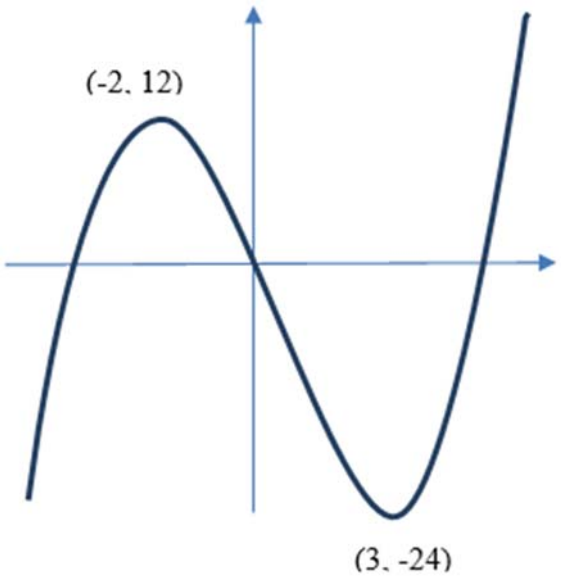
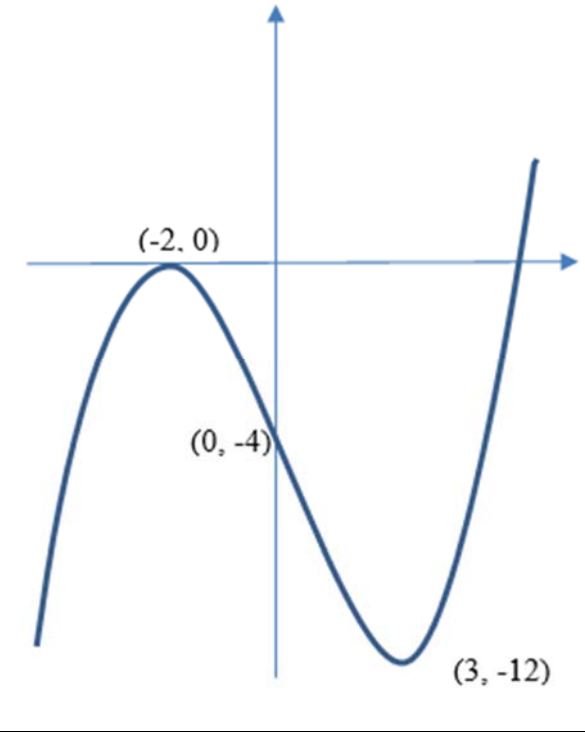
Year 11 to Year 12 Transition Paper

