ to 4 with at least 4 correct M1 (dep M1) for drawing suitable axes on grid A1 for at least 6 points correct A1 cao
(b)		-0.5 to -0.6 or 0.6 to 0.7 or 2.8 to 2.9	2	M1 for correct method, eg line from 1 on $y$ -axis across to graph or $x^3 - 3x^2 + 2 = 1$ A1 ft from a cubic curve



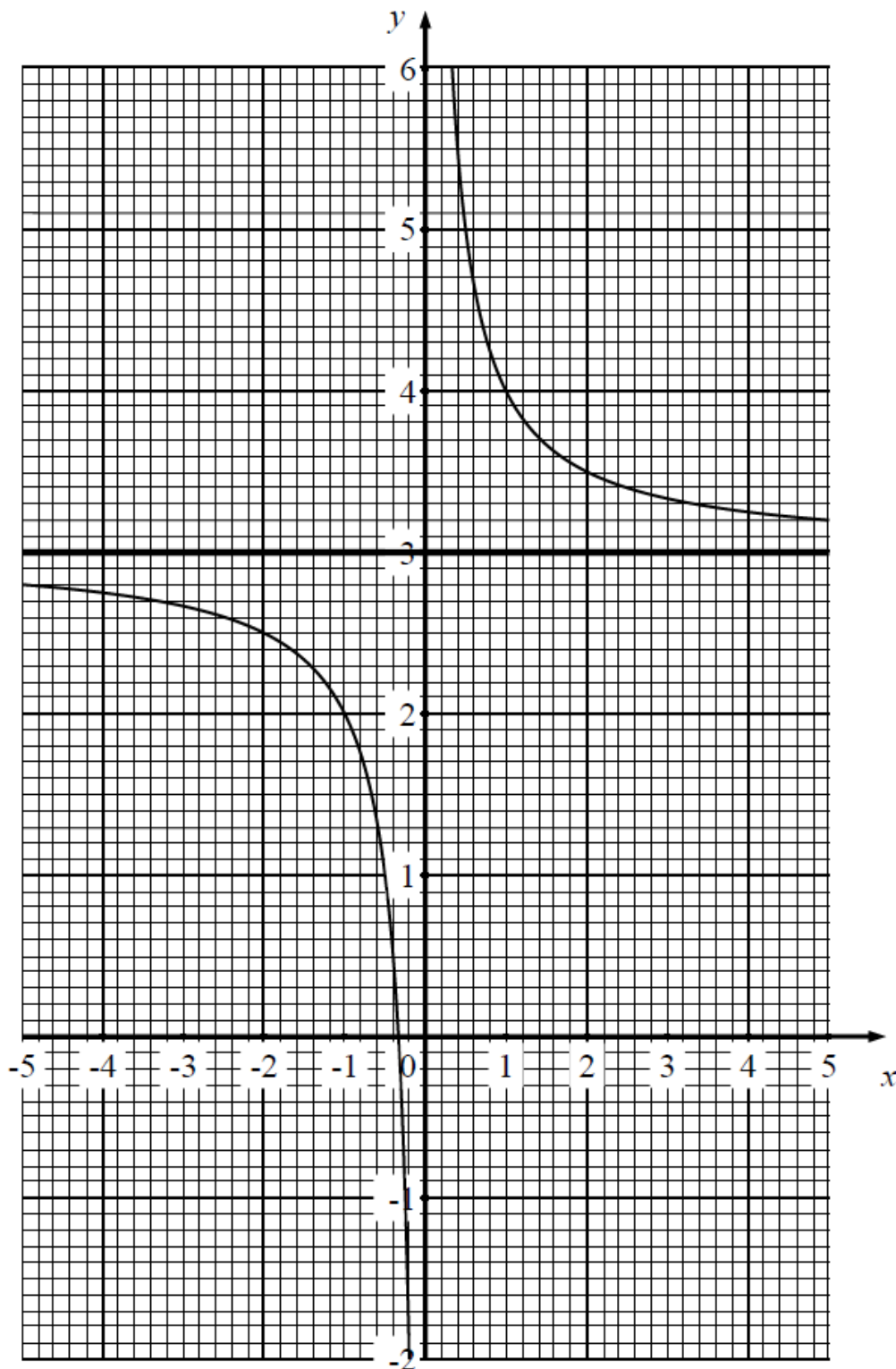
## Jan 2018 - Question 10

10	(a)	-3, -2, -1, 0, 1, 2, 3 -20, -7, -4, -5, -4, 5, 28	Curve drawn	4	B2 for all values correct (B1 for 4, 5 or 6 correct values) M1 (dep B1) for all their points correctly plotted A1 for correct curve
	(b)		1.6	2	M1 for intercept of $x$ axis indicated (provided a cubic is drawn) or $x^3 + x^2 - x - 5 = 0$ A1 for 1.5 – 1.7 or fit their cubic graph



