## **Functions**

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1	8 (a)	0.25, 8, 16	3	B1 B1 B1
	(b)	- 5, 4	2	B1 B1
	(c) (i)	7 points plotted ft Curve through all 7 points exponential shape	P2ft C1ft	P1 for 5 or 6 points ft ft only if exponential shape
	(ii)	6 points plotted ft Curve through all 6 points parabola shape	P2ft C1ft	P1 for 5 points ft ft only if parabola shape
	(d) (i)	3.2 to 3.4	1	
	(ii)	0.3 to 0.4 and 2	2	B1 B1
	(iii)	3.1 to 3.4	1	
2	6 (a)	-2.5, -2, 2, 2.5	2	B1 for 3 correct
	(b)	4 points correct ft Correct shape curve through at least 9 points over full domain Two branches either side of <i>y</i> -axis and not touching it	P1ft C1ft B1	<b>ft</b> only if correct shape and isw any curve outside domain (including crossing <i>y</i> -axis) Independent
	(c)	-1, 0, 1	2	<b>B1</b> for two correct, each extra –1
	(d)	(x) < -1 and $(x) > 1$ as final answer	2	<b>B1 B1</b> Condone inclusive inequality, allow in words, condone inclusion of $-4$ and $+4$ as limits. $1 < x < -1$ or $-1 > x > 1$ <b>SC1</b> $-1 < x < 1$ scores <b>0</b> . Each extra $-1$ if more than two answers.
	(e) (i)	Correct ruled line though $(-2, -3)$ to $(1, 3)$	2	<b>SC1</b> for ruled line gradient 2 or <i>y</i> -intercept 1 from $x = -2$ to 1 or correct line but short or good freehand full line.
	(ii)	Some reasonable indication on graph for both points	1	e.g. points of intersection marked, or, lines drawn from point of intersection to <i>x</i> -axis etc
	(iii)	for both points $x^{2} + 1 = 2x^{2} + x$ or then $x^{2} + x - 1 = 0$ or $\frac{1}{x} = x + 1$ then $1 = x^{2} + x$ then $x^{2} + x - 1 = 0$ 1, -1	3	E2 Must be intermediate step before answer – no errors or omissions or E1 Either no intermediate step or one error or omission. B1

3	8	(a) (i) 3 (ii) 4		1 1	
		(iii) $4x - 3$ final answ $x + 1$	ver	2	<b>M1</b> for $2(2x-1)-1$
		(iv) $\frac{x+1}{2}$ of final and	swer	2	<b>M1</b> for $x = 2y - 1$ or $\frac{y + 1}{2}$ or $\frac{y (x) + 1}{2}$ or
		(v) $-\frac{1}{2}$ and $1\frac{1}{2}$		4	<b>B1</b> for $(2x - 1)^2$ soi <b>M2</b> for $2x - 1 = \pm 2$ <b>M1</b> for $4x^2 - 2x - 2x + 1$ <b>and M1</b> for $(2x + 1)(2x - 3)$ or correct substitution in formula soi by $(4 \pm \sqrt{64})/8$
		<b>(b)</b> (i) $y = \frac{16}{x}$ oe	<b>B</b> 2 55	2	Condone $y = k/x$ and $k = 16$ stated M1 for $y = \frac{k}{2}$ oe
		(ii) 32	LUD .	1	x
4	2	(a) (i) 11 (ii) 22		1	
		(b) $\frac{x+1}{4}$ of final answer	er l	2	<b>M1</b> for $x + 1 = 4y$ or $\frac{g(x) + 1}{4}$ or $\frac{y + 1}{4}$
		(c) $16x^2 - 8x + 7$ final ar	nswer	3	<b>M1</b> for $6 + (4x - 1)^2$ and <b>B1</b> for $16x^2 - 4x - 4x + 1$ or better seen
		( <b>d</b> ) 0.5 or <sup>1</sup> / <sub>2</sub> www		3	M2 for $16x - 4 - 1 = 3$ or better or M1 for $4(4x - 1) - 1$ (= 3) Alt method M2 allow $g^{-1}g^{-1}(3)$ complete method or M1 for $g(x) = g^{-1}(3)$
5	7	(a) −3, −4.25, −3		1, 1, 1	Allow – 4.2 or – 4.3 for – 4.25
		(b) 10 correct points plot Smooth curve throug	ted h their 10 points	P3ft C1	P2ft for 8 or 9 correct P1ft for 6 or 7 correct Correct shape not ruled, (curves could be joined)
		Two separate branche	es	B1ft	Indep but needs two 'curves' on either side of <i>y</i> -axis
		<ul> <li>(c) (i) 0.7 to 0.85</li> <li>(ii) Any value of k s and must be congraph</li> </ul>	uch that $k \le -3$ sistent with their	1 1ft	-1 each extra ft consistent with their graph (If curves are joined then $k = -3$ only)
		(d) $y = 5x \text{ drawn} - 0.6 \text{ to } -0.75, 0.55 \text{ to}$	0.65	L1 1, 1	Ruled and long enough to meet curves Indep –1 each extra
		(e) Tangent drawn at $x =$	-2	T1	Must be a reasonable tangent, not chord, no
		<i>y</i> change / <i>x</i> change a	ttempt	M1	Depend on <b>T</b> and uses scales correctly. Mark intention – allow <b>one</b> slight slip e.g. sign error from coords but not scale misread If no working shown and answer is out of range
		2.7 to 4.3		A1	– cneck their tangent for method Answer in range gets 2 marks after <b>T1</b> earned

6	7	(a) $-5.4$ 3.7	1	
		(b) 8 points correctly plotted ft	Р3	<b>P3ft</b> their table. <b>P2ft</b> for 6 or 7 points <b>P1ft</b> for 4 or 5 points
		Smooth cubic curve through all 8 points	C1	Only ft points if shape not affected.
		(c) −2, −4, 4	2	<b>B1</b> for 2 correct
		<ul><li>(d) 7 points correctly plotted ft Two separate smooth branches of rectangular hyperbola</li></ul>	P2 C1	<b>P2ft P1ft</b> for 5 or 6 points Must pass through all 7 points, only ft if shape not affected and no contact with either axis.
		(e) (i) $-2.9 \le x \le -2.8$ $2.05 \le x \le 2.15$ (ii) $a = 10$ b = -40	1 1 1 1	Not with <i>y</i> coordinates
7	7 (a)	1(.00) 4(.00) 11.1(1) 1(.00) 0.25	3	B2 for 4 correct, B1 for 3 correct
	(b)	10 points plotted Correct shaped curve through 10 points (condone 2 points slightly missed) 2 separate curves not crossing <i>x</i> -axis and not touching or crossing <i>y</i> -axis	P3 ft C1 ft B1	B2 for 8 or 9 points correct ft B1 for 6 or 7 points correct ft ft their points if shape correct – ignore anything between – 0.6 and 0.6 Independent
	(c)	-0.85 to - 0.75 cao 0.75 to 0.85 cao	1 1	
	(d)	Tangent drawn (ruled) at $x = 1.5$ - 3 to -2	T1 2	Allow slight daylight <b>Dep</b> on T1 M1 evidence rise/run <b>dependent</b> on tangent SC1 for answer in range 2 to 3 Answer implies M but not the T mark
	(e)	(i) $y = x - 2$ oe	1	
		(ii) line ruled to cross curve	2 ft	Dependent on (i) in form $y = mx + c$ , $m \neq 0$ , $c \neq 0$ B1 for gradient ft or y intercept ft but again to cross curve at all possible points
		(iii) 2.5 to 2.7 cao	1	Dependent on (e)(i) correct
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		1	1	
8	4 (a)	4	1	
		- 5.8 or - 5.75 or - 5.7	1	
		- 2	1	
	(b)	10 correct plots ft	P3ft	ft from their values in (a) generous with
				(- 0.25, 12.1) P2 for 8 or 9 correct plots ft
				or P1 for 6 or 7 correct plots ft
		Correct shape curve through 10 points	C1 <b>ft</b>	ft their points if shape correct – ignore anything
		Two separate branches not crossing y-axi	s B1	between $-0.23$ and $0.23$
				C1 and B1 are independent
	(c)	-2.5 to $-2.3$	N 1	
		- 0.5 to - 0.4	1	
		2.75 to 2.9	1	
	(d)	Correct tangent drawn at $x = -2$	T1	Allow slight daylight
		-4 to $-2.5$	2	Dep on T1 M1 Disc/True d attempt Dan en T1
				or SC1 for answer in range 2.5 to 4 after T1
a	<b>5</b> (a)	0 11 4 25 2 2 4 25 0 11	2	P2 for 4 or 5 correct and P1 for 2 or 3 correct
	5 (a)	9.11, 4.23, 2,, 2, 4.23, 9.11		B2 101 4 01 5 correct and B1 101 2 01 5 correct
	(b)	12 points plotted	5	P3, <b>ft</b> their <b>(a)</b> , P2 for 10 or 11 points, P1 for 8
		Two branches, neither touching <i>y</i> -axis	l an	C1 correct shape ft their points shape same.
				Ignore anything between $-0.5$ and $0.5$ .
			0.2	B1 independent
	(c)	(i) $x = 0$	1	
		(ii) tangent at $-1.5$	T1	Description
		-3 to -1.8	2	M1(also dep on T1) for attempt at rise/run or
				SC1 for 1.8 to 3
		(iii) $-1.7$ to $-1.55$ , $-0.7$ to $-0.55$ , 0.55 to 0.7, 1.55 to 1.7	2	B1 for 1 or more correct
		(iv) $y = 2x$ drawn to meet graph twice	B1	
		1	B1	
10	9 (a)	(i) 81	<u>B1</u> 2	B1 for $(f(2) =) 7$
		(ii) 8.5	2	B1 for $(f(0.5) =) 2.5$
		x-1		v - 1 $f(x) - 1$
	(b)	$\overline{3}$ oe	2	M1 for $(x =) \frac{2}{3}$ or $(x =) \frac{2}{3}$
				or $3y = x - 1$ or $3f(x) = x - 1$
		www.	C M	or $-1$ then $\div 3$ in flowchart (must be clear)
	(c)	$3x^2 + 12x + 13$ final answer	2	M1 for $3(x + 2)^2 + 1$ or better
	(d)	$(x =) \frac{-3 \pm \sqrt{3^2 - 4(1)(1)}}{2(1)}$	2	B1 for $\sqrt{3^2 - 4(1)(1)}$ or better Seen anywhere
		2(1)		$p + \sqrt{q}  p - \sqrt{q}$
				It in form $\frac{r}{r}$ or $\frac{r}{r}$ oe,
				B1 for $p = -3$ and $r = 2(1)$
				or $(x + \frac{3}{2})^{2}$ B1 then $\sqrt{\frac{9}{4}} - 1$ B1
		–2.62, – 0.38 final answer	1,1	If 0, SC1 for $-2.6$ or $-2.62$ or $-2.618$ and $-0.4(0)$ or $-0.38$ or $-0.382$ to $-0.381$ score
				Answers only B1 B1

