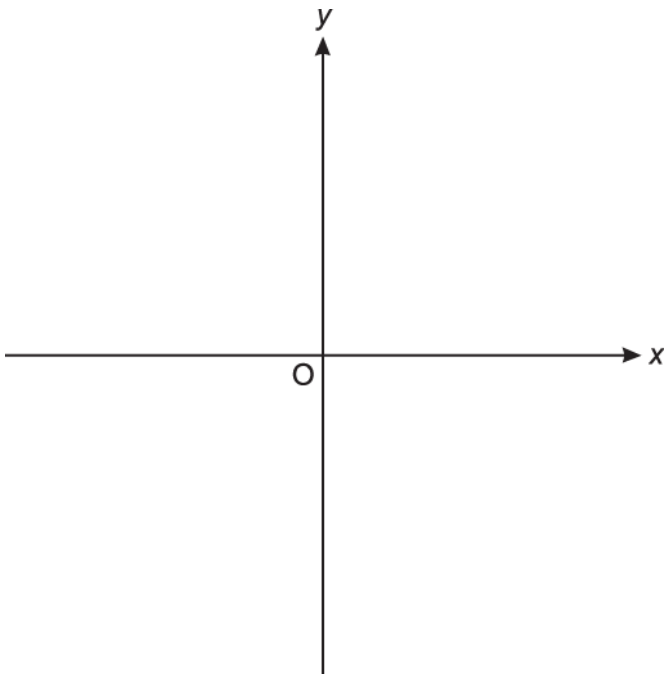
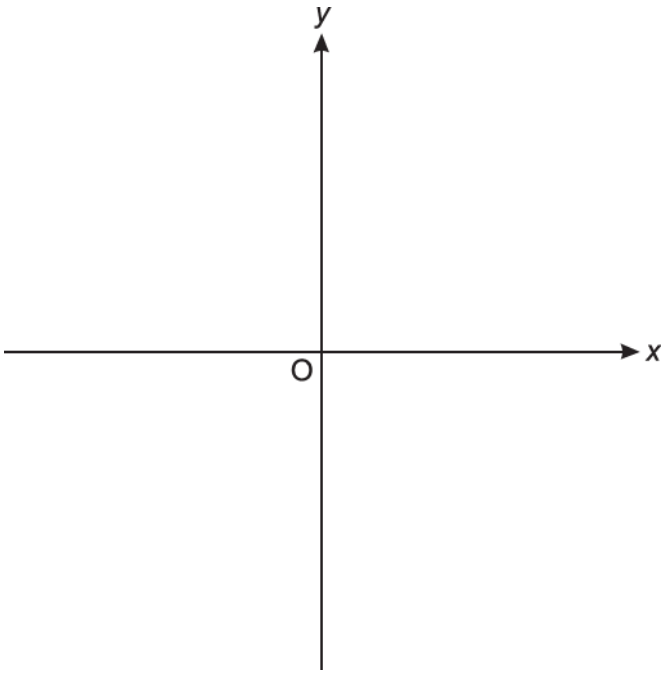
1.

(i) Sketch a graph on the axes below that shows that y is directly proportional to x.



[2]

(ii) Sketch a graph on the axes below that shows $y = x^3$.



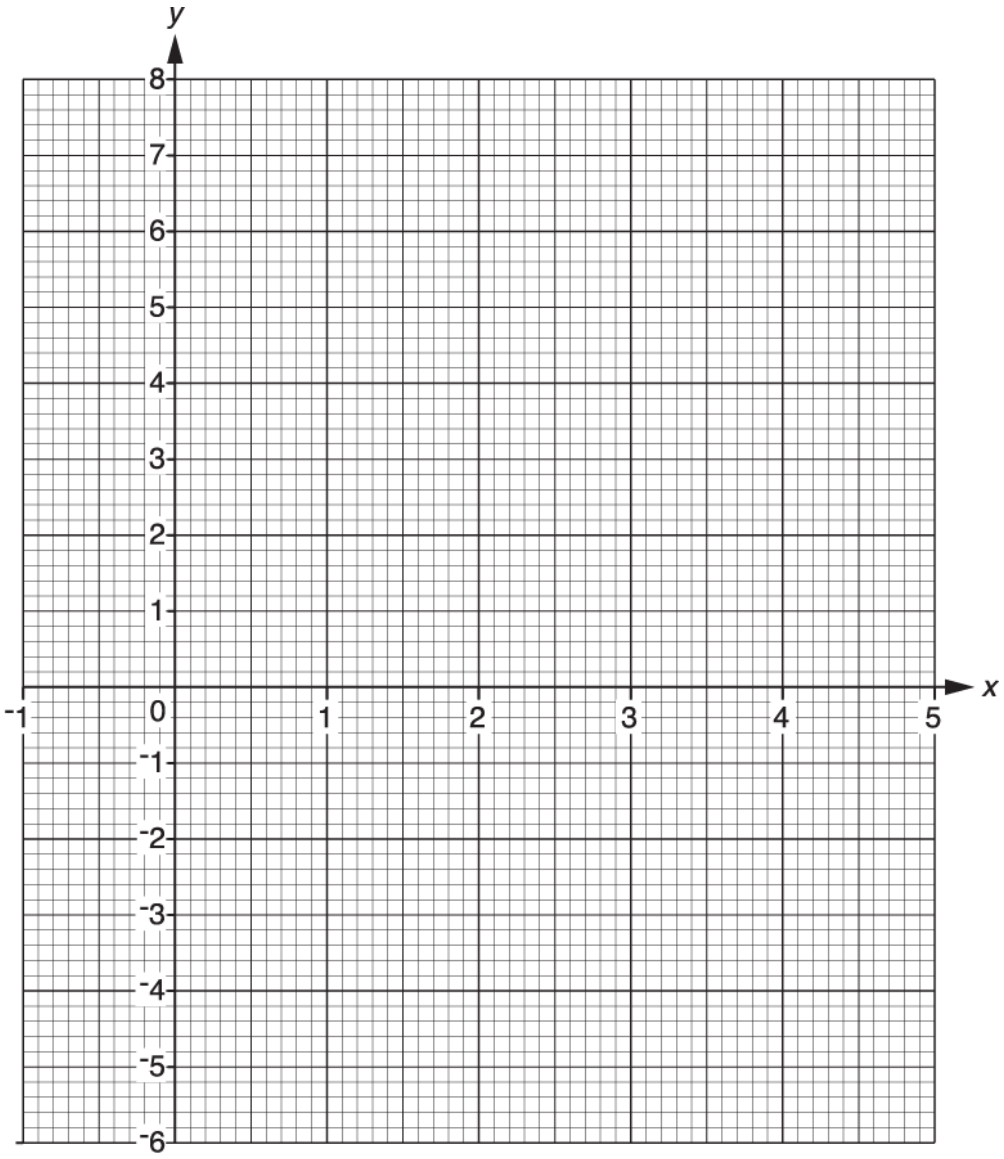
[2]

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

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

[2]

(b). Draw the graph of $y = x^2 - 4x$ for values of x from $^-1$ to 5.



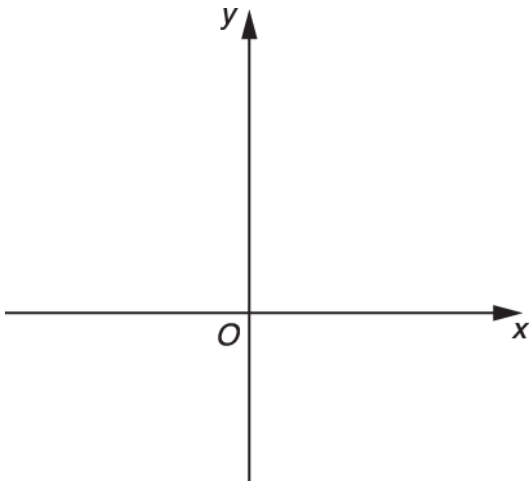
[2]

(c). Use your graph to solve the equation $x^2 - 4x = 3$.