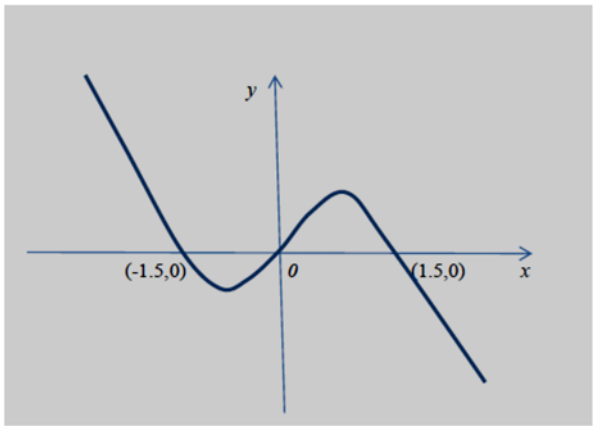
Graphs and Transformations

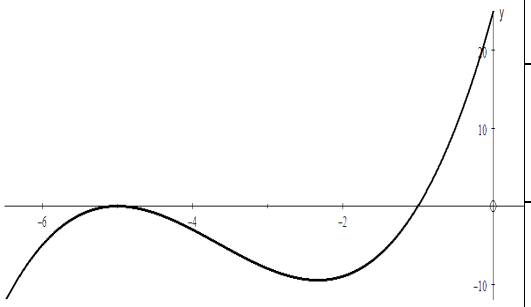
Mark Scheme

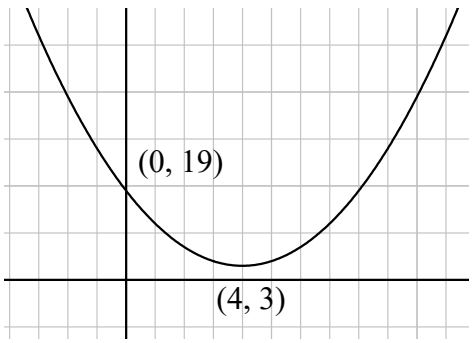
Question	Scheme	Marks
1	B	B1cao
		(1 mark)

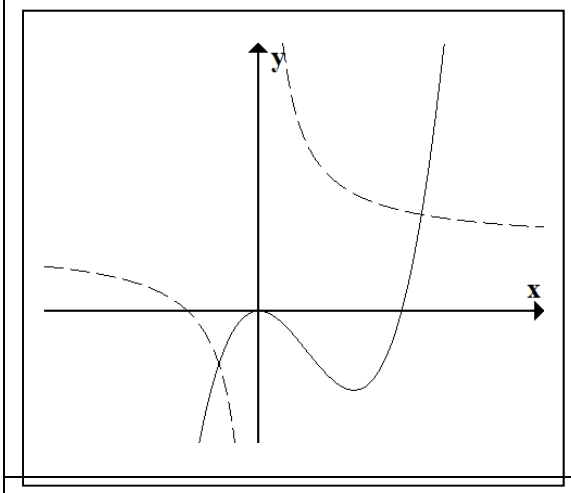
Question	Scheme		Marks
2(a)	For reflection in x-axis	Correct graph	M1
	For curve drawn with (−4, 0), (0, 0) and (−2, 3) labelled		A1
			(2)
(b)	for stretch in direction of y-axis	Correct graph	M1
	for curve drawn with (– 4, 0), (0, 0) and $(-2, -\frac{3}{2})$ labelled		A1
			(2)
			(4 marks)

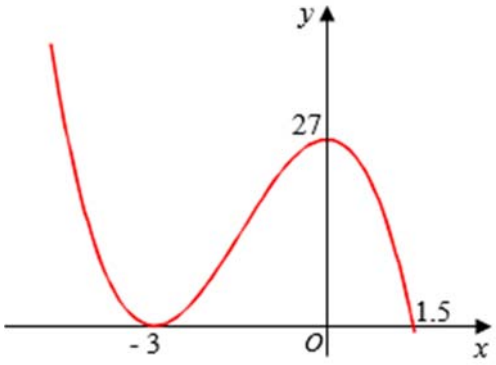
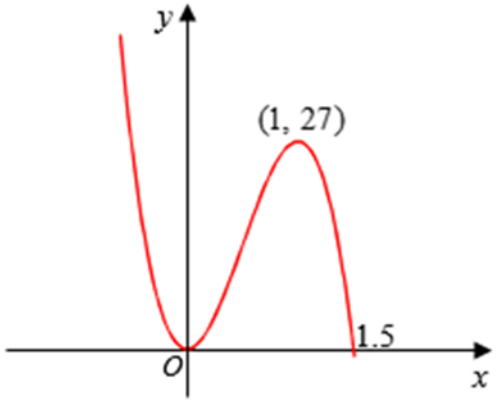
Question	Scheme	Marks
3(a)		B1 B1
		(2)
(b)		M1 A1 A1
		(3)
		(5 marks)

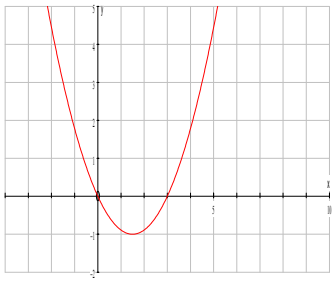