11	5	(a)	1, -1, 3.5	1,1,1	
		(b)	10 correct points plotted	P3ft	<ul><li>P2ft for 8 or 9 correct</li><li>P1ft for 6 or 7 correct</li><li>Allow points to be implied from curve</li></ul>
			Smooth curve through at least 8 points and correct shape	C1ft	Correct cubic shape, not ruled
		(c)	(i) -2.2 to -2.1	1ft	Correct or ft their x values
			-0.65 to -0.45	1ft	
			2.5 to 2.7	1ft	If ft and more than 3 solns then 2 marks maximum
			(ii) $(k <) -4$ to $-3.7$	1ft	Correct or ft their graph for <i>y</i> values at max and min
			( <i>k</i> >) 1.7 to 2	1ft	After 0 scored SC1 for both correct but reversed
		(d)	(i) Ruled line gradient 3 and y-intercept -2 over the range -1 to 3.5	3	<b>B2</b> for correct but freehand or short or <b>M1</b> for a ruled line of gradient 3 or passes through $(0, -2)$ (but not $y = -2$ )
			(ii) $(a =) -12, (b =) 2$	1,1	After 0, M1 for $x^{3}-6x-6x-2+4$ (=0) or better
			(iii) 0.1 to 0.2 and 3.3 to 3.4 cao	1,1	5
12	2	(a)	(i) 39	2	<b>B1</b> for $(f(2) =) 6$ or $6^2$ seen or $(4x - 2)^2 + 3$ seen
			(ii) $\frac{8}{-1} + 2 \text{ or } \frac{8+2x}{-1} \text{ or } \frac{2(4+x)}{-1}$	2	<b>M1</b> for $4\left(\frac{2}{-}+1\right)-2$
			x x x x x or $8x^{-1} + 2$ final answer		
		(b)	-2.5 oe	2	<b>M1</b> for $2 + x = 0.2x$ oe or $\frac{2}{x} = 0.2 - 1$ or better
		(c)	2.2 oe	2	M1 for $\frac{2}{5_3 \text{ oe}}$ + 1 allow 1.66 to 1.67 for 5/3
					or $\frac{2}{2\chi + 1} + 1$
		(d)	(i) $4x - 2 = \frac{2}{x} + 1$	Willia A.	oe with these four terms
			At least 1 intermediate step and $4x^2 - 3x - 2 = 0$	E1	No errors
			(ii) $\frac{-(-3)\pm\sqrt{(-3)^2-4(4)(-2)}}{2(4)}$	B1 B1	<b>B1</b> for $\sqrt{(-3)^2 - 4(4)(-2)}$ or better (41)
			uuu.Q8	M	and in form $\frac{p+\sqrt{q}}{r}$ or $\frac{p-\sqrt{q}}{r}$
					<b>B1</b> for $-(-3)$ and $2(4)$ or better
			1.18 and -0.43 cao	B1B1	<b>SC1</b> for 1.18 and -0.43 seen or 1.2 <u>and</u> -0.4 or 1.17 <u>and</u> -0.425

13	7	(a)	8.7, -3.2, -10	B3	8.66() or 8.67, -3.24, -9.99 if given to 2 dp B1 for each correct value
		(b)	6 correct points plotted	P2ft	P1ft for 5 or 4 correct
			Smooth curve through 6 points and correct shape	C1ft	<b>C0</b> if curve crosses <i>y</i> -axis
		(c)	Ruled tangent drawn at $x = 2$	T1	Not chord, allow slight daylight
			Rise/run (using correct scales)	<b>M1</b>	Dep T1
			3.4 to 4	A1	
		(d)	k > 1.85 or $k >$ any value greater than 1.85	n <b>B1</b>	Accept $\geq$ Ignore $k <$ any value greater than 1.85
		(e)	(i) Correct ruled line for $-3 \le x \le 3$	B2	SC1 for short ruled line or good freehand complete line or any ruled line grad $-1$ or ruled with <i>y</i> intercept of 1 (not <i>y</i> = 1)
			(ii) -1.75 to -1.9	B1	
		(f)	(i) $x^2 + \frac{1}{x} = x + 2$	B2	<b>B1</b> for $x^2 - x - 2 + \frac{1}{x} = 0$ oe seen
					or $1 + x^3 = x^2 + 2x$ seen
			(ii) $(y =) x + 2$	B1ft	or their $ax + b$ numerical $a \neq 0$ and $b \neq 0$
  14	2	(2)	0.5.4	1+1	
		(b)	6 points plotted ft	P2	P1 for 5 points
			Correct shaped curve through 6 poin	ts C1	Ignore to left of $x = -2$
			(exponential)		
		(c)	(i) Correct ruled line reaching both points	L1	
			(ii) $6 \div 3$ oe	1	Allow 'test' with a coordinate on the line (not 0, 2)
			(iii) -0.8 to -0.6	1	Dep on L1
		(d)	Tangent drawn at (1, 2)	T1	Not chord, allow up to 1 mm daylight
			Rise/run attempt using correct scales	M1	Dep on T1
			1.2 to 1.6 cao	A1	5
15	8	(a)	243	2	<b>B1</b> for $(g(-2) =)$ 5 seen or $3^{(1-2x)}$
		(b)	$\frac{1-x}{2}$ or $\frac{x-1}{-2}$ final ans	2	M1 for $x = 1 - 2y$ or $x = (1 - y)/2$
		(c)	$\frac{-1\pm\sqrt{1^2-4(1)(-1)}}{2(1)}$	B2	<b>B1</b> for $\sqrt{1^2 - 4(1)(-1)}$ or better ( $\sqrt{5}$ ) seen anywhere
					If in form $\frac{p+\sqrt{q}}{r}$ or $\frac{p-\sqrt{q}}{r}$
					<b>B1</b> for $p = -1$ and $r = 2(1)$
			-1.62, 0.62	B1B1	<b>SC1</b> for -1.62 and 0.62 seen or -1.6 or -1.618 and 0.6 or 0.618
		(d)	$4x^2 - 6x + 1$ final ans www3	3	<b>M1</b> for $(1 - 2x)^2 + (1 - 2x) - 1$ or better and <b>B1</b> for $(1 - 2x)^2 = 1 - 2x - 2x + 4x^2$ or better
		(e)	9	1	

163	(a)	1 0.98(4) 0 -0.98(4) -1	B3	<b>B2</b> for 4 correct, <b>B1</b> for 3 correct
	(b)	9 points plotted	P3ft	<b>B2</b> for 7 or 8 points correct
		smooth curve	C1	<b>B1</b> for 5 or 6 points correct correct <b>cubic</b> shape through 8 or more points from $-2$ to 2
	(c) (i)	y = 0.8 drawn	B1	Accept good freehand To make the three possible intersections (otherwise the line must be from $-2$ to 2)
	(ii)	-1.1 to -1.2, -0.4 to -0. 5, 1.55 to 1.65	1, 1, 1	
	(d)	correct tangent drawn at $x = -1.5$ 4 to 5.5	T1 B2	Allow slight daylight dep on T1 M1 for evidence rise/run with correct scales dep on T1
179	(a) (i)	14	1	
	(ii)	13 - 2x	2	<b>M1</b> for $7 - 2(x - 3)$
	(iii)	$25x^2 - 8$ final answer	-1	
	(b)	$\frac{7-x}{2}$ oe	2	M1 for $2x = 7 - y$ , $x = \frac{7 - y}{2}$ oe or $x = 7 - 2y$ , $2y = 7 - x$ oe i.e one step from answer
	(c)	$9x^2 + 30x + 17$	3	M1 for $(3x+5)^2 - 8$ seen B1 for $9x^2 + 30x + 25$
	(d)	7 cao	3	M2 for $3(3x+5)+5=83$ or better or B1 for $3(3x+5)+5$ oe
	(e)	$x < -\frac{3}{8}$ oe cao	3	M1 for $2(3x + 5) < 7 - 2x$ oe B1 for $8x^* - 3$ or $-8x^* 3$ Do not accept $\frac{3}{-8}$