$x =$ _____ or $x =$ _____

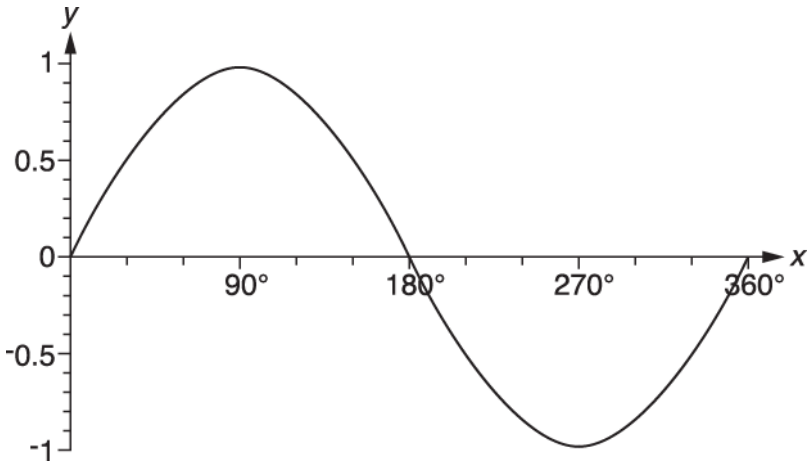
[2]

3. Sketch the graph of $y = 3^x$ on the axes below.



[1]

4. Here is the graph of $y = \sin x$ for $0° \leqslant x \leqslant 360°$.



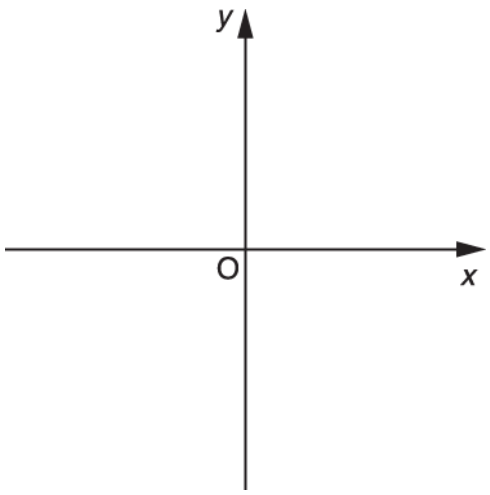
Calculate the two solutions of the equation $\sin x = 0.82$ for values of x between 0° and 360°.

$x =$ _____ ° and $x =$ _____ °

[2]

5.

(i) Sketch the graph of $y = -x + 4$. Mark the value where the line crosses the y-axis.

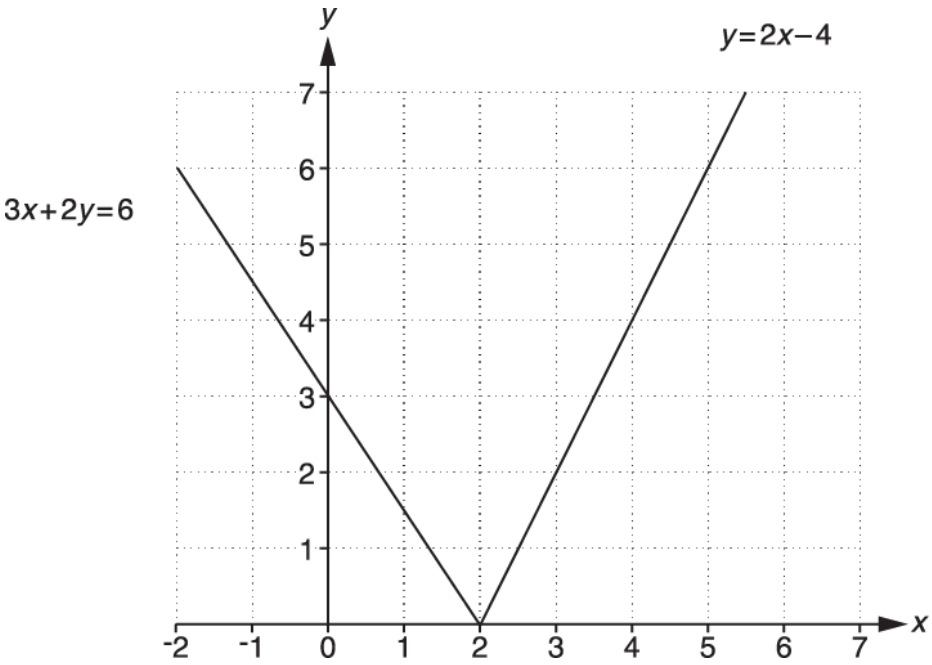


[2]

(ii) Write down the gradient of the line $y = -x + 4$.

(ii) _____ [1]

6. The diagram shows part of the graphs of $y = 2x - 4$ and $3x + 2y = 6$.



On the grid, draw the graph of $y = 3$.

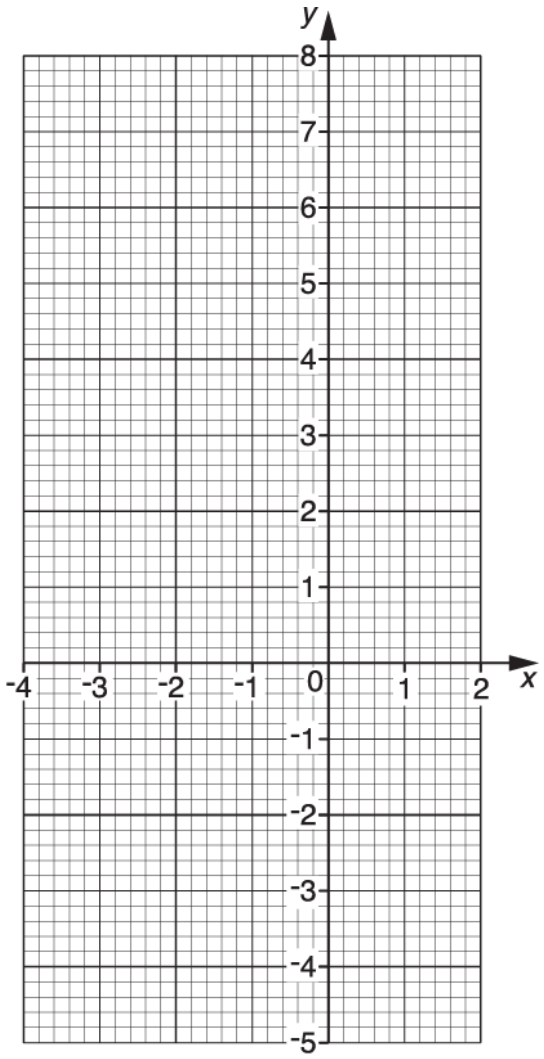
[1]

7(a). Complete the table for $y = x^2 + 3x - 2$.

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

[2]

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



[2]

(c). Use your graph to solve the equation $x^2 + 3x - 2 = 0$.

(c)_____

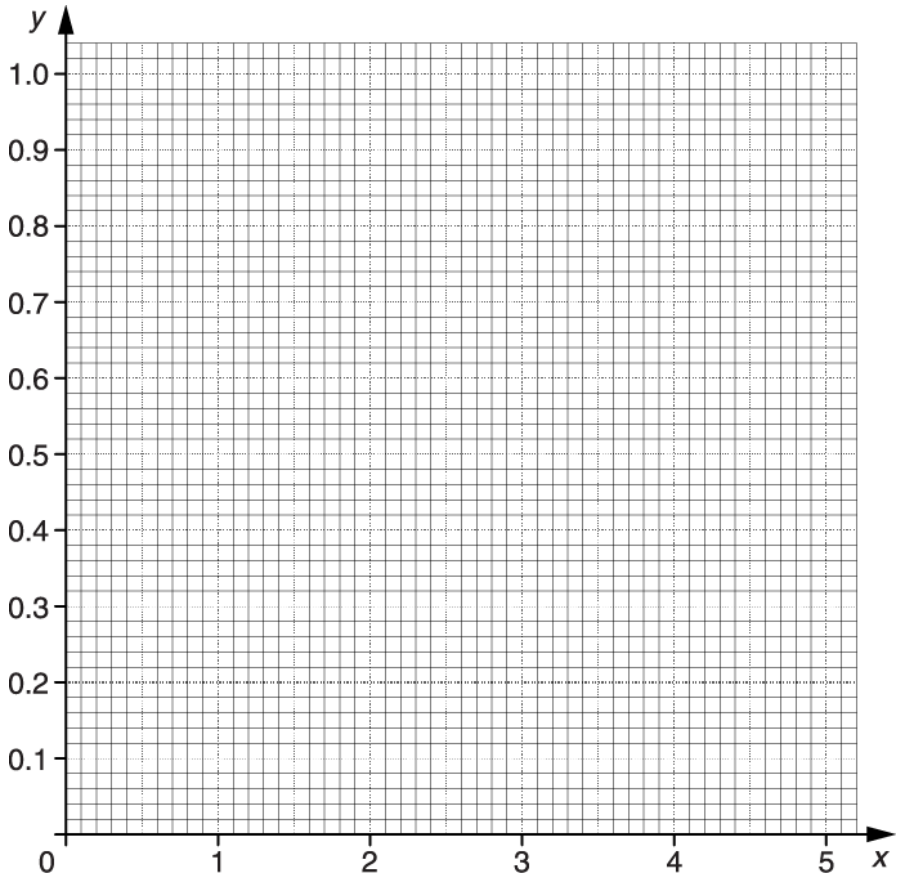
[2]

8(a). Complete the table of values for $y = 0.5^x$.

x	0	1	2	3	4	5
y		0.5			0.0625	0.03125

[2]

(b). Draw the graph of $y = 0.5^x$ for $0 \leq x \leq 5$.