## June 2018 - Question 13

13	(a)	2.75, 2.66, 2.5, 2, 4, 3.5, 3.33, 3.25 Equations of asymptotes $x = 0$ and $y = 3$	Curve drawn	4	M1 for drawing suitable axes on grid  M1 for curve of correct shape for values of $x$ from $-4$ to $4$  B1 for one asymptote shown  A1 for fully correct graph drawn with both asymptotes shown
	(b)		1.6 to 1.8	1	B1 ft (provided at least 2 marks scored in (a))



## Jan 2019 - Question 13

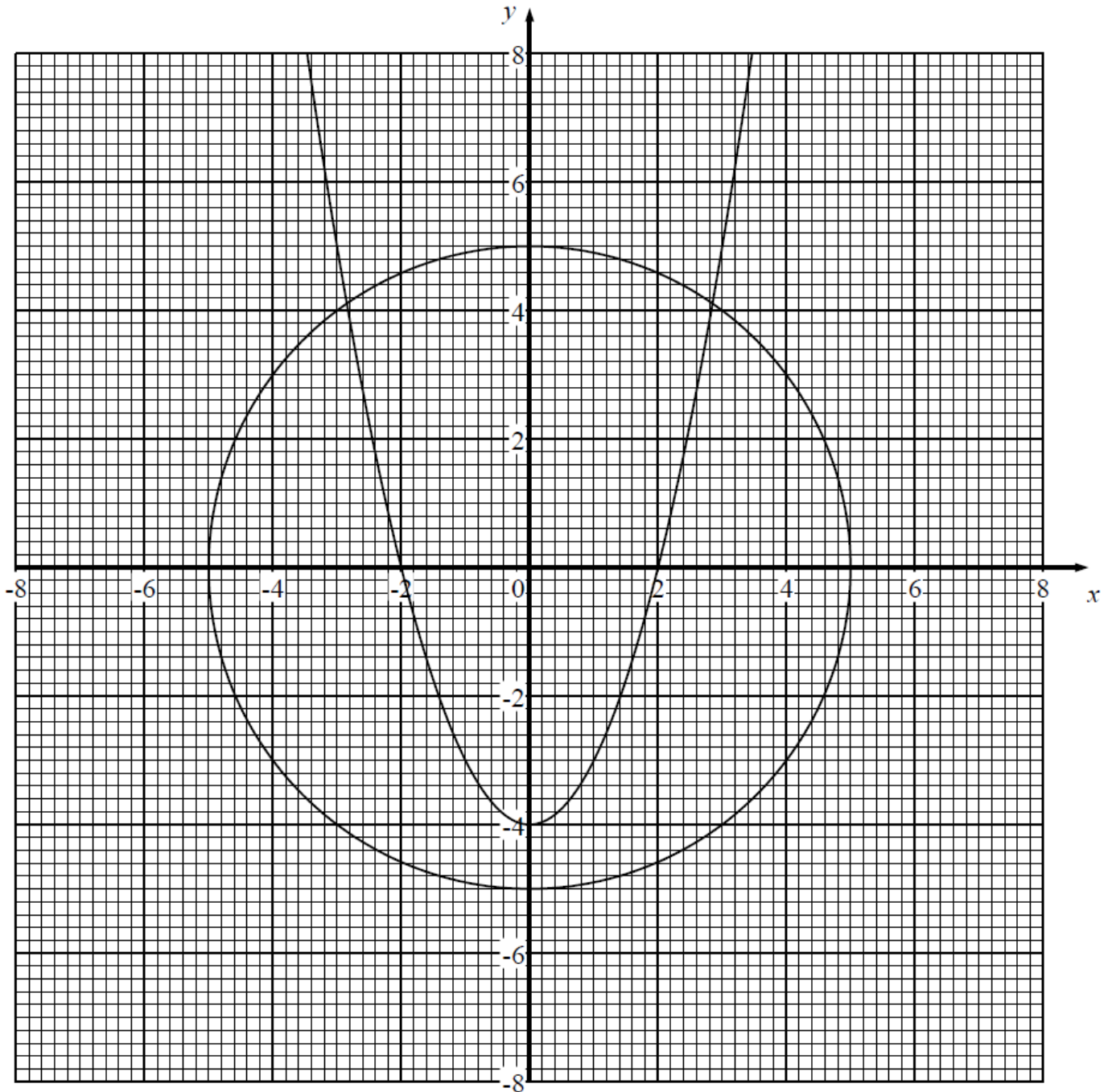
13	(a)		-3, -1, 4	2	B2 for all 3 correct values (B1 for 2 correct values)
	(b)		4.45 to 4.55	2	M1 for correct use of cubic graph, eg line from 10 on y-axis across to graph or $0.5x^3 - 6.5x - 6 = 10$ A1 for 4.45 to 4.55