18 <sub>7</sub>	(a)	1,, 11.3[1] , 16	3	B1 each
	(b)	9 points plotted	P3ft	<b>P2ft</b> for 7 or 8, <b>P1ft</b> for 5 or 6.
		Smooth curve through at least 8 points and exponential shape	C1ft	ft only if correct shape and covers the domain $0 < x < 4$
	(c)	2.3 < <i>x</i> < 2.35	1	
	(d)	0.4 < <i>x</i> < 0.5, 3.25 < <i>x</i> < 3.35	M1 A1 A1	y = 3x ruled to cut curve at all possible points.
	(e)	Reasonable tangent with gradient 3	M2	Or M1 for any tangent
		(their x, their y)	A1	Dep on M2. Their point of contact
199	(a) (i)	$-\frac{1}{3}$ oe	2	<b>B1</b> for $f(2) = -3$ soi
	(ii)	-7	1	
	(b)	$\frac{x-2}{x}$ final answer www	2	<b>M1</b> for $1 - \frac{2}{x}$ seen
	(c)	$y-1 = x^{3} \text{ or } x = y^{3} + 1$ $x = \sqrt[3]{y-1} \text{ or } x-1 = y^{3}$ $\sqrt[3]{x-1} \text{ oe final answer www2}$	M1 A1	i.e. two correct steps For M1, accept a correct reverse flowchart After 0 scored allow SC1 for $\sqrt[3]{x-1}$ seen then
				spont Pl cach
	(u)	A, F, D	2	
	(e)	29 Maria and and a standard and a		M1 for $x = k(2)$ or $\sqrt[3]{x+3} = 2$ (Variable can be y in second method)

20	2	(a)	(i)	14 -5.5 20	1+1+1	
			(ii)	10 correct points plotted	P3 ft	<b>P2</b> ft for 8 or 9 correct
						P1 ft for 6 or 7 correct
						Centre of point must touch line if exact or be in correct square (including boundaries)
				Smooth curve through all 10 points	C1	Within 1 mm radially of potted points. In absence of plot[s], allow curve to imply plot[s]
				correct shape		No ruled sections
		(b)	-4.8	to -4.6, -0.4 to -0.2, 3 to 3.1	1+1+1	After 0 scored, <b>SC1</b> for $y = 2$ soi
			WWV	W		Penalise first occurrence of co-ord answers in <b>(b)</b> and <b>(d)(ii)</b>
		(c)	Tang	gent drawn at $x = -4$	<b>T1</b>	Not chord or daylight
			Atte	$\frac{1}{2} \frac{1}{2} \frac{1}$	M1	Dep on T1 or close attempt at tangent at $x = -4$
			6 to	11	A1	Dep on M1 only
		(d)	(i)	Ruled line through $(1, 15)$ and $(3, -5)$	3	L2 for short line but correct or freehand full length correct line.
						L1 for ruled or freehand line through $(0, 10)$ (but not $y = 10$ ) or for ruled line with gradient -5
			(ii)	2.5 to 2.7	1	isw for extra solns from wrong curve/line
21	8	(a)	(i)	Tangent drawn at $x = 2.5$	1	reasonable tangent at correct point, no daylight, or chord, crossing <i>x</i> -axis between 1.7, 2.0 when extended if necessary
21	8	(a)	(i) (ii)	Tangent drawn at <i>x</i> = 2.5 1.55 to 2.2	1 2dep	reasonable tangent at correct point, no daylight, or chord, crossing <i>x</i> -axis between 1.7, 2.0 when extended if necessary <b>Dependent</b> on correct tangent or close attempt at tangent at $x = 2.5$
21	8	(a)	(i) (ii)	Tangent drawn at <i>x</i> = 2.5 1.55 to 2.2	1 2dep	reasonable tangent at correct point, no daylight, or chord, crossing x-axis between 1.7, 2.0 when extended if necessary <b>Dependent</b> on correct tangent or close attempt at tangent at $x = 2.5$ <b>M1dep</b> attempts y step / x step
21	8	(a)	(i) (ii)	Tangent drawn at <i>x</i> = 2.5 1.55 to 2.2	1 2dep	reasonable tangent at correct point, no daylight, or chord, crossing x-axis between 1.7, 2.0 when extended if necessary <b>Dependent</b> on correct tangent or close attempt at tangent at $x = 2.5$ <b>M1dep</b> attempts y step / x step with correct scales
21	8	(a) (b)	(i) (ii) 1.42	Tangent drawn at <i>x</i> = 2.5 1.55 to 2.2 2 to 1.45 and 2.8 to 2.82	1 2dep 1, 1	reasonable tangent at correct point, no daylight, or chord, crossing x-axis between 1.7, 2.0 when extended if necessary <b>Dependent</b> on correct tangent or close attempt at tangent at $x = 2.5$ <b>M1dep</b> attempts y step / x step with correct scales
21	8	(a) (b) (c)	(i) (ii) 1.42 (i)	Tangent drawn at <i>x</i> = 2.5 1.55 to 2.2 2 to 1.45 and 2.8 to 2.82 4.4, 2.5, 1.5	1 2dep 1, 1 2	reasonable tangent at correct point, no daylight, or chord, crossing x-axis between 1.7, 2.0 when extended if necessary <b>Dependent</b> on correct tangent or close attempt at tangent at $x = 2.5$ <b>M1dep</b> attempts y step / x step with correct scales <b>B1</b> for 2 correct values
21	8	(a) (b) (c)	<ul> <li>(i)</li> <li>(ii)</li> <li>(ii)</li> </ul>	Tangent drawn at <i>x</i> = 2.5 1.55 to 2.2 2 to 1.45 and 2.8 to 2.82 4.4, 2.5, 1.5 6 correct points plotted	1 2dep 1, 1 2 P2ft	<ul> <li>reasonable tangent at correct point, no daylight, or chord, crossing <i>x</i>-axis between 1.7, 2.0 when extended if necessary</li> <li>Dependent on correct tangent or close attempt at tangent at x = 2.5</li> <li>M1dep attempts y step / x step with correct scales</li> <li>B1 for 2 correct values</li> <li>P1ft for 4 or 5 correct plots</li> </ul>
21	8	(a) (b) (c)	(i) (ii) 1.42 (i) (ii)	Tangent drawn at $x = 2.5$ 1.55 to 2.2 2 to 1.45 and 2.8 to 2.82 4.4, 2.5, 1.5 6 correct points plotted curve through all 6 points and correct shape	1 2dep 1, 1 2 P2ft C1	reasonable tangent at correct point, no daylight, or chord, crossing x-axis between 1.7, 2.0 when extended if necessary <b>Dependent</b> on correct tangent or close attempt at tangent at $x = 2.5$ <b>M1dep</b> attempts y step / x step with correct scales <b>B1</b> for 2 correct values <b>P1ft</b> for 4 or 5 correct plots Smooth curve but last 3 points may be ruled. In absence of plot[s], allow curve to imply plot[s]
21	8	(a) (b) (c)	<ul> <li>(i)</li> <li>(ii)</li> <li>(iii)</li> <li>(iii)</li> </ul>	Tangent drawn at $x = 2.5$ 1.55 to 2.2 2 to 1.45 and 2.8 to 2.82 4.4, 2.5, 1.5 6 correct points plotted curve through all 6 points and correct shape 0.75 to 0.9	1 2dep 1, 1 2 P2ft C1 1	<ul> <li>reasonable tangent at correct point, no daylight, or chord, crossing x-axis between 1.7, 2.0 when extended if necessary</li> <li>Dependent on correct tangent or close attempt at tangent at x = 2.5</li> <li>M1dep attempts y step / x step with correct scales</li> <li>B1 for 2 correct values</li> <li>P1ft for 4 or 5 correct plots</li> <li>Smooth curve but last 3 points may be ruled. In absence of plot[s], allow curve to imply plot[s]</li> <li>Solutions may be in any order</li> </ul>
21	8	(a) (b) (c)	(i) (ii) (ii) (iii)	Tangent drawn at x = 2.5         1.55 to 2.2         2 to 1.45 and 2.8 to 2.82         4.4, 2.5, 1.5         6 correct points plotted         curve through all 6 points and correct shape         0.75 to 0.9         1.6 to 1.7	1 2dep 1, 1 2 P2ft C1 1 1	<ul> <li>reasonable tangent at correct point, no daylight, or chord, crossing <i>x</i>-axis between 1.7, 2.0 when extended if necessary</li> <li>Dependent on correct tangent or close attempt at tangent at x = 2.5</li> <li>M1dep attempts y step / x step with correct scales</li> <li>B1 for 2 correct values</li> <li>P1ft for 4 or 5 correct plots</li> <li>Smooth curve but last 3 points may be ruled. In absence of plot[s], allow curve to imply plot[s]</li> <li>Solutions may be in any order</li> </ul>

22	4	(a)	5, -1	2	B1 B1
		(b)	12 points plotted ft	P3ft	<b>P2ft</b> for 10 or 11, <b>P1ft</b> for 8 or 9
			Smooth curve through at least 12 points	C1	In absence of plot[s], allow curve to imply plot[s]. No ruled sections
			Two separate branches	<b>B</b> 1	Not touching <i>y</i> -axis
		(c)	(i) 0.55 to 0.65	1	
			(ii) 0.65 to 0.75	2	<b>M1</b> for $y = 3x$ drawn (ruled) to cross curve
		(d) (e)	1 3 (i) Ruled line through (-1, 5)	2	Accept 0.333[3] or 0.3 <b>M1</b> for $\frac{2}{x^2} - 3x = 3x$ or better
			and $(3, -9)$		
			(ii) $y = -3.5x + 1.5$ oe final answer	3	<b>B2</b> for $y = kx + 1.5$ [ $k \neq 0$ ] oe or $y = -3.5 \neq d$ oe <b>B1</b> for gradient = $-3.5$ oe accept integer/integer of y = kx + [1.4  to  1.6] oe <b>SC2</b> for answer $-3.5x + 1.5$ [no ' $y =$ ']
			(iii) Tangent	1	
					aths.com