[2]

(c). Use your graph to solve this equation.

$0.5^x = 0.4$

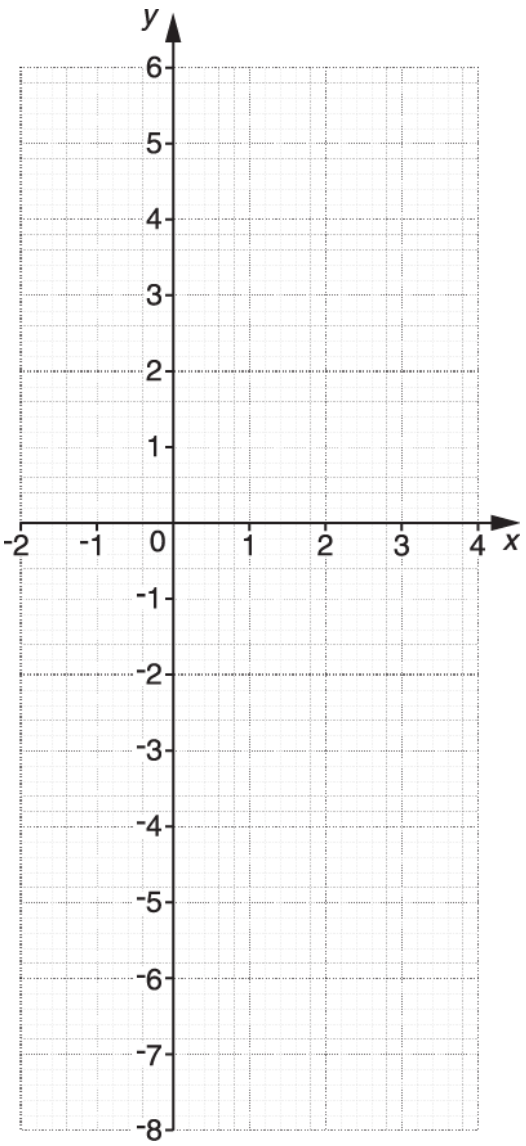
_____ [1]

9(a). Complete this table for $y = 2x - 3$.

x	–2	–1	0	1	2	3	4
y	–7	–5		–1			5

[1]

(b). Draw the graph of $y = 2x - 3$ for values of x from –2 to 4.



[2]

(c). Write down the gradient of the line $y = 2x - 3$.

_____ [1]

10(a) Write $y = x^2 + 12x + 24$ in the form $y = (x + p)^2 + q$.

.

_____ [3]

(b). Hence state

(i) the minimum value of $y = x^2 + 12x + 24$,

(i) _____ [1]

(ii) the value of x at which this minimum occurs.

(ii) _____ [1]

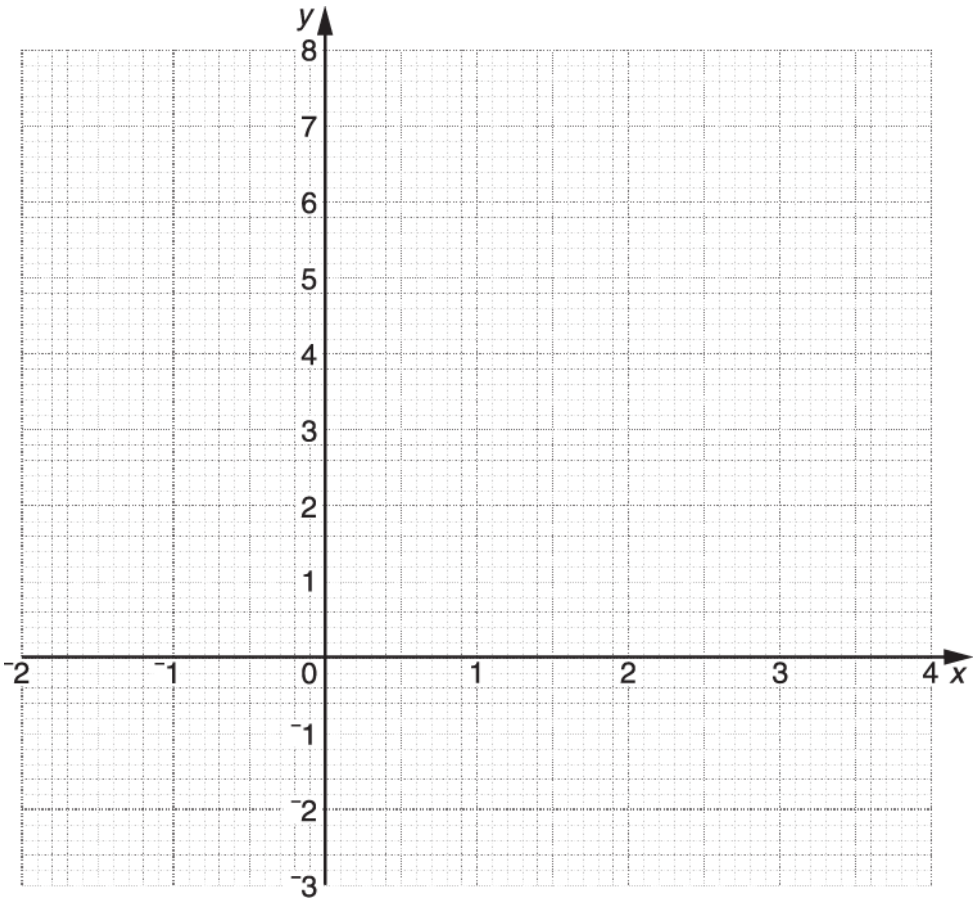
11(a) Complete this table for $y = x^2 - 2x - 1$.

.

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

[1]

(b). Draw the graph of $y = x^2 - 2x - 1$ for values of x from $^-2$ to 4.



[3]

(c). Use the graph to solve the equation $x^2 - 2x - 1 = 0$.

$x =$ _____ or $x =$ _____ **[2]**

12(a)