## June 2019 - Question 4

Question	Working	Answer	Mark	Notes
4 (a)		Circle centre the origin radius 6 drawn	2	M1 for drawing a circle, centre (0, 0) or circle radius 6 or $x^2 + y^2 = 36$ seen A1 for correct circle
(b)(i)		Line drawn	1	B1 for correct line drawn
(ii)		$x = -1.0, y = -5.9$ $x = 4.2, y = 4.3$ (from graph)	2	M1 (dep M1 B1) for points of intersection highlighted or one correct answer A1 for $x = -0.8$ to $-1.1, y = -5.8$ to $-6.1$ $x = 4.0$ to $4.3, y = 4.2$ to $4.5$ or ft accuracy of their graph

## Jan 2021 - Question 3

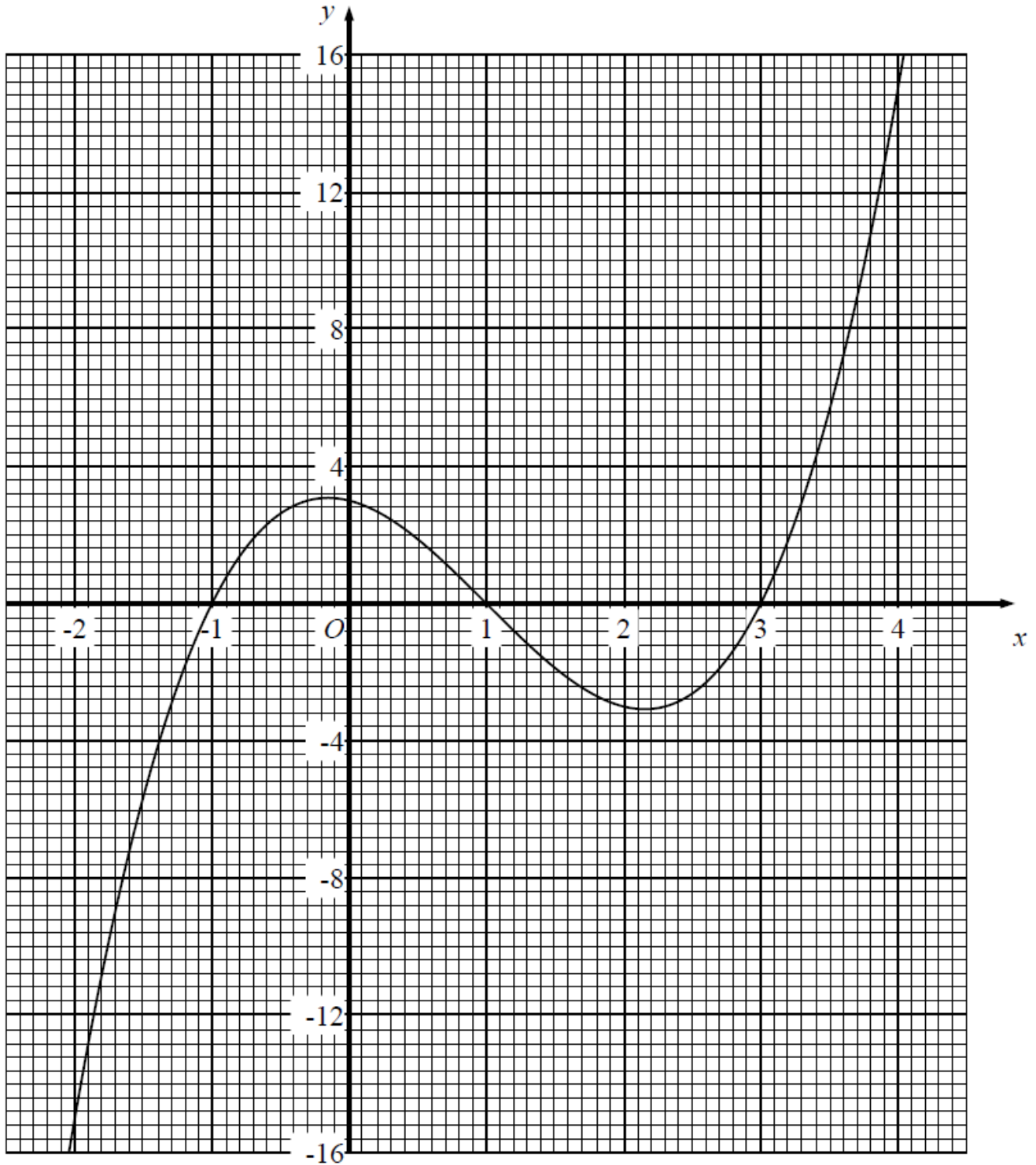
3	(a)(i)	Circle centre origin, radius 5	2	M1 for a circle centre (0,0) or radius 5 A1 for accurate correct circle drawn
	(ii)	Parabola drawn	2	M1 for a parabola in the correct orientation A1 for the correct parabola
	(b)	$x = 2.8, y = 4.1$ $x = -2.8, y = 4.1$	2	M1 for intersection of graphs indicated or one solution eg $x = 2.8, y = 4.1$ A1 $x = 2.8, y = 4.1$ and $x = -2.8, y = 4.1$ or ft the graphs in part (a) provided M1M1 scored