23	2 (a)	3, 0.33[3], 1	3	<b>B1</b> for each correct value
	(b)	Correct quadratic curve	3	<b>B2FT</b> for 7 correct points
				or B1FT for 5 or 6 correct points
		Correct exponential curve	3	<b>B2FT</b> for 7 correct points
				B1FT for 5 or 6 correct points
				A CONTRACTOR
	(c) (i)	Answer in range $1.2 < x < 1.4$	1	
	(ii)	Answer in range $1.2 < x < 1.35$	1	Not from a line other than $y = 4$ (±1mm)
	(iii)	Answer in range $0.55 < x < 0.7$	1	
	(d)	Correct tangent drawn And answer in range $-2.5 \le m \le -1.5$	3	<b>B1</b> for correct tangent at $x = 0.5$
				<b>B2</b> for answer in range dep on close attempt at tangent
				<b>M1</b> for $[-] \frac{rise}{run}$ used with values soi
				from tangent, dep on close attempt at tangent or answer in range 1.5 < m < 2.5
				or SC1 for close attempt at tangent to exponential curve and answer in the range $1.6 < m < 2.2$
24	9 (a)	$-1\pm\sqrt{1^2-4\times1\times(-3)}$	2	<b>B1</b> for $1^2 - 4 \times 1 \times (-3)$ or better
				and if in the form $\frac{p+\sqrt{q}}{r}$ or $\frac{p-\sqrt{q}}{r}$
		-2.30 1.30 final answer	2	then <b>B1</b> for $p = -1$ and $r = 2(1)$ or better
			M	<b>B1 B1</b> SC1 for -2.30 and 1.30 seen or -2.3 or -2.303 to - 2.302 and 1.3 or 1.302 to 1.303 or final answer -1.30 and 2.30
	(b)	4, 30, 53	3	M1 for $(2x + 7)^2 + (2x + 7) - 3$ and B1 for $(2x + 7)^2 = 4x^2 + 14x + 14x + 49$ oe

	(c)		$\frac{x-7}{2}$	_	2	M1 for $y - 7 = 2x$ or $x = 2y + 7$ or $-7$ then $\div 2$ clearly seen in correct order
						with arrow or better or $\frac{y-7}{2}$
	(d)		-2		1	
	(e)		1.158	× 10 <sup>77</sup>	4	<b>B3</b> for $1.16 \times 10^{77}$ or $1.1579 \times 10^{77}$ or $1.157 \times 10^{77}$ or
						B2 for $2^{260}$ seen or B1 for $2^8$ seen or 256
25	3	(a)		0, 2, 0, -3	3	B2 for 3 correct or B1 for 2 correct
		(b)		Correct curve	<b>B4</b>	B3FT for 8 points B2FT for 7 or 6 points B1FT for 5 or 4 points
		(c)		y = -1 indicated	B1	e.g. Could be mark[s] on curve
				x = 1.3 to 1.4 and 4.1 to 4.2	B1	isw other filles if not clearly used
		(d)	(i)	line drawn from (0, 2) to touch curve	M1	No daylight at point of contact If short, must cross at (0, 2) within ½ small square when extended
				(2.5 to 2.75, 3 to 3.4)	A1	
			(ii)	rise/run e.g. (their y – 2)/their x	M1	dep on attempt at a tangent from $(0, 2)$ in $(d)(i)$ and uses scales correctly Can be implied from answer- check on tangent for their rise for a run of 1 $(\frac{1}{2} \text{ small square})$
				0.4 to 0.48	A1	<b>ww2</b> dep on attempt at a tangent from (0, 2) in (d)(i)
				uuu.Q8		aths.com

26	5	(a)	-5.04, 1.75, 0	3	<b>B1</b> for each correct value
		(b)	Fully correct curve	5	<ul> <li>B3FT for 10 correct plots from <i>their</i> (a)</li> <li>B2FT for 8 or 9 correct plots</li> <li>or B1FT for 6 or 7 correct plots</li> <li>and SC1 for two branches not joined</li> </ul>
		(c)	-1.6 to -1.5 -0.4 to -0.3 1.8 to 1.9	1 1 1	
		(d)	-2.6 to -2.5 www -0.4 to -0.3	1 1	After 0 second M1 for $u = 2u - 2$ drown
			$\frac{1}{2}$ 25 to 4.25 with correct tangent	2	After 0 scored, will for $y - 2x - 2$ drawn <b>B1</b> for correct tangent
		(e)	5.25 to 4.25 with correct tangent	3	<b>BI</b> for correct tangent
					<b>B2</b> for answer in range dep on close attempt at tangent
					<b>M1dep</b> for $[-]\frac{rise}{run}$ used with values soi from
					tangent, dep on correct or close attempt at tangent
27	6	(a)	(i) 1.4 to 1.6	1	
			(ii) 1.15 to 1.25	1	
			(iii) – 1	1	
			(iv) $-2.25$ to $-2.1$ -0.9 to $-0.752.2$ to $2.35$	3	<b>B2</b> for 2 correct or <b>B1</b> for one correct or <b>B1</b> for $y = x$ drawn ruled to cut curve 3 times
		(b)	(i) –15	2	<b>B1</b> for $[h(3) = ]$ 8 seen or <b>M1</b> for $1 - 2(x^2 - 1)$ or better
			(ii) $\frac{1-x}{2}$ or $\frac{1}{2} - \frac{x}{2}$ or final answer	2	<b>M1</b> for $x = 1 - y$ or $x = 1 - 2y$ or better
			(iii) -2, 2	3	M1 for $x^2 - 1 = 3$ or better B1 for one answer
			(iv) $\frac{1}{8}$ of nfww 28	3	<b>M2</b> for $8x = 1$ or $8x - 1 = 0$ or <b>M1</b> for $1 - 2(3x) = 2x$

28 5	(a) 7, 11.5, 4.5	1,1,1	
	(b) Correct curve cao	5	<ul> <li>B3FT for 10 correct plots, on correct vertical grid line and within correct 2 mm square vertically</li> <li>Or B2FT for 8 or 9 correct plots</li> <li>Or B1FT for 6 or 7 correct plots</li> <li>and B1 indep for two separate branches on either side of <i>y</i>-axis</li> </ul>
	(c) (i) $0.69 < x < 0.81$	1	
	(ii) $-2.3 < x < -2.2$ -0.8 < x < -0.6 0.35 < x < 0.5	3	<b>B1</b> for each correct After 0 scored, allow <b>SC1</b> for drawing line y = 7.5 long enough to cross curve at least once
	(d) (i) $y = 10 - 3x$ ruled correctly	<b>B2</b>	long enough to cross curve twice.
			<b>B1</b> for ruled line gradient $-3$ or <i>y</i> intercept at 10 but not $y = 10$ <b>Or B1</b> for 'correct' but freehand
	-0.55 < <i>x</i> < -0.45	B1dep	Dependent on at least <b>B1</b> scored for line
	0.35 < x < 0.45	B1dep	
			After 0 scored, SC2 for -0.5 and 0.4 [from solving equation]
	(ii) 10 1 -2 or -10 -1 2	3	<b>B2</b> for $2 - x - 10x^2$ [= 0] oe Or <b>B1</b> for $\frac{2}{x^2} - \frac{1}{x} - 10 = 0$ oe Correctly eliminating $-3x$ Or <b>B1</b> for $2 - x - 3x^3 = 10x^2 - 3x^3$ oe Correctly clearing fractions
	uuu.Q8		ettaing nacions

29	8	(a) (i) -6	1	
		(ii) 2.75 oe	2	<b>M1</b> for $[g(x) = ]$ 0.5 or 7/14
				Or $\left(\frac{7}{x+1}\right)^2 + 5\left(\frac{7}{x+1}\right)$ oe
		(b) $\frac{x-3}{4}$ or $\frac{x}{4} - \frac{3}{4}$ Final answer	2	M1 for $y - 3 = 4x$ or better or $x = 4y + 3$ or better or $\frac{y}{4} = \frac{3}{4} + x$ or flowchart with $-3$ then $\div 4$
		(c) (i) 5	2	M1 for $4x = 23 - 3$ or $x + \frac{3}{4} = \frac{23}{4}$ or better
		(ii) $x^2 + 5x - 7 = 0$	B1	May be implied by correct values in formula
		$\frac{-5\pm\sqrt{5^2-4(1)(-7)}}{2(1)}$ oe	B1 B1	<b>B1</b> for $\sqrt{5^2 - 4(1)(-7)}$ or better [53]
				If in form $\frac{p+\sqrt{q}}{r}$ or $\frac{p-\sqrt{q}}{r}$ , <b>B1</b> for -5 and
				2(1) or better No recovery of full line unless seen
		1.14 and –6.14 final answers	B1 B1	<b>Or SC1</b> for 1.1 or 1.140 and -6.1 or - 6.140 Or answers -1.14 and 6.14
30	8 (a	) 2.125 and 2.375	2	B1 for one correct value
	(b	) Correct curve	B4	<b>B3FT</b> for 11 correct plots
				or B2FT for 9 or 10 correct plots or
	,			BIFI for / or 8 correct piots
	(c	) Ruled tangent at $x = 2$	B1	No daylight at $x = 2$ . Consider point of contact as midpoint between two vertices of daylight, this must be between $x = 1.8$ and 2.2
		Gradient from 7.8 to 10.2	2	<b>Dep</b> on B1 awarded Allow integer/integer or a mixed number if within range
		www.Q8	e ///	M1 dep for (change in $y$ ) ÷ (change in $x$ ) Dependent on any tangent drawn or close attempt at a tangent at <u>any</u> point Must see correct or implied calculation from a drawn tangent
	(d	) 0 and $-1.75$ to $-1.65$ and $1.65$ to $1.75$	2	<b>B1</b> for two correct values
	(e	) $ -1.2 \text{ to } -0.8 \le k \le 2.8 \text{ to } 3.2$	2	B1 for each correct or SC1 for reversed answers