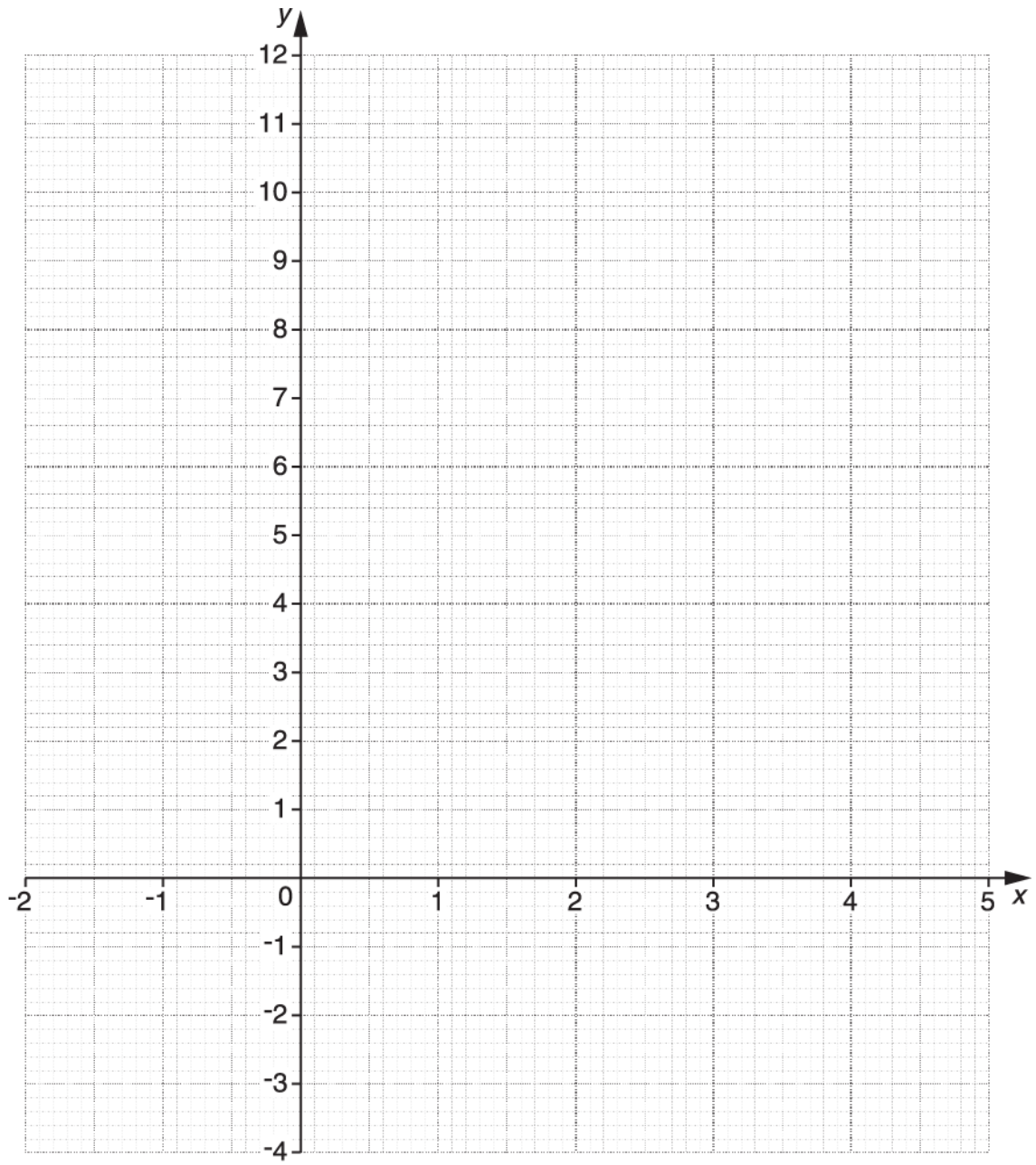
.

(i) Complete the table for $y = x^2 - 3x$.

x	−2	−1	0	1	2	3	4
y		4	0	−2	−2	0	4

[1]

(ii) Draw the graph of $y = x^2 - 3x$ for values of x from −2 to 4.



[2]

(b). On the same set of axes, plot the graph of $x + y = 5$.

[3]

(c). Use your graphs to find the solutions to these simultaneous equations.

$y = x^2 - 3x$

$x + y = 5$

$x =$ _____ $y =$ _____

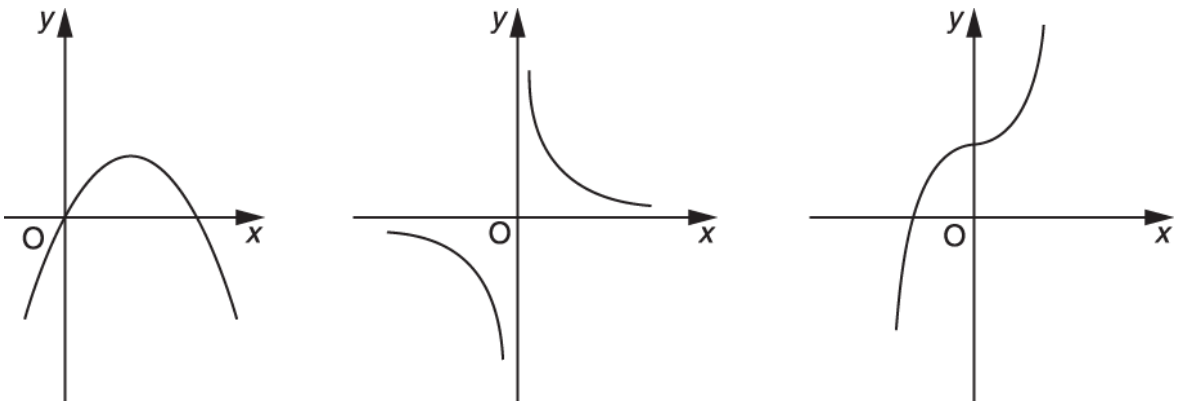
$x =$ _____ $y =$ _____

[2]

13. For each of the graphs below, select the correct equation from this list.

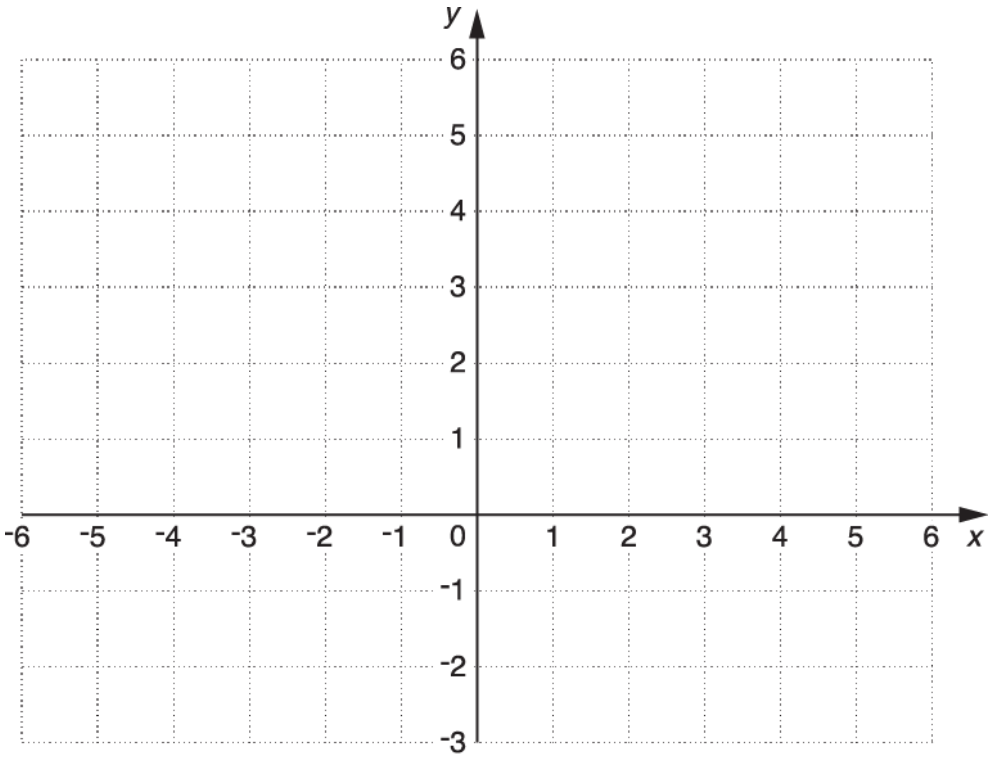
$y = 2x + 2$ $y = x^2 + 2x$ $y = 2x - x^2$ $y = 2x$

$y = \frac{1}{x}$ $y = x^3 + 2x$ $y = x^3 + 2$ $y = 2 - x^3$



$y =$ _____ $y =$ _____ $y =$ _____ **[3]**

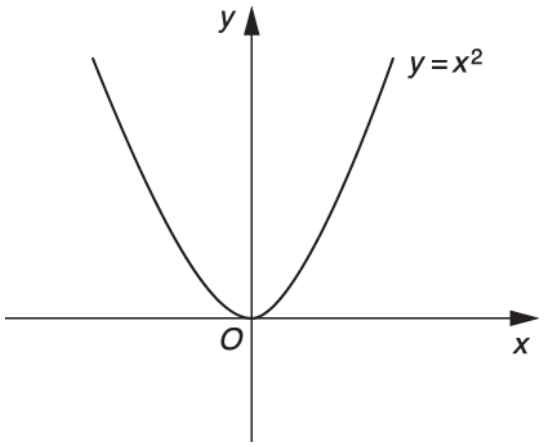
14. Draw the graph of $2y - x = 5$ on the grid below.