## Jan 2021 - Question 7

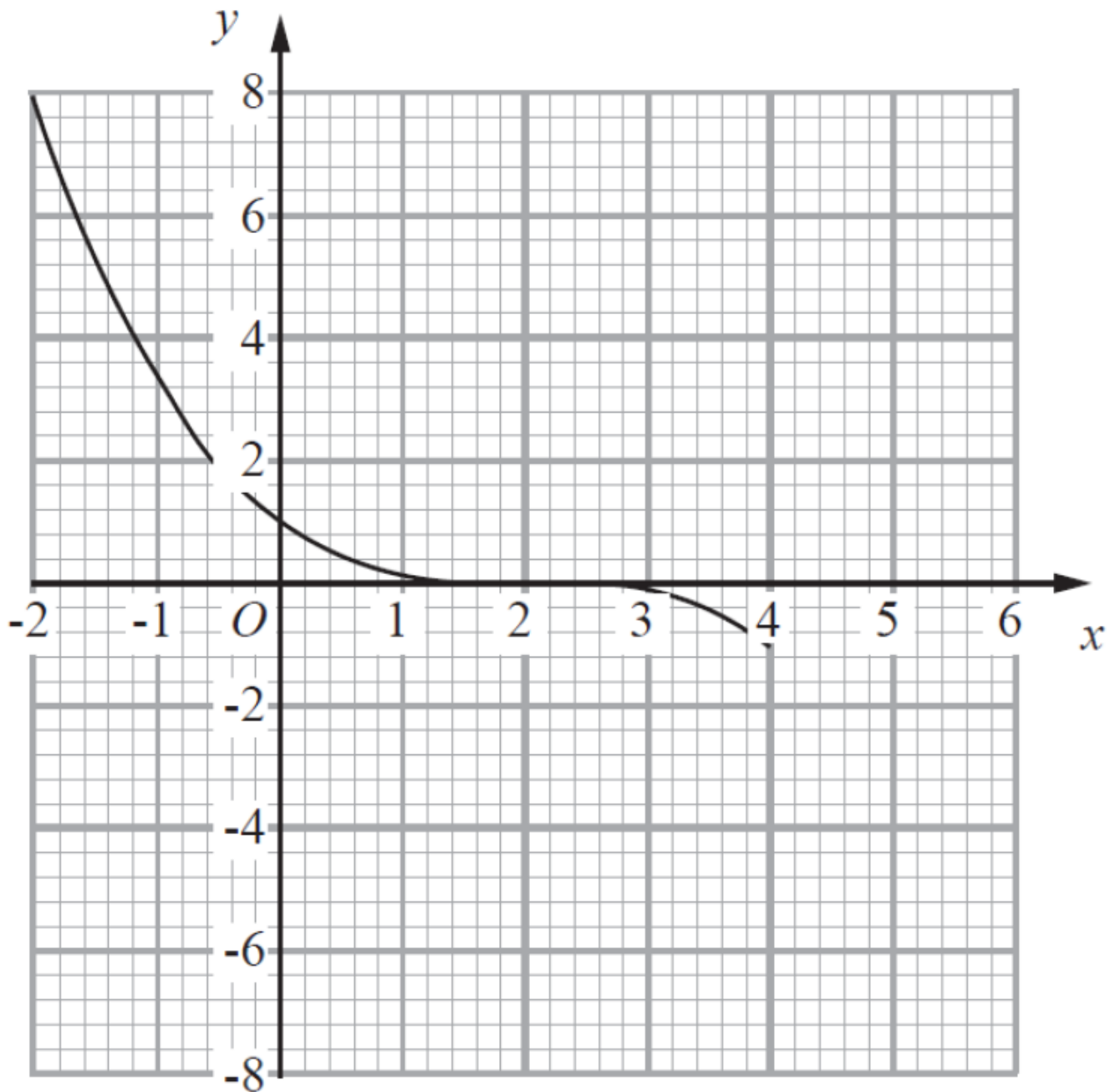
7	(a)	-2, -1, 0, 1, 2, 3, 4 -15, 0, 3, 0, -3, 0, 15	Curve drawn	4	M1 for calculating at least 4 correct values of $y$ B1 for suitable axes drawn A1 for at least 4 correct points plotted A1 for a smooth curve through correct points
	(b)		3.2 0.5 -0.7	3	M1 for $(x-1)(x+1)(x-3) = 2$ or use of $y = 2$ or draws graph translated by $\begin{pmatrix} 0 \\ -2 \end{pmatrix}$ A2 for three correct solutions (A1 for one or two correct solutions)

Note: scales may vary.