31 
$$|\mathbf{10}(\mathbf{a})$$
 (i) 5  
(ii)  $-2\frac{1}{3}$  oe  
(iii)  $-\frac{2}{3}\frac{1}{3}$  oe  
(iii)  $\frac{x+3}{2}$  or  $\frac{x}{2} + 1.5$  as final ans  
(iii)  $\frac{x+3}{2}$  or  $\frac{x}{2} + 1.5$  as final ans  
(iv)  $4x - 9$  as final answer nfivw  
(v)  $(2x - 3)(x + 1) = 1 + 2(x + 1)$   
 $2x^2 - 3x + 2x = 3$  or better seen  
 $2x^2 - 3x - 6 = 0$   
(v)  $\frac{-(-3)\pm\sqrt{(-3)^2 + 4 \times 2 \times -6}}{2 \times 2}$   
B1 for  $\sqrt{(-3)^2 - 4 \times 2 \times -6}$  or better seen  
 $2x^2 - 3x - 6 = 0$   
(v)  $\frac{-(-3)\pm\sqrt{(-3)^2 - 4 \times 2 \times -6}}{2 \times 2}$   
B2 B1 for  $\sqrt{(-3)^2 - 4 \times 2 \times -6}$  or better (V57)  
and if in form  $\frac{p + 4\overline{q}}{r}$  or  $\frac{p - \sqrt{q}}{r}$   
B1 for  $p = -(-3)$  and  $r = 2 \times 2$  or better  
(v)  $\frac{x - 1}{x + 5}$  as final answer nfiww  
(b)  $\frac{x - 1}{x + 5}$  as final answer nfiww  
(c)  $\frac{x - 1}{x + 5}$  as final answer nfiww  
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(c)  $\frac{x - 1}{x + 5}$  as fin

32	10	(a)	2	2	<b>B1</b> for g $\begin{pmatrix} 1 \\ 2 \end{pmatrix} = \frac{1}{2}$ soi or [fg=] $\frac{1}{1-x}$
		(b)	1-x	1	Accept equivalents e.g. $-(x-1)$
		(c)	$x^2 - 2x + 2$	3	<b>M1</b> for $(1-x)^2 + 1$ <b>B1</b> for $[(1-x)^2 = ]1 - x - x + x^2$ or better
		(d)	- 6	1	
		(e)	$\sqrt{(-3)^2 - 4(1)(1)}$ or better	B1	or for $\left(x-\frac{3}{2}\right)^2$
			$p = -(-3)$ and $r = 2 \times 1$ oe	B1	Must see $\frac{p+\sqrt{q}}{r}$ or $\frac{p-\sqrt{q}}{r}$ or both
					<b>or</b> for $\frac{3}{2} + or - \sqrt{\left(\frac{3}{2}\right)^2 - 1}$
			0.38, 2.62	B1B1	<b>SC1</b> for answers 0.4 <b>and</b> 2.6 or 0.3819 to 0.3820 <b>and</b> 2.618 or 0.38 <b>and</b> 2.62 seen in working or for -0.38 and -2.62 as final ans
		(f)	f(x) and $g(x)$	1	Accept f and g or $1/x$ and $1 - x$
33	4	(a)	0, 4.5, 3.11[1]	3	B1, B1, B1
		(b)	Complete correct curve with	5	<b>B3 FT</b> for 9 points correctly plotted
			minimum below $y = 2$		<b>B2 FT</b> for 7 or 8 points correctly plotted
					or BI FT 5 or 6 points correctly plotted
					<b>and B1 indep</b> two separate branches not touching or cutting <i>y</i> -axis
		(c)	-0.5 to $-0.6$	1	
			2.8 to 2.9	1	if 0 <b>SC1</b> for $y = 3$ indicated
		(d)	Correct line or no line <b>and</b> - 0.7 to - 0.6 nfww	3	Must check line - not if wrong line <b>B2</b> for $y = 1 - x$ ruled correctly
					or SC1 for ruled line with either gradient $-1$ or <i>y</i> -intercept 1 but not line $y = 1$ or correct freehand line

	(e)	tangent ruled at $x = 2$ and 0.62 to 0.8	3	Accept integer/integer provided in rangeB1 for correct tangent drawnand M1 for change in $y$ / change in $x$ depon any tangent or close attempt at tangent atany pointMust see correct or implied calculationfrom a drawn tangent
	(f)	$\frac{1}{x^2} = -x \text{ or } 1 + x^3 = 0$	M1	
		$1 = -x^{3}$ or $x^{3} = -1$ $x = \sqrt[3]{-1}$	M1 A1	dep M1 dep M2
34 9	(a)	4 – 6 <i>x</i> final answer	1	A Barrow and
	(b)	9x - 8 final answer	2	<b>M1</b> for $4 - 3(4 - 3x)$ seen
	(c)	$\frac{1}{27}$ final answer	3	M2 for $3^{-3}$ soi by final answer 0.037037 to 3sf or better or M1 for $[g(-1)=]$ 3 soi
	(d)	$\frac{4-x}{3}$ of final answer	2	M1 for a correct first step $3x = 4 - y$ oe or $x = 4 - 3y$ or $\frac{y}{3} = \frac{4}{3} - x$
	(e)	$\frac{4}{3}$ or $1\frac{1}{3}$ or 1.33 or better	3	<b>M2</b> for $3x - 4 = 0$ or better or <b>M1</b> for $3^{-(4-3x)}$
35	5 (a)	-2, 5.5	2	B1 for each value
	(b)	Correct curve	5	<b>B5</b> for correct curve over full domain
			M	or B3FT for 9 or 10 points or B2FT for 7 or 8 points or B1FT for 5 or 6 points Point must touch line if exact or be in correct square if not exact (including boundaries) and B1 independent for one branch on each side of the y-axis and not touching or crossing the y-axis SC4 for correct curve with branches joined
	(c)	$-2.6 \le x \le -2.4$ $0.6 \le x \le 0.7$ $1.8 \le x \le 1.9$	3	<b>B1</b> for each value If <b>B0</b> then <b>SC1</b> for $y = 5$ used

(d)
 
$$y = x + 5$$
 ruled correctly  
and  
 $-2.2 \approx x \approx -2.0$   
 $0.5 \approx x \approx 0.6$   
 $2.4 \approx x \approx 2.6$ 
 4
 B1 for  $y = x + 5$  ruled correctly  
Blindep for each value

 36
 5
 (a)
 (b)
 4
 1

 (b)
 4 or -4
 3
 M1 for  $[g(17) = \frac{7}{14}$  or  $2(\frac{7}{x-3})^2 + 7(\frac{7}{x-3})$ 

 (b)
 4 or -4
 3
 M2 for  $x^2 - 16$  or  $x^2 - 16 = 0$   
or M1 for  $7 = (x-3)(x+3)$  or better

 (c)
  $2x^2 + 7x - 11$  [=0] soi
 B1

  $-74 \pm \sqrt{77}^2 - 4(2)(-11)$ 
 B1FT  
2(2)
 B1FT  
B1FT

 oc
 B1FT for  $\sqrt{7^2} - 4(2)(-11)$  or better or  $(x + \frac{3}{4})^2$ , or  
 $1 \text{ fin form } \frac{p + \sqrt{q}}{r}$  or  $\frac{p - \sqrt{q}}{r}$ ,  
B1FT for  $-7$  and  $2(2)$  or better or  
 $-\frac{7}{4} + or -\sqrt{\frac{137}{16}}$  oc

 (d)
  $\frac{x+2}{5}$  or  $\frac{x}{5} + \frac{2}{5}$ 
 2

 (e)
 -2
 1

 (f)
  $\frac{y+2}{5}$  or  $x = 5y - 2$  or  $y + 2 = 5x$  or  
 $\frac{y}{5} = x - \frac{2}{5}$ 