[3]

15(a) This is a sketch of the graph of $y = x^2$.

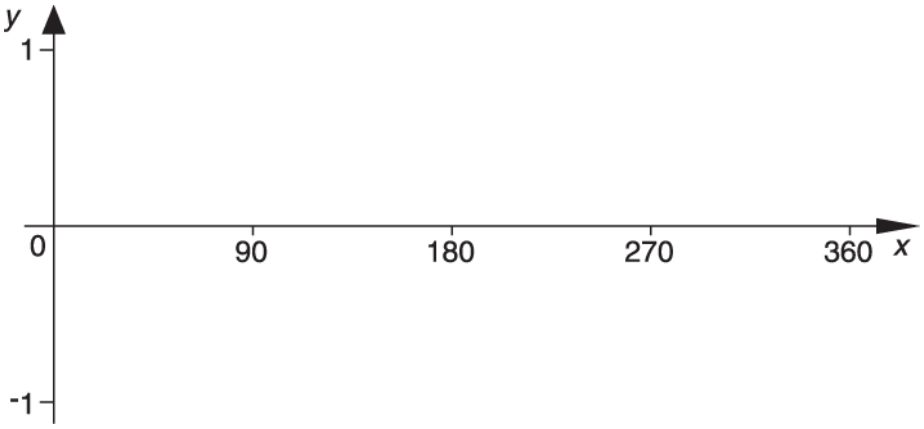
.



On the same axes, sketch the graph of $y = x^2 + 3$.

[1]

(b). On the axes below, sketch the graph of $y = \cos x$ for $0° \leqslant x \leqslant 360°$.



[1]

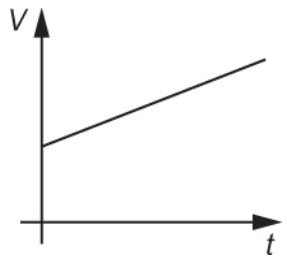
16. Describe fully the graph which has the equation $x^2 + y^2 = 9$.

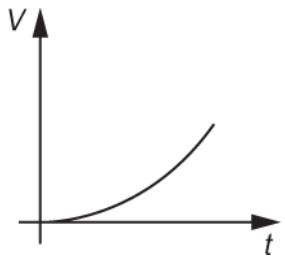
[2]

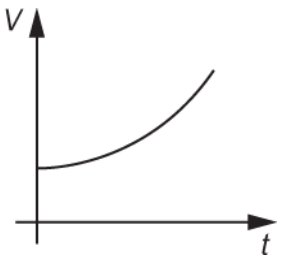
17. Rashid invests money into an account which pays a fixed rate of compound interest each year.
The value, £V, of his investment after t years is given by the formula

$$V = 1250 \times 1.03^{t}.$$

Circle the graph that best represents the growth in Rashid's account.





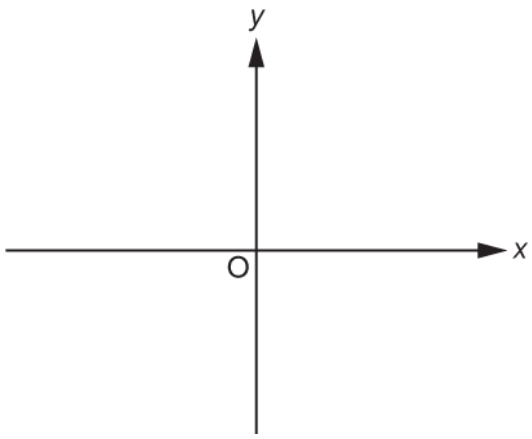


[1]

18.

Sketch the graph of $y = (x - 2)^2 - 3$.

Show the coordinates of any turning points.



[3]

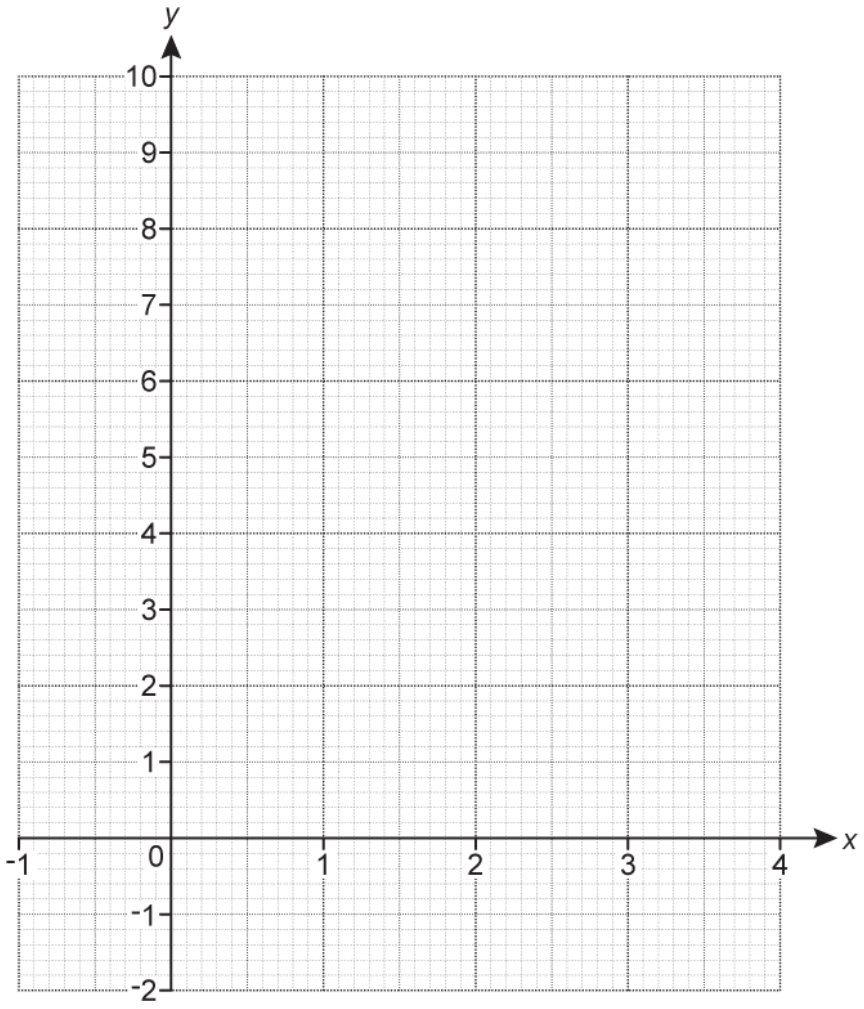
19(a)

. Complete the table for $y = x^2 - 2x$.

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

[1]

(b). Draw the graph of $y = x^2 - 2x$ for $-1 \leq x \leq 4$.



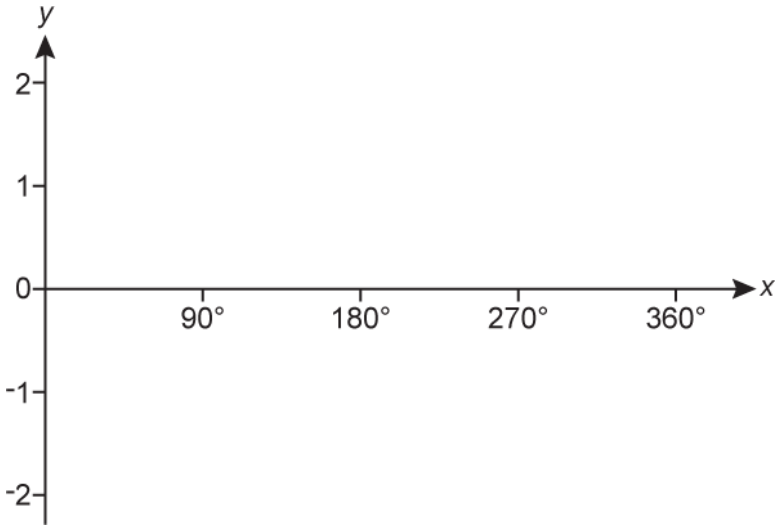
[2]

(c). Use your graph to solve $x^2 - 2x = 2$.

_____ [2]

20(a)

. Sketch the graph of $y = \sin x$ for $0° \leq x \leq 360°$.