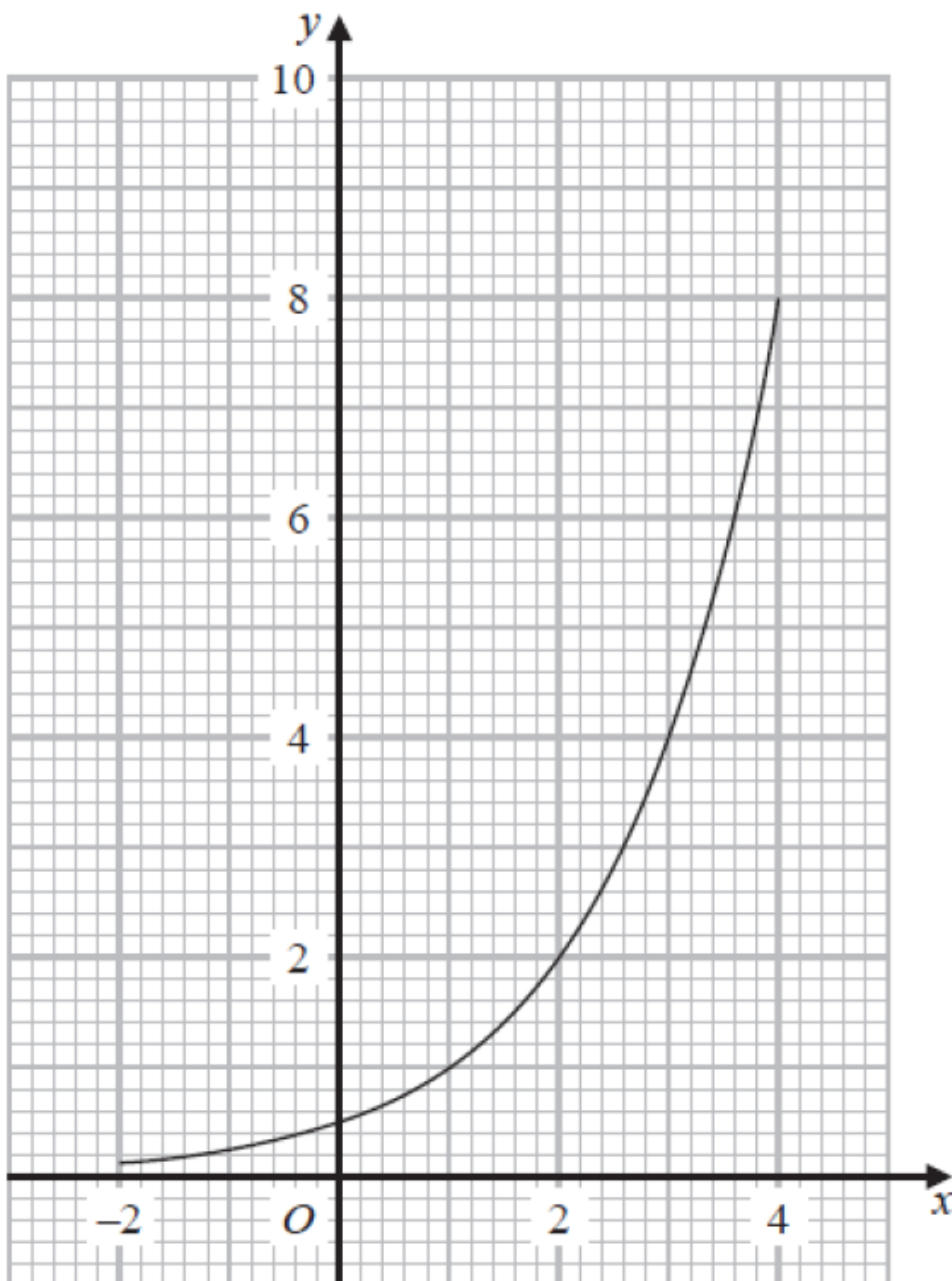
## Jan 2022 - Question 12

Question	Working	Answer	Mark	Notes
12 (a)		8, (3.375), 1, 0.125, 0, -0.125, (-1)	2	B2 for all values correct (B1 for 3 or 4 correct values)
(b)		Curve drawn	3	M1 (dep B1) suitable axes drawn and scaled M1 (dep M1) for at least 5 of their points correctly plotted A1 for correct curve
(c)(i)		-0.5 to -0.7	1	B1 for value in range -0.5 to -0.7 or ft cubic graph
(ii)		-1.6 to -1.9	2	M1 for reading from $y = 6$ on graph or for $\left(\frac{2-x}{2}\right)^3 = 6$ A1 for -1.6 to -1.9 or ft cubic graph