_	1		1			i de la constance de
37	6	<b>(a</b> )		-3, 7.375, 8.875	1, 1, 1	Accept 7.4 or 7.37 or 7.38 for 7.375 and 8.9 or 8.87 or 8.88 for 8.875
		(b)		Correct curve	4	<ul> <li>B3FT for 8 or 9 correct plots</li> <li>B2FT for 6 or 7 correct plots</li> <li>B1FT for 4 or 5 correct plots</li> <li>Point must touch line if exact or be in correct square if not exact (including boundaries)</li> </ul>
		(c)	(i)	Any integer less than 7 or greater than 10	1	
			(ii)	7, 8 or 9	1	
		(d)		y = 15x + 2 ruled and fit for purpose	B2	<b>B1</b> for short line but correct or freehand full length correct line or for ruled line through (0, 2) (but not $y = 2$ ) or for ruled line with gradient 15 (acc $\pm 1$ mm vertically for 1 horizontal unit)
				-1.45 to -1.35 and 0.4 to 0.5	B2	B1 for each
		(e)		Tangent ruled at $x = 1.5$	B1	No daylight at point of contact. Consider point of contact as midpoint between two vertices of daylight, the midpoint must be between $x = 1.4$ and 1.6
				7 to 12	2	<b>Dep</b> on <b>B1</b> or close attempt at tangent at $x = 1.5$ <b>M1</b> for $y - \frac{\frac{1}{x}}{\frac{1}{y}}$ or their tangent
38	8	(a)	(i)	(1, 2)	1+1	
			(ii)	y = 3x - 1 cao final answer	3	M1 for gradient = $\frac{84}{31}$ oe and M1 for substituting (3, 8) or (-1, -4) into <i>their</i> y = 3x + c or for finding y-intercept is -1
		(b)	(i)	(x+5)(x-2) isw solutions	2	<b>SC1</b> for $(x + a)(x + b)$ where $ab = -10$ or $a + b = 3$
			(ii)	$\begin{bmatrix} a = ] & -5 \\ [b = ] & 2 \\ [c = ] & -10 \end{bmatrix}$	3FT	<b>B1FT</b> for each of <i>their</i> 5 and <i>their</i> $-2$ from (b)(i) and <b>B1</b> for $c = -10$
			(iii)	x = -1.5	1FT	<b>FT</b> $x = (their (a + b))/2$
		(c)		Inverted parabola	B1	
				x-axis intercepts at $-2$ and 9	B2	B1 for each
				y-axis intercept at 18	B1	After <b>B0</b> allow <b>SC1</b> for $(9 - x)(2 + x)$ oe
		(d)	(i)	p = 6 q = 43	3	<b>B2</b> for $(x + 6)^2 - 43$ or $p = 6$ or $q = 43$ or <b>M1</b> for $(x + 6)^2$ or $x^2 + px + px + p^2$ and <b>M1</b> for $-7 - (their 6)^2$ or $p^2 - q = -7$ or $2p = 12$
			(ii)	-43	1FT	<b>FT</b> – their $q$

39 2	(a)	1.5 1.25 -0.75 0.5	4	B1 for each
	(b)	Fully correct curve	5	<ul> <li>B5 for correct curve over full domain or</li> <li>B3 FT for 11 or 12 points or B2 FT for 9 or 10 points or B1 FT for 7 or 8 points</li> <li>and</li> <li>B1 independent for one complete branch on each side of the <i>y</i>-axis and not touching or crossing the <i>y</i>-axis</li> <li>SC4 for correct curve with branches joined</li> </ul>
	(c)	-1.35 to -1.25	<b>S 1</b>	
		-0.27 to -0.251	1	
		1.51 to 1.55	1	
	(d)	<i>k</i> < 1.2 or 1.15 to 1.25	2	SC1 for 1.15 to 1.25 seen or horizontal line drawn at min point
	(e)	tangent ruled at $x = -1$	B1	No daylight at $x = -1$ Consider point of contact as midpoint between two vertices of daylight, the midpoint must be between $x = -1.1$ and $-0.9$
		-1.7 to -1.3	2	dep on B1 or a close attempt at tangent at $x = -1$ or M1 for rise/run also dep on any tangent drawn or close attempt at tangent at any point. Must see correct or implied calculation from a drawn tangent
		www.C	28 M	aths.com

40	5	(a)	2 and 7	2	B1 for each value
		(b)	Complete correct curve	5	<ul> <li>B3 FT for <i>their</i> 9 or 10 points or B2 FT for <i>their</i> 7 or 8 points or B1 FT for <i>their</i> 5 or 6 points and</li> <li>B1 independent for one branch on each side of the <i>y</i>-axis and <b>not touching</b> the <i>y</i>-axis</li> <li>SC4 for correct curve with branches joined</li> </ul>
		(c)	Correct tangent and −13 ≤ grad ≤ −8	3	<b>B2</b> for close attempt at tangent at $x = 1$ and answer in range OR <b>B1</b> for ruled tangent at $x = 1$ , no daylight at $x = 1$ Consider point of contact as midpoint between two vertices of daylight, the midpoint must be between $x = 0.8$ and 1.2 <b>and M1</b> (dep on <b>B1</b> or close attempt at tangent [at any point ] for $\frac{rise}{run}$
		(d) (	i) 5 to 6	1	
		(i	i) 2 to 2.35 and -2.55 to -2.35	2FT	<b>FT</b> <i>their k</i> <b>B1FT</b> for each correct solution
		(e)	[a =] -5 [b =] -1 [c =] 12	3	<b>B2</b> for two correct values or for $x^3 - 5x^2 - x + 12$ [= 0] oe or <b>M1</b> for $x^2 - 2x + \frac{12}{x} = 3x + 1$
			www.Qe	8 M.	aths.com

	1	1	1	
41	3 (a)	1 3 2.5	1 1 1	
	(b)	Fully correct graph	5	<ul> <li>B3FT for 11, 12 points correct or B2FT for 9, 10 correct points or B1FT for 7, 8 correct points</li> <li>B1 for branch each side of <i>y</i>-axis and not touching <i>y</i>-axis</li> </ul>
				SC4 for correct graph but branches joined
	(c)	-2.6 to -2.4	1	
	(d)	Correct ruled line fit for purpose $-1.6$ to $-1.5$	2 1	<b>SC1</b> for ruled line through $(0, 1)$ but not $y = 1$ or ruled line with gradient $-1$ or for correct line but freehand
	(e)	Correct tangent and $0.9 \leq \text{grad} \leq 1.5$	3	Consider point of contact as midpoint between two vertices of daylight, the midpoint must be between $x = -3.4$ and $-2.6$ <b>B2</b> if close attempt at correct tangent and answer in range (may be small amount of daylight)
				or <b>B1</b> for ruled tangent at $x = -3$ within tolerance, no daylight at the point of contact <b>and M1 (dep on B1 or close attempt at</b> tangent) for a tangent at any point and $\frac{rise}{run}$ used
42	10 (a)	9	2	<b>B1</b> for $[f(3) = ]$ 5 or $2(2x - 1) - 1$
	(b)	$4x^2 - 2x$ or $2x(2x - 1)$ final answer	3	M1 for $(2x-1)^2 + (2x-1)$ B1 for $[(2x-1)^2 = ]4x^2 - 2x - 2x + 1$ or $(2x-1)(2x-1+1)$
	(c)	$\frac{x+1}{2}$ oe final answer	2	M1 for $x = 2y - 1$ or $y + 1 = 2x$ or $\frac{y}{2} = x - \frac{1}{2}$
	(d)	$\frac{4x+4}{x(x+2)}$ or $\frac{4x+4}{x^2+2x}$ or $\frac{4(x+1)}{x(x+2)}$	4	<b>B1</b> for $x(x + 2)$ oe isw as common denominator
		or $\frac{4(x+1)}{x^2+2x}$ final answer		<b>B2</b> for $4x + 4$ as numerator or <b>B1</b> for $2(x + 2) + 2x$ or better as numerator

43	2	(a)	1.62 or 1.62	1	
		(b)	(i) 7	1	
			( <b>ii</b> ) 4	1	
			<b>(iii)</b> 7	1	
			(iv) $\frac{1}{3}$ oe	1	
		(c)	(i) 0.25 oe and 1	2	B1 for each
			(ii) Correct curve	4	<b>B3FT</b> for 6 or 7 correct plots or <b>B2FT</b> for 4 or 5 correct plots or <b>B1FT</b> for 2 or 3 correct plots
			(iii) 2.3	1FT	Correct or <b>FT</b> where $y = 5$ on <i>their</i> graph
			(iv) $y = 3x - 1$ or 3 term equation	3	<b>B2</b> for $3x - 1$ or $y = 3x [+c]$ oe or for $m = 3$ and $c = -1$
					and M1 for substitution of (1, 2) or (3, 8) into <i>their</i> $y = mx + c$
			(v) -1.7 to -1.5 and 2	2	<b>B1</b> for either or <b>M1</b> for $y = x + 2$ seen or drawn
44	2	(a)	0 4 0.625 0.875	1,1,1,1	
		(b)	Fully correct smooth curve	4	<b>B3 FT</b> for 8 or 9 points
					or <b>B2 FT</b> for 6 or 7 points
					or <b>B1 FT</b> for 4 or 5 points
		(c)	line $y = x + 1$ ruled and 0.2 to 0.3	3	Line must be fit for purpose ie at least from $x = 0$ to $x = 2$
			and 1.8 to 1.95		<b>B2</b> for correct line and 1 correct value or <b>B1</b> for correct line or <b>SC1</b> for no/wrong line and 2 correct values
		(d)	Tangent ruled at $x = -1.5$	B1	No daylight between tangent and curve at point of contact. Consider point of contact as midpoint between two vertices of daylight, the midpoint must be between $x = -1.6$ and $x = -1.4$
			2.2 to 5	2	dep on B1 M1 for $\frac{rise}{run}$ also dep on any tangent drawn or close attempt at tangent at any point Must see correct or implied calculation from a drawn tangent