[2]

(b). Solve the equation $5 \sin x = -3$.

Give all of the solutions in the range $0° \leq x \leq 360°$.

$x =$ _____ ° or $x =$ _____ ° **[4]**

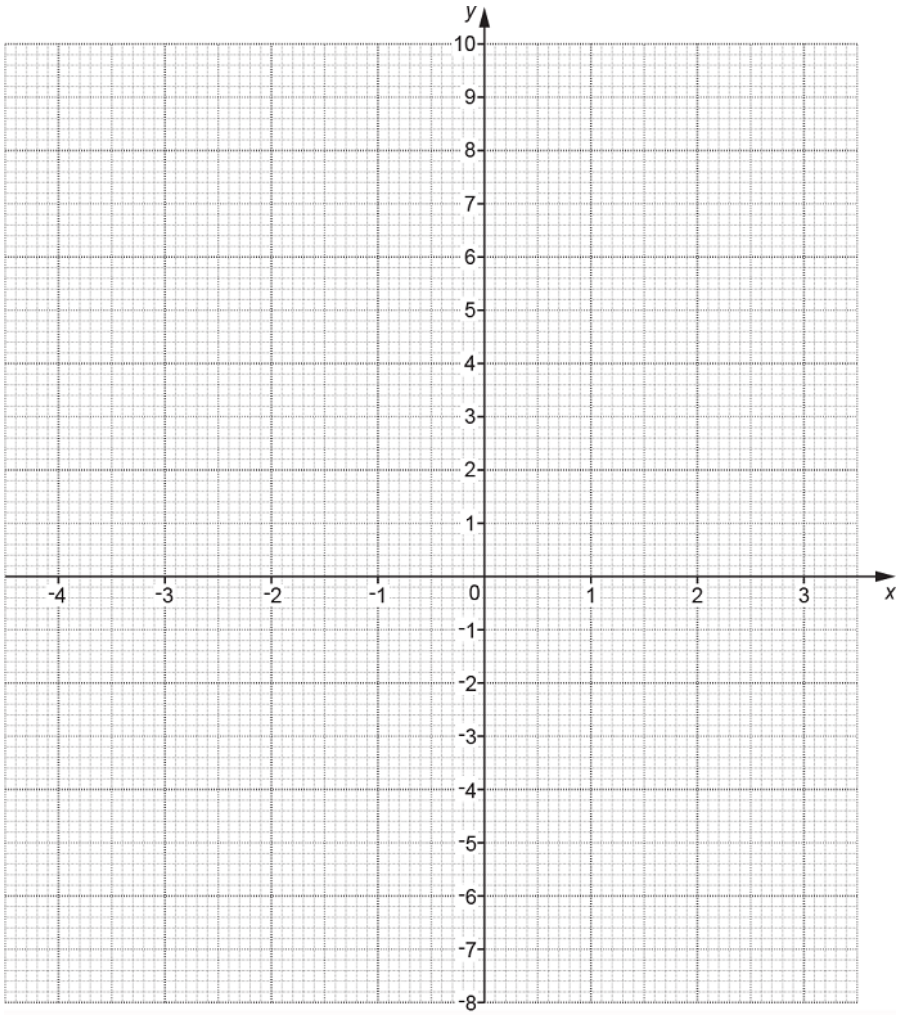
21(a) Complete this table for $y = x^2 + x - 4$.

.

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

[2]

(b). Draw the graph of $y = x^2 + x - 4$ for $-4 \leq x \leq 3$.



[3]

(c). Use your graph to solve $x^2 + x - 4 = 0$.

x = _____ or x = _____ **[2]**

(d). On the same grid, draw the graph of $y = -2x - 1$ for $-4 \leq x \leq 3$.
You may use the table if you wish.

x	-4		
y	7		

[3]

(e). Use your graphs to solve the equation $x^2 + x - 4 = -2x - 1$.

x = _____ or x = _____ **[2]**

22(a)

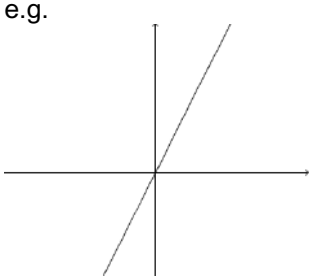
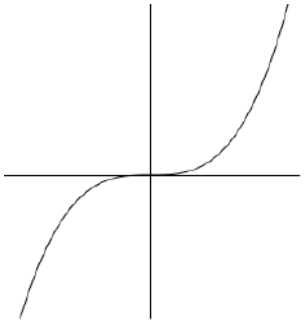
. Write $x^2 - 6x + 20$ in the form $(x - a)^2 + b$.

---------- [3]

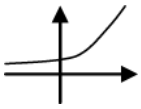
(b). Write down the turning point of the graph of $y = x^2 - 6x + 20$.

(---------- , ----------) [2]

END OF QUESTION PAPER

Question			Answer/Indicative content	Marks	Part marks and guidance	
1		i	Any straight line through the origin e.g. 	2	**B1** for a straight line	
		ii		2	**B1** for a cubic with two turning points	
			Total	4		
2	a		5, 5	2	**B1** for one correct Or **M1** for $(-1)^2 - 4\times(-1)$ or $5^2 - 4 \times 5$ seen	<u>Examiner's Comments</u> Most candidates correctly calculated the value of y when $x = 5$. They usually substituted into the equation to find the value of y when $x = -1$ rather than using the symmetry of the table, and the result was sometimes incorrect due to inability to deal with –1 correctly. For $x = -1$, values of $y = 3$ or –3 were common.

Question			Answer/Indicative content	Marks	Part marks and guidance	
	b		Correct smooth curve through all 7 correct points	2	**B1** for at least 6 points plotted correctly FT their table	Use overlay Tolerance for plotting ± 1mm Intention of correct smooth curve through correct points Examiner's Comments Candidates almost always plotted their points correctly and attempted to join them with a smooth curve. Very few candidates failed to join their points or joined them using ruled line segments.
	c		–0.7 to –0.5 and 4.5 to 4.7	2	**B1** for each correct value or each correct value FT *their* parabola	Tolerance half small square Examiner's Comments Candidates who understood that the solutions to the equation were the *x*-values when $y = 3$ on their graph usually gave accurate answers, although some omitted the – symbol from the negative solution. A common error was to solve the equation $y = 0$ rather than $y = 3$ and some candidates did not recognise the need to use the graph and attempted to solve the equation algebraically.
			Total	6		

Question			Answer/Indicative content	Marks	Part marks and guidance	
3				1		Clear intention of exponential curve correct shape, condone touching but not crossing, *x*-axis <u>Examiner's Comments</u> It was rare to see a correct curve. Very few candidates calculated any values to help them to identify the correct shape of the curve. Some exponential curves were seen that did not go below $x = 0$, and credit was not given for these. The most common answer was a parabola with 3 indicated on one of the axes. Many straight lines were also seen.
			Total	1		

Question			Answer/Indicative content	Marks	Part marks and guidance	
4			55[.08...] or 55.1 124[.91...] or 124.92 or 125	1 1	 If **0** scored award **SC1** for two reasonable answers adding to 180	 Reasonable means not 0, not negative and not 90 Examiner's Comments Both correct answers were often given but more often there would be one correct and one incorrect answer seen. Some candidates subtracted their 55.08 from 360 or added it onto180. A very common answer of 60 and 120 was seen from a very rough graphical solution . There were few that showed any working.
			Total	2		
5		i	Straight line with negative gradient and *y*-intercept 4 marked.	2	**B1** for line with negative gradient or *y*-intercept 4 marked. Non-linear graph does not score.	Condone freehand line for 2 marks Ignore anything on *x*-axis Examiner's Comments Most candidates were able to draw a sketch and many indicated the correct intercept. However there were many who did not know the difference between negative and positive gradient.
		ii	–1	1		Not –*x* etc Examiner's Comments Common wrong answers were 1 and 4.
			Total	3		