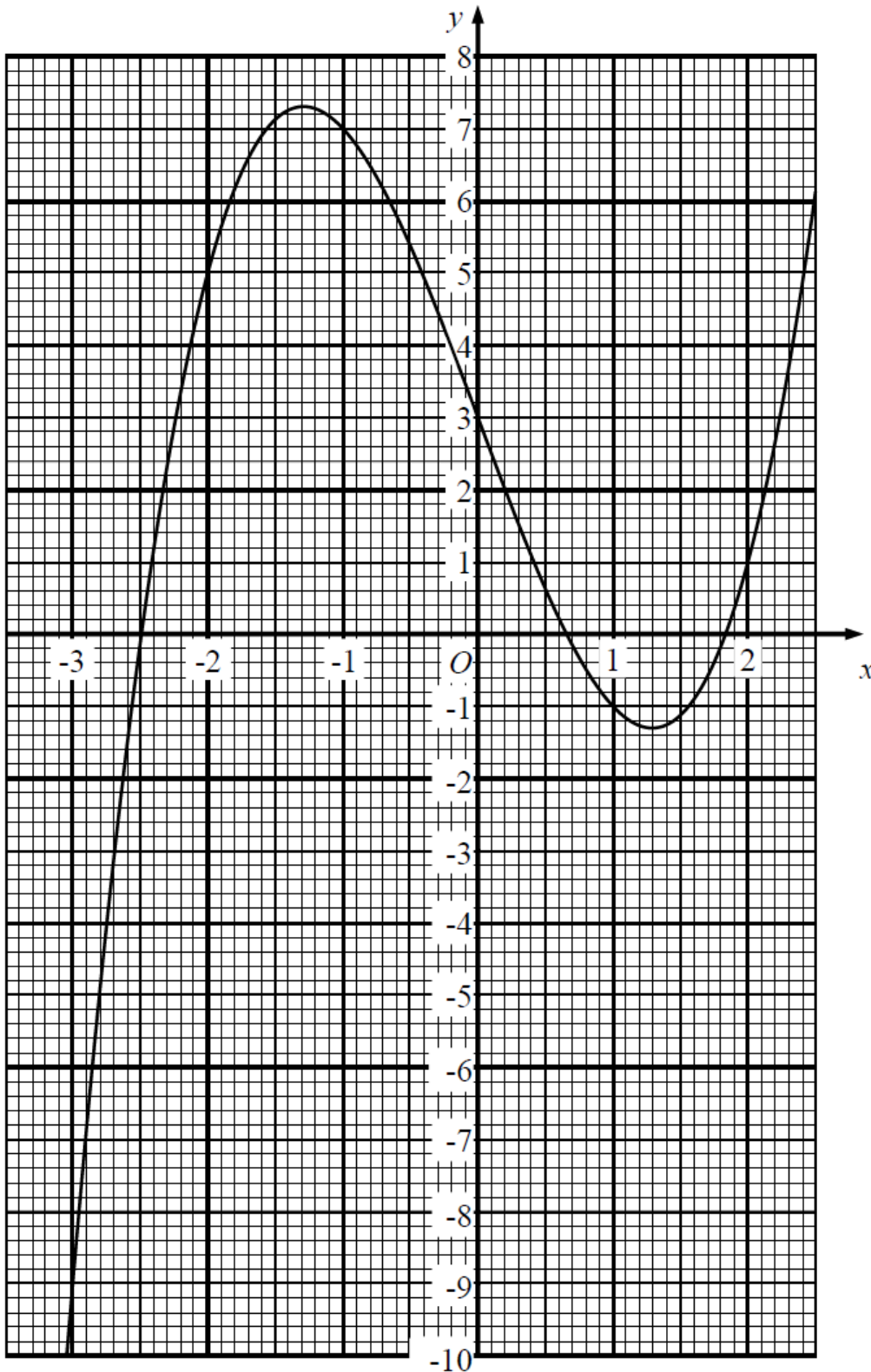
## June 2022 - Question 19

Question	Working	Answer	Mark	Notes
19 (a)		Graph drawn	2	M1 for suitable axes drawn and all points correctly plotted OR for suitable axes drawn, 5 or 6 points plotted correctly and joined with a curve  A1 fully correct graph
(b)		3.6	2	M1 for a line drawn at $y = 6$ or for $2^{x-1} = 6$  A1 for value in the range 3.5 to 3.7 from $y = 6$ on graph
(c)		10.5	2	M1 for substituting values and $h = 1$ into trapezium rule, eg $\frac{1}{2}(1 + 8 + 2(2 + 4))$  A1 for 10.5 oe



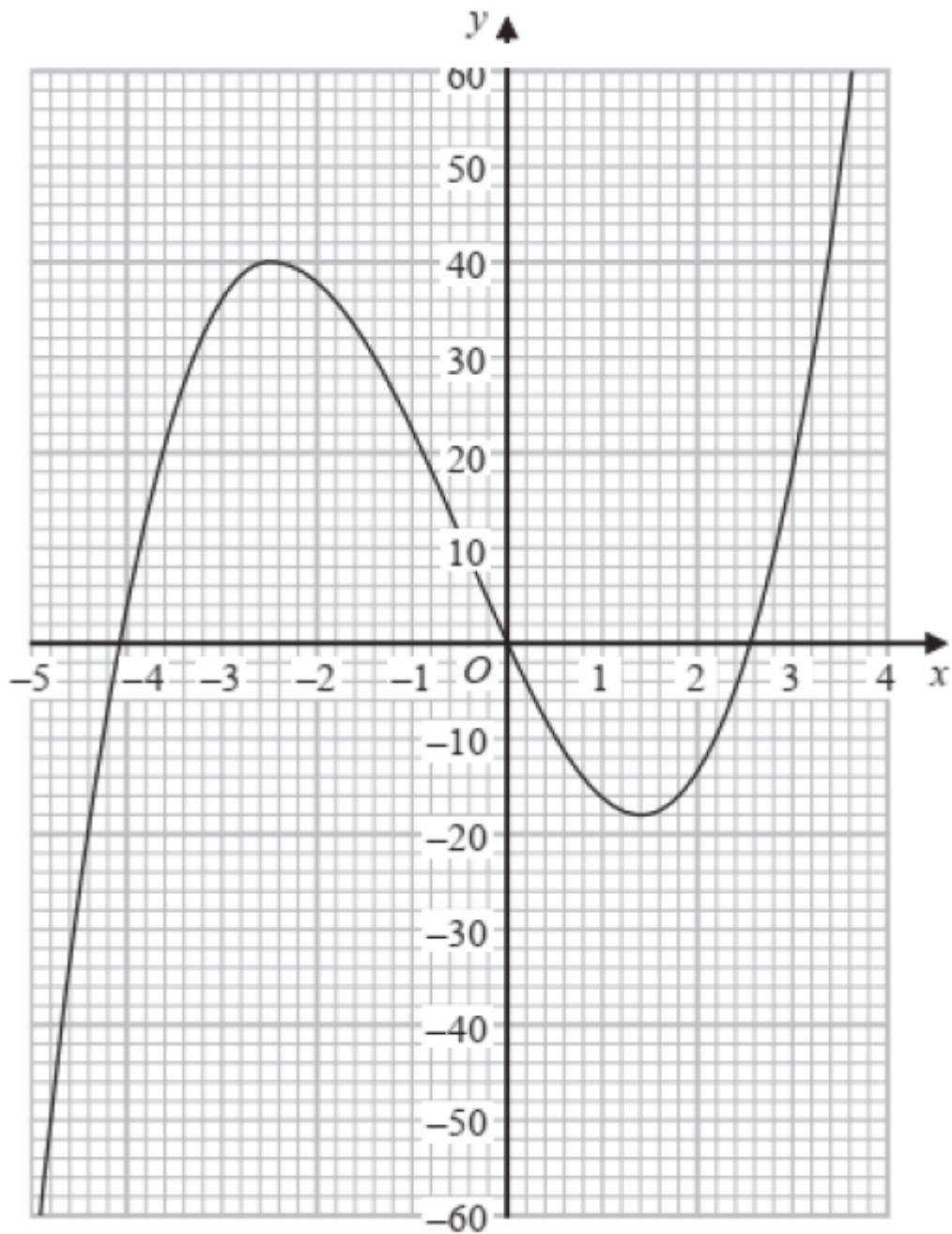
## Jan 2023 - Question 11

Question	Working	Answer	Mark	Notes
11 (a)	-3 -2 -1 0 1 2 -9 5 7 3 -1 1	Graph drawn	4	B2 for all values correct (B1 for 4 or 5 values correct) M1 (dep on B1) for at least 5 of their 6 values plotted accurately A1 for correct curve
(b)		-2.3 or 0.2	2	M1 for $x^3 - 5x + 3 = 2$ or line drawn at $y = 2$ A1 for -2.4 to -2.2 or 0.1 to 0.3 or ft their cubic graph



## June 2023 - Question 10

10	(a)		(4), 36, 38, (22), 0, -16, (-14), (18)	2	B2 for all 4 missing values correct (B1 for 2 or 3 values)
	(b)		Correct curve drawn	2	M1 (dep B1) for plotting at least 7 of their points correctly.  A1 correct curve



## Jan 2024 - Question 19

Question	Working	Answer	Mark	Notes
19 (a)		Graph drawn	2	M1 all points correctly plotted or for 5 or 6 points plotted correctly and joined with a curve A1 fully correct graph
(b)		-1.6	2	M1(dep M1) for a line drawn at $y = 6$ or for $2^{1-x} = 6$ A1 for -1.6 or ft from graph
(c)		5.25	2	M1 for substituting values and $h = 1$ into trapezium rule, eg $\frac{1}{2}(4 + \frac{1}{2} + 2(2 + 1))$ A1 for 5.25 oe