45	4	(a)		-1.5, 0.5	2	B1, B1
		(b)		Correct curve	5	<b>B3 FT</b> for 10 or 11 points or <b>B2FT</b> for 8 or 9 points or <b>B1FT</b> for 6 or 7 points and <b>B1</b> independent for two branches
						SC4 for correct curve but branches joined
		(c)		1.25 to 1.35	1	
		(d)		-1	1	
		(e)	(i)	2-x	1	
			(ii)	Ruled line with gradient –1 through (0, 2) and fit for purpose	2FT 1	SC1 for ruled line, with gradient $-1$ or through (0, 2), but not $y = 2$ FT <i>their</i> $y = mx + c$ from (e)(i), if $m \neq 0$ SC1FT for ruled line either with correct gradient or through (0, c), but not $y = c$
46	0	(9)		8		
	,	(a) (b)		3	2	<b>B1</b> for $[g(0.5) = ]2$ soi
		(~)				Or (1)
						<b>M1</b> for $2\left(\frac{1}{x}\right) - 1$ or better
		(c)	70	$\frac{x+1}{2}$ final answer	2	<b>M1</b> for $x = 2y - 1$ or $y + 1 = 2x$ or better or $\frac{y}{2} = x - \frac{1}{2}$
		(d)		4 <i>x</i> – 3	2	<b>M1</b> for $2(2x-1) - 1$
		(e)		$4x^2 - 4x + 7$	2	<b>B1</b> for $\left[ \left( 2x - 1 \right)^2 \right] = 4x^2 - 2x - 2x + 1$
		(f)		x	1	
		(g)		$g^{-1}(x) = g(x)$	1	
		(h)		fh(x)	1	
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47	3	<b>(a)</b>	2 0 -2 2	3	B2 for 3 correct B1 for 2 correct
		(b)	smooth correct curve through correct points	4	<b>B3FT</b> for 8 or 9 correct plots <b>B2FT</b> for 6 or 7 correct plots <b>B1FT</b> for 4 or 5 correct plots
					FT <i>their</i> table
		(c)	line $y = \frac{1}{2}(x+1)$ ruled <u>and</u>		Line must be fit for purpose
			-2.85 to -2.95		
			-1 0.85 to 0.95	4	<b>B3</b> for correct line and 2 correct values or <b>B2</b> for correct line and 1 correct value or <b>B1</b> for correct line or <b>SC2</b> for no/wrong line and 3 correct values or <b>SC1</b> for no/wrong line and 2 correct values
		(d)	tangent ruled	B1	No daylight between tangent and curve at point of contact. Consider point of contact as midpoint between two vertices of daylight, the midpoint must be between $x = -1.85$ and x = -1.65
			- 1.1 to - 1.5	2	dep on <b>B1</b> <b>M1</b> for rise/run <b>also dep on</b> any tangent drawn or close attempt at tangent at any point Must see correct or implied calculation from a drawn tangent Accept <b>M1</b> for answer in range 1.1 to 1.5 after <b>B1</b>
48	7	(a)	3.5[0] 1.94 3.11	3	B1 for each
		(b)	Fully correct curve	5	<b>B3 FT</b> for 10 or 11 points or <b>B2 FT</b> for 8 or 9 points or <b>B1 FT</b> for 6 or 7 points
					<b>B1 indep</b> two separate branches not touching or cutting <i>y</i> -axis
					SC4 for correct curve, but branches joined
		(c)	-0.7 to $-0.6$	1	
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	(d)	(i)	-1	1	
		(ii)	-0.6 to $-0.5$ with correct ruled line	1	If 0,0, MI for $y = 2.5 - x$ oe seen in working B2FT for drawing <i>their</i> ruled line from (d)(i)
	(e)	()	Correct tangent and $0.5 \leq \text{grad} \leq 0.85$	3	or M1 for ruled line through $(0, 2.5)$ FT or gradient -1 FT B2 for close attempt at tangent at $x = 2$ and answer in range OR B1 for ruled tangent at $x = 2$ , no daylight at
					x = 2 Consider point of contact as midpoint between two vertices of daylight, the midpoint must be between $x = 1.8$ and 2.2
			Silling Bas		and M1 (dep on B1 or close attempt at tangent [at any point ] for $\frac{rise}{run}$
49	11	(a)	(i) 11	1	
			(ii) $14x + 3$ final answer		
		(b)	17 - 21x final answer	2	<b>M1</b> for $7(2-3x)+3$ oe
		(c)	$-\frac{1}{9}$	3	<b>M1</b> for $3(2-3x) = 7$ oe
					M1 for correct first step
		(a)	-1.3	3	M1 for $2-3(x+4)-(7x+3)=0$ M1 for $-10x-13=0$ oe
					If <b>0</b> scored, <b>SC1</b> for answer $-0.7$ oe after $2-3(x+4)-7x+3=0$ shown previously
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	1			
50	5 (a)	9 10.5	1 1	
	(b)	Fully correct curve	5	SC4 for correct curve, but branches joined
				<b>B3 FT</b> for 9 or 10 points plotted or <b>B2 FT</b> for 7 or 8 points plotted or <b>B1 FT</b> for 5 or 6 points plotted
				and <b>B1</b> for two separate branches not touching or cutting <i>y</i> -axis
	(c)	2.1 to 2.6	1	
		8.5 to 9	1	
	(d)	2, 3, 5, 7	2	SC1 for correct 4 values and no more than one extra positive integer or $\pm 2, \pm 3, \pm 5, \pm 7$
				or 3 correct values and no extras
	(e)	(-2, -12)	1	
	(f) (i)	$20 + x^2 = x^3$	M1 -	Multiplication by <i>x</i>
		$x^3 - x^2 - 20 = 0$	A1	No errors or omissions
	(ii)	Fully correct curve $y = x^2$	2	<b>SC1</b> for U – shaped parabola, vertex at origin
	(iii)	2.5 to 3.5	1	
	(iv)	3.[0] to 3.1 or FT their answer to (iii)	1FT	<b>FT</b> dep on (iii) $> 0$
51	8 (a)	2	2	M1 for $2x + 1 = 1 + 4$
	(b)	17	2	<b>B1</b> for $[h(3) = ]$ 8 soi or $2 \times 2^{x} + 1$ oe
	(c)	$\frac{x-1}{2}$ of final answer	2	<b>M1</b> for $y-1=2x$ or $\frac{y}{2} = x + \frac{1}{2}$ or $x = 2y+1$
	(d)	$4x^2 + 4x + 5$ final answer	3	M1 for $(2x+1)^2 + 4$ and B1 for $[(2x+1)^2 = ]4x^2 + 2x + 2x + 1$ or better
	(e)	2 or 1.41 or 1.414	1	
	(f)	-1	1	

52	4	(a)	(i) $-2, -0.5 \text{ or } -\frac{1}{2}$	2	B1 for each
			(ii) Complete correct curve	5	SC4 for correct curves but branches joined or touching <i>y</i> -axis or <b>B3FT</b> 9 or 10 points or <b>B2FT</b> for 7 or 8 points or <b>B1FT</b> for 5 or 6 points
					and <b>B1indep</b> two separate branches not touching or crossing <i>y</i> -axis
		(b)	- 1.95 to - 1.8 - 0.4 to - 0.2 2.05 to 2.2	3	B1 for each
		(c)	Any integer <i>k</i> where $k \leq -3$	1	
		(d)	(i) Correct line $y = -5x - 2$ ruled and -0.4 to $-0.20.55$ to $0.75$	4	M2 for correct ruled line or M1 for correct line but freehand or for ruled line gradient – 5 or ruled line <i>y</i> -intercept – 2, but not $y = -2$ and A1 for each correct solution dependent on at least M1 If 0 scored, SC1 for both correct with no line drawn
			(ii) $[a = ] 5 \text{ and } [b = ] - 2$	2	B1 for one correct value or M1 for $x^3 + 5x^2 - 2x - 1 = 0$ seen

54	3 (a)	(i) 10	1	
		(ii) -3.4 to -3.3 and -0.4 to -0.3 and 1.6 to 1.7	3	<b>B1</b> for each
		(iii) $y = -2.3$ to $-2.1$ oe y = 10 to $10.1$ oe	2	<b>B1</b> for each
	(b)	(i) 2, -1, 4	3	<b>B1</b> for each
		(ii) Fully correct curve drawn	4	<b>SC3</b> for correct curves but branches joined or touching <i>y</i> -axis
				or <b>B2FT</b> for 8 or 9 correct plots or <b>B1FT</b> for 6 or 7 correct plots
				and <b>B1</b> indep for two separate branches not touching or crossing <i>y</i> - axis
		(iii) -3.4 to -3.2 and 1.8 to 1.9	2	B1 for each
	(c)	3.2 oe	2FT	<b>FT</b> $2 \div their$ (a)(i) + 3 <b>M1</b> for f(-2) = 10 or <i>their</i> (a)(i) used
	(d)	1	1	
55	4(a)	-1.6 to -1.4	1	
	4(b)	-0.5	1	
	4(c)	k>-4	2	<b>B1</b> for identifying the $-4$ or for horizontal line drawn $y = -4$
	4(d)	y = x - 5 ruled and -2.3 to $-2.1-1.2$ to $-1.11.3$ to $1.4$	3	<b>B2</b> for correct line and 2 correct values or no line and 3 correct values or <b>B1</b> for no line and 2 correct values or <b>B1</b> for correct line
	4(e)	Tangent ruled at $x = 1$	B1	No daylight at point of contact. Consider point of contact as midpoint between two vertices of daylight, the midpoint must be between $x = 0.8$ and 1.2
		6 to4	2	Dep on <b>B1</b> or close attempt at tangent at $x = 1$
		www.Q8	$\langle M$	<b>M1</b> for rise/run for <i>their</i> tangent at $x = 1$