Question			Answer/Indicative content	Marks	Part marks and guidance	
6			Solid line through (0,3) and (4.5, 3)	1		Condone dotted line for 1 **Examiner's Comments** Nearly all candidates were able to draw the line $y = 3$ correctly.
			Total	**1**		
7	a		–4, –4, –2, 2	2	**B1** for two values correct	**Examiner's Comments** The table was correctly completed in most cases in part (a). A common error was to give $y = –12$ when $x = –2$ and $y = –6$ when $x = –1$. Graphs were drawn carefully and accurately by the majority of candidates in part (b). Candidates knew how to use the graph to solve the equation and many did this correctly. A few gave only one of the solutions, usually the positive one.
	b		6 or 7 of their points correctly plotted Smooth U-shape curve thro' their 7 points	1 1	Points and curve ±1/2 small square Curve must go below $y = –4$	
	c		0.4 to 0.7 –3.4 –3.7	1 1		
			Total	**6**		

Question			Answer/Indicative content	Marks	Part marks and guidance	
8	a		1, __, 0.25, 0.125, ___, ___	2	**B1** for two values correct Examiner's Comments Accurate use of their calculator meant that candidates usually had the values in the table correct. Some incorrectly gave the value of *y* as zero when *x* was zero.	Accept ¼, 1/8
	b		5 or 6 of *their* points correctly plotted Curve through *their* six points	1 FT1	± ½ small square. ± ½ small square. Continually decreasing curve. Not too thick or hairy. Examiner's Comments Plotting of points and drawing of curves was done accurately and neatly. There was some difficulty in plotting the final two points, probably due to misreading the vertical scale.	
	c		1.2 to 1.41	1	Examiner's Comments Although most gave an answer in the required range, it was not uncommon to see candidates finding a value of *y* for *x* = 0.4 instead of the reverse.	
			Total	5		

Question			Answer/Indicative content	Marks	Part marks and guidance	
9	a		¯3 1 3	1		
	b		correct ruled line from x = –2 to x = 4	2	**B1** for 4 points correctly plotted **FT** their table for points only	For points and line tolerance is ½ small square horizontally
	c		2 **cao**	1	**Examiner's Comments** Most candidates did complete the table correctly in (a) and they plotted the points accurately in (b). However some did not join the points with a ruled line. In (c) they were given the opportunity to use the graph if they did not know the rule about the gradient of a straight line. Most candidates did not know how to find the gradient of the line and 2*x* was often given as the answer.	Not 2/1
			Total	4		

Question			Answer/Indicative content	Marks	Part marks and guidance	
10	a		$(y =) (x + 6)^2 - 12$	3	**B1** for $(x + 6)^2$ **B2FT** for *their* '$^{-}$12' following from *their* '$(x + 6)^2$' or **M1** for $24 - (\textit{their}\ 6)^2$	Condone + $^{-}$12 eg $(x + 4)^2 + 8$ scores **B2 FT** because $4^2 + 8 = 24$ eg $24 - 4^2$ following $(x + 4)^2$
	b	i	$^{-}$12	1	**or FT** *their* '$^{-}$12'	if they have $(x + p)^2 + q$ then accept q
		ii	$^{-}$6	1	**or FT** *their* $(x + 6)$ **Examiner's Comments** Most of those who attempted this question had learned to halve the 12, although some halved the 24. Having obtained the $(x + 6)^2$ most could not work out the value of the constant, –12. In part (b) very few answered these two parts correctly and in many responses it was difficult to apply a follow through because they did not have a linear expression in (a).	if they have $(x + p)^2 + q$ then accept $-p$
			Total	5		

Question			Answer/Indicative content	Marks	Part marks and guidance	
11	a		$^{-}2$	1		
	b		Correct smooth curve	3	**B2FT** for 6 or 7 points correctly plotted or **B1FT** for 4 or 5 points correctly plotted	points and curve tolerance ±1 mm, condone some fuzziness in places, penalise ruled line segments between x =–1 and x = +3
	c		$^{-}0.5$ to $^{-}0.3$ 2.3 to 2.5	1 1	If 2 not scored check graph and FT *their graph* for any wrong answers with tolerance ± 0.1 <u>Examiner's Comments</u> In (a) most gave the correct answer of $^{-}2$, the alternative was $^{-}3$ when they did not involve the 1^2 at the beginning. The plotting was usually good though some points where rather 'thick' and some curves had many lines looking like multiple attempts had been made. The important factors are that the curve is hand-drawn, goes through all the points and has a single line. Part (c) was asking for the points where the curve crosses the x-axis and it was surprising that some candidates misread the numbers on the axis, particularly for the negative solution where they still count left to right when it should be right to left.	
			Total	6		

Question			Answer/Indicative content	Marks	Part marks and guidance	
12	a	i	10	1	Examiner's Comments The response to the straightforward substitution in part (a)(i) was poor, with many candidates failing to deal with the –2 correctly. Answers of 2, –2 and 8 were almost as common as the correct answer of 10.	
		ii	At least 6 points plotted correctly	1	1 mm tolerance, FT *their* table	
		ii	Correct smooth curve drawn for $^{-}2 < x > 4$	1	1 mm tolerance from correct points, must be daylight between curve and $y = –2$ Examiner's Comments Candidates are expected to be able to identify the shape of a quadratic graph, so, in plotting the points in part (a)(ii), they should have realised that there had been an error in their calculation in part (i). Most candidates plotted their points correctly, and those who had found the correct value in part (i) often joined with a smooth correct curve with a minimum between $x = 1$ and $x = 2$. However there a significant proportion of curves were poor and could not be given full credit, including curves missing plotted points, feathering of lines, no attempt to show curve below $y = -2$ or, very occasionally, joining with straight lines.	No ft mark for curve Intention of smooth curve with intention of a minimum between $x = 1$ and $x = 2$, not ruled, ignore curve for x 4

Question			Answer/Indicative content	Marks	Part marks and guidance	
	b		Straight line through (¯2, 7) and (4, 1)	3	**B2** for correct short straight line Or **B1** for one correct pair of coordinates found or plotted **Examiner's Comments** In part (b) there were many excellent ruled straight lines of the correct length drawn gaining full credit. Very few freehand lines were seen but some lines were too short and were awarded only two marks. A number of incorrect lines gained one mark for passing through a correct point: often $y = x + 5$ or $y = 5$ passing through (0, 5).	1 small square tolerance at (0, 5) and (4, 1) Condone line between $x = -1.5$ and $x = 3.5$ for 3 marks Any line through one correct integer point implies B1
	c		$x = 3.4 – 3.5$, $y = 1.3 – 1.7$	1	Or **FT** intersection of *their* curve with *their* straight line	Correct or follow through

Question			Answer/Indicative content	Marks	Part marks and guidance	
			$x = {}^{-}1.4 – {}^{-}1.5$, $y = 6.3 – 6.7$	1	*their* straight line Or **SC1** for two correct x -values ft or two correct y -values ft **Examiner's Comments** There was a poor response to part (c) with many candidates not knowing that the solutions to the simultaneous equations were the points of intersection of their graphs. Many candidates either omitted to answer or gave integer solutions that bore no resemblance to the points of intersection. Those who attempted to find the coordinates often read them accurately, although some misread the vertical scale which was different from the horizontal. Some candidates did not read the question and solved the equations algebraically.	Tolerance for readings ± one small square
			Total	8		

Question			Answer/Indicative content	Marks	Part marks and guidance	
13			$[y =] \ 2x - x^2$ $[y =] \ \frac{1}{x}$ $[y =] \ x^3 + 2$	1 1 1	Examiner's Comments This topic had clearly been covered as many candidates identified at least one graph correctly, often the reciprocal. Many candidates used the shape of the graphs to identify that the first graph must be a quadratic and the third a cubic, but then could not select the correct equation for each. If they had considered whether the terms should be positive or negative and then the effect of translations on the position of the curve they would have been able to reach the correct equation in each case.	
			Total	3		

Question			Answer/Indicative content	Marks	Part marks and guidance	
14			Ruled straight line passing at least between (-5, 0) and (5, 5)	3	**B2** for correct ruled short or dashed line Or two correct points plotted OR **B1** for one correct pair of values with integer x or y **soi** **Examiner's Comments** Some very good correct ruled lines that covered the full width of the grid were seen in this question. Unlike previous years, very few candidates plotted points without joining them and few candidates did not use a ruler to draw their line. As the equation was given in its implicit form, rather than the more straightforward explicit $y = mx + c$ form, some candidates made errors in finding pairs of values of x and y. The question did not provide a table of values for candidates to complete and few candidates drew their own table of values. Many candidates who drew incorrect lines gained 1 mark for one correct point plotted, usually (5, 5), (0, 2.5) or ($^{-}$5, 0). Some candidates used the values in the equation and drew graphs crossing the x-axis at $^{-}$5 or 5 and the y-axis at 5 or 2. Only a very small number of candidates drew curves.	Tolerance 2mm radially by eye for plots x –5 –3 –1 0 1 3 5 y 0 1 2 2.5 3 4 5 **B1** may be implied by one correct plot or their straight line clearly through a correct point for integer x or y
			Total	3		

Question			Answer/Indicative content	Marks	Part marks and guidance	
15	a		Correct translation of given parabola	1	**Examiner's Comments** Some candidates identified the correct translation of the given parabola. Some sketches were careless and if the parabola drawn crossed the given parabola credit was not given. It was common to see translations of the given parabola down, to the left or to the right.	Clear intention but clearly not touching / crossing given parabola 3 need not be indicated
	b		Sketch of $y = \cos x$ through (0, 1), (90, 0), (180, –1), (270, 0), (360, 1)	1	**Examiner's Comments** Many candidates identified the correct shape of curve required but the curve drawn seldom passed though the correct points at 0°, 90°, 180°, 270° and 360° as required. Many candidates drew graphs of sin x, cos $2x$ or other incorrect trigonometric functions. In some cases the correct key points were shown but joined with straight lines rather than a curve.	Clear intention of curve through these 5 points
			Total	**2**		
16			circle centre (0, 0) oe and radius 3	1 1	condone circular accept origin or O for (0,0) **Examiner's Comments** Many candidates identified that it was a circle and with a radius of 3, but often did not include that the centre was (0, 0).	
			Total	**2**		

Question			Answer/Indicative content	Marks	Part marks and guidance	
17			3rd graph indicated only	1	Accept any clear indication of correct graph Examiner's Comments This was generally well answered in parts (a) and (b), though slightly less well answered in (c). Most recognised the significance of 1250 and 1.03 in the growth formula. Errors seen included 1325 in (a) from using $t = 1$, 103% or 1.03% in part (b) and selecting the first graph in part (c).	
			Total	1		

Question			Answer/Indicative content	Marks	Part marks and guidance		
18			U shaped parabola with minimum value indicated at (2, –3)	3	**B1** for U shape curve **B1** for turning point at (2, *k*) **B1** for turning point at (*k*, –3)	Be generous for the U shape condone broken line Values must be shown but could be marked on axes. Mark intention Accept turning point = (2, –3) written in working provided no contradictio n on sketch If point (2, –3) only plotted on graph and no sketch then B0B1B1	
					Examiner's Comments In part (a) 1 mark was often awarded for a sketch of a U shape graph. The minimum was rarely at the correct point, with (0, –3) being the more popular turning point. A number of candidates created a table of values in an attempt to draw an accurate graph rather than a sketch.		
			Total	3			

Question			Answer/Indicative content	Marks	Part marks and guidance	
19	a		8	1 1 AO1.3a		
	b		Correct curve	2 2 AO2.3b	**B1FT** for 4, 5 or 6 points plotted correctly ½ square tolerance **B1** max if line ruled (between any points) **Examiner's Comment** The vast majority of candidates completed the table correctly and the graph was generally well done. Most realised it should be a curve and ruled lines were rare. Some feathering appeared at times and occasionally a point was missed when drawing the curve. In part (c) it was common to see only one answer despite drawing an appropriate straight line on the graph, as the line was frequently not extended to the left of the *y*-axis and so missed the negative *x* solution. Some candidates could not relate the equation to the graph and were just picking numbers from the equation; 0 and 2 were often quoted as a result. Some candidates attempted algebraic solutions, despite the question saying 'Use your graph to solve'.	

Question			Answer/Indicative content	Marks	Part marks and guidance		
	c		–0.9 to –0.6 2.6 to 2.9	2 2 AO2.1a	B1 for each If 0 scored SC1 for (–0.9 to –0.6, 2) and (2.6 to 2.9, 2)	If more than two answers mark the worst two Condone for 2 marks when both answers in body but only one given on answer line	
			Total	5			

Question			Answer/Indicative content	Marks	Part marks and guidance	
20	a		Correct sketch with max at (90, 1) and min at (270, –1) and crossing *x*-axis at 0, 180 and 360	2 2 AO2.3b	M1 for correct shape starting at (0, 0) but inaccurate at roots and max / min. Needs at least one cycle, but may have more than one. **Examiner's Comment** Weaker candidates often made no attempt, however the sine graph was normally well drawn by most and two marks were commonly awarded. Even incorrect graphs usually showed an appreciation of the shape of the curve and that it should go through the origin, with the usual errors being multiple cycles and / or incorrect maximum / minimums. In (b), M1 was often scored for sin $x = –0.6$ but many could not progress successfully from there. Some earned M2 for –37°. Trial and improvement methods occurred fairly frequently with some success, partly because the answers accepted were whole numbers. Candidates often were unable to find the second correct answer, which suggests a lack of understanding of the symmetry of trigonometric graphs and its role in finding solutions.	

Question			Answer/Indicative content	Marks	Part marks and guidance		
	b		217° and 323°	4 1 AO1.3b 1 AO3.1b 1 AO3.2 1 AO3.3	**B3** for one correct even if from trials OR **M2** for [x =] –37 to –36.86 OR **M1** for sin x = –0.6 oe If **0** scored **SC1** answers summing to 540 to 3sf	Accept answers to greater accuracy 216.8[6...] and 323.1[3...] **B3** for grads: [x =] (–41), 221, 319 OR **B2** for grads: [x =] one of 221, 319 OR **M1** implied for grads [x =] –41 or rads: [x =] –0.64[…]	
			Total	6			

Question			Answer/Indicative content	Marks	Part marks and guidance	
21	a		8 ¯2 ¯2 8	2	B1 for any 2 correct Examiner's Comments In part (a) candidates should use symmetry to avoid errors when negative numbers are substituted into quadratic expressions and when they draw the graph in part (b) they should notice the errors when it is not symmetric. Many curves did not go through the points and missed them by quite a wide margin.	
	b		correct curve which dips below the line $y = -4$	3	B2 for 6 or 7 points correctly plotted FT *their* table or B1 for 4 or 5 points correctly plotted FT *their* tolerance ± 2 mm for plotting and the curve through the correct points Examiner's Comments In part (a) candidates should use symmetry to avoid errors when negative numbers are substituted into quadratic expressions and when they draw the graph in part (b) they should notice the errors when it is not symmetric. Many curves did not go through the points and missed them by quite a wide margin.	

Question			Answer/Indicative content	Marks	Part marks and guidance	
	c		–2.7 to –2.5 1.5 to 1.7	2	B1 for each Correct answer or FT their graph | tolerance ± 2 mm Examiner's Comments In part (c) many knew where to read the figures from the graph. As with part (c) there was some incorrect reading of the scales.	
	d		correct ruled line	3	M2 for a correct unruled line or a line of gradient $^{-}2$ or a line going through (0, $^{-}1$) or two further correct points in the table or plotted or M1 for one point correctly plotted or one further correct point in the table | points are x - - - 0 1 2 3 3 2 1 y 5 3 1 - - - - 1 3 5 7 tolerance ± 2 mm Examiner's Comments In part (d) they often completed the table correctly but did not know that it was a straight line so they plotted the points and connected them with a curve.	

Question			Answer/Indicative content	Marks	Part marks and guidance	
	e		⁻3.9 to ⁻ 3.7 [0].7 to [0].9	2	B1 for each Correct answer or FT *their* straight line | tolerance ± 2 mm Examiner's Comments In part (e) some did not know that it was the intersection of the line and the curve	
			Total	12		
22	a		$(x-3)2+11$ final answer	3	B1 for $(x-3)^2$ B2 for +11 or FT *their* $(x-3)^2$ Examiner's Comments Part (a) was a straightforward question and yet many candidates failed to progress. Some did get the square term correct, $(x-3)^2$ and then they usually put +20 for the *'b'* term. Few knew how to calculate the constant term and no-one checked their answer by expanding.	
	b		(3, 11)	2	B1FT for each part | FT *their* $(x-a)^2+b$ e.g. (a, b) Examiner's Comments Part (b) was testing understanding the use of this technique to find the turning point and very few knew how to do this.	
			Total	5		