56	4(a)	10, 7	2	B1 for each value
	4(b)	Correct curve	4	<ul> <li>B3 FT for 10 or 11 correct points</li> <li>B2 FT for 8 or 9 correct points</li> <li>B1 FT for 6 or 7 correct points</li> </ul>
				FT <i>their</i> table
	4(c)	-1.7 to -1.55	1	FT <i>their</i> graph if one answer
	4(d)	Tangent ruled at $x = 3.5$	B1	No daylight between tangent and curve at point of contact
		6.5 to 11	B2	dep on tangent drawn or close attempt at tangent at $x = 3.5$ M1 for rise/run also dep on tangent or close attempt at $x = 3.5$
	4(e)	line $y = 2x + 10$ ruled <u>AND</u> -1.3 to -1.1 1	4	<b>B3</b> for correct line (could be short) and 1 correct value or <b>B2</b> for correct line (could be short) or <b>B1</b> for $[y = ] 2x + 10$ seen
		4.1 to 4.25		If zero scored, <b>SC1</b> for no/wrong line and 3 correct values
57	7(a)	x = 0	1	
	7(b)	Tangent ruled at $x = 0.5$	B1	No daylight between tangent and curve at point of contact
		-9 to -6.5	2	dep on ruled tangent or close attempt at tangent at $x = 0.5$
				M1 for rise/run also dep on tangent or close attempt at tangent at $x = 0.5$
	7(c)(i)	0 2.4 or better 4	3	B1 for each
	7(c)(ii)	Correct smooth curve	4	<b>B3FT</b> for 6 or 7 correct plots or <b>B2 FT</b> for 4 or 5 correct plots or <b>B1 FT</b> for 2 or 3 correct plots
				FT <i>their</i> table
	7(d)	$x^{3} + 3x + 4 = 10 - 8x^{2}$ and correctly completed	1	
	7(e)	line $y = -2x + 2$ drawn and -0.45 to -0.35 nfww	3	<b>B2</b> for ruled $y = -2x + 2$ or <b>B1</b> for $-2x + 2$ seen or for line y = -2x + c drawn or for $y = cx + 2(c \neq 0) drawnand B1 for -0.45 to -0.35 nfww$

58	6(a)	-2[.0], -0.2, 2.5	3	B1 for each
	6(b)	Fully correct curve	5	<b>B4</b> for correct curve, but branches joined
				or <b>B3FT</b> for 9 or 10 correct plots or <b>B2FT</b> for 7 or 8 correct plots or <b>B1FT</b> for 5 or 6 correct plots and <b>B1 indep</b> two separate branches not touching or cutting <i>y</i> -axis
	6(c)(i)	Correct tangent and $3 \leq \text{grad} \leq 5$	3	<b>B2</b> for close attempt at tangent to curve at $x = -2$ and answer in range OR <b>B1</b> for ruled tangent at $x = -2$ , no daylight at $x = -2$ and <b>M1dep</b> (dep on <b>B1</b> or close attempt at tangent) [at $x = -2$ ] for $\frac{rise}{run}$
	6(c)(ii)	[y =] <i>their</i> (c)(i) x + <i>their</i> y-intercept final answer	2	Strict FT their y-intercept for their line M1 for $y = their(\mathbf{c})(\mathbf{i}) x + any value$ or 'c' oe seen or for $y = any value(non-zero) x$ or 'mx' + their y-intercept seen oe
	6(d)(i)	1.05 to 1.25	1	
	6(d)(ii)	- 2.3 to - 2.2 - 0.4 to - 0.3 0.3 to 0.4	3	<b>B1</b> for each After 0 scored <b>B1</b> for $y = -4$ ruled
	6(e)	[a =] 2 [b =] 24 [n =] 5	3	<b>B2</b> for 2 correct or for $2x^5 + 24x^2 [-3 = 0]$ or <b>B1</b> for 1 correct or for $\frac{2x^5 - 3 + 4(6x^2)}{6x^2} [= 0]$ oe If 0 scored <b>SC1</b> for $2x^5$ seen in final line of algebra

59	5(a)	2.45, 0.25, -0.25	3	B1 for each
	5(b)	Fully correct smooth curve	4	<b>B3FT</b> for 6 or 7 points or <b>B2 FT</b> for 4 or 5 points or <b>B1 FT</b> for 2 or 3 points
	5(c)	0.7 to 0.8	1	FT their curve
	5(d)(i)	Correct ruled line	2	M1 for good freehand, or ruled line with gradient -1.05 to -0.95
	5(d)(ii)	Both intersections of <i>their</i> ( <b>b</b> ) and <i>their</i> ( <b>d</b> )( <b>i</b> )	2	or ruled line through $(0, 2)$ but not line $y = 2$ Strict FT intersection of <i>their</i> (b) and <i>their</i> (d)(i)
		State State		<b>B1FT</b> for one correct OR <b>B2</b> for 0.27 to 0.28 <b>and</b> 2.38 to 2.39
	5(e)	Substitutes $x = \sqrt{2}$ into $\frac{1}{2x} - \frac{x}{4}$ OR	M1	
		Identifies $y = 0$ oe		
		OR		
		Correctly manipulates to a single fraction e.g. $\frac{2-x^2}{4x}$ oe seen		101123
		Concludes 'read the graph at $y = 0$ ' oe	A1	
		Manipulates $0 = \frac{1}{x} - \frac{x}{x}$ oe		
		$2x  4$ leading to $x^2 = 2$		
		OR		
		States $\frac{2-x^2}{4x}$ oe = 0 leading to		
		$x^2 = 2$ $www. Q8$	M	aths.com

60	6(a)	256	1	
	6(b)	8	2	<b>M1</b> for $3(x^2 + 1) + 2$ or for $3(2) + 2$
	6(c)	$9x^2 + 12x + 5$	3	<b>M1</b> for $(3x + 2)^2 + 1$ <b>B1</b> for $[(3x + 2)^2 = ]9x^2 + 6x + 6x + 4$ oe
	6(d)	16	2	<b>M1</b> for $3x + 2 = 7^2 + 1$ or better
	6(e)	$\frac{x-2}{3}$ of final answer	2	M1 for $x = 3y + 2$ or for $y - 2 = 3x$ or for $\frac{y}{3} = x + \frac{2}{3}$
	6(f)	$\frac{4x^2 + 2x + 1}{3x + 2}$ final answer	3	<b>B1</b> for $x^2 + 1 + x (3x + 2)$ or better seen <b>M1</b> for common denominator $3x + 2$
	6(g)	16	1	
61	10(a)(i)	x + 5	2	<b>B1</b> for linear equation with positive gradient or intercept 5
	10(a)(ii)	$2 \sin x$ oe	2	<b>B1</b> for recognition of sin or $cos(x - 90)$
	10(b)	tangent ruled at P	B1	
		1.3 to 1.4	B2	dep on tangent drawn M1 for rise/run
62				
	5(a)(i)	2.7 to 2.8	1	The addition of the second sec
	5(a)(ii)	tangent ruled at $x = -2$	B1	
		6 to 10	2	dep on B1 or a close attempt at tangent at $x = -2$
				or <b>M1</b> for rise/run for <i>their</i> tangent, or close attempt, at any point Must see correct or implied calculation from a drawn tangent After <b>M0, SC1</b> for gradient of tangent (or close attempt) in range embedded in y = mx + c
	5(a)(iii)	y = 2x - 2 ruled and $x = -2.9$ to $-2.8$ cao	3	<b>B2</b> for correct ruled line or <b>B1</b> for short line or for freehand line or broken line or ruled line with gradient 2 or with <i>y</i> -intercept at $-2$ (but not $y = -2$ )

	5(b)	A (4, 17) B (-1.5, 0.5)	5	<b>B4</b> for (-1.5, 0.5) and (4, 17), or for $x = 4$ and $x = -1.5$ OR
				<b>B3</b> for A(4, 17) or B(-1.5, 0.5)
				OR
				<b>M1</b> for $2x^2 - 2x - 7 = 3x + 5$ oe
				AND either M2 for $(2x + 3)(x - 4)$ or M1 for $2x(x - 4) + 3(x - 4)$ or $x(2x + 3) - 4(2x + 3)$ or $(2x + c)(x + d)$ where $cd = -12$ or $c + 2d = -5$ [ $c$ and $d$ are integers] OR M2 for $-\underline{their \ b \pm \sqrt{(their \ b)^2 - 4(their \ a)(their \ c)}}$ Or M1 for $\sqrt{(their \ b)^2 - 4(their \ a)(their \ c)}}$ or M1 for $\sqrt{(their \ b)^2 - 4(their \ a)(their \ c)}}$ or for $p = -their \ b, r = 2(their \ a)$ if in the form $\frac{p + \sqrt{q}}{q}$ or $\frac{p - \sqrt{q}}{q}$
63	10(a)(i)	10	1	
	10(a)(ii)	-19	1	FT 1 – 2 <i>their</i> ( <b>a</b> )( <b>i</b> )
	10(b)	$\frac{1-x}{2}$ of final answer	2	<b>M1</b> for $x = 1 - 2y$ or $y + 2x = 1$ or $\frac{y}{2} = \frac{1}{2} - x$
				or $y - 1 = -2x$ or better
	10(c)	$\frac{1}{2}$ oe	1	
	10(d)	$4x^2 - 8x + 2$ final answer	4	M1 for $(1 - 2x)(1 - 2x) - (1 - 2(1 - 2x))$ or better
		www.08	M	<b>B1</b> for $1 - 2x - 2x + 4x^2$ <b>B1</b> for $-(1 - 2 + 4x)$ or better or [+] $1 - 4x$ or for correct answer seen then spoiled
	10(e)	<i>x</i> final answer	1	
	10(f)	3125	1	
	10(g)	25	1	
	10(h)	-2	2	<b>B1</b> for $\frac{1}{25}$ or 0.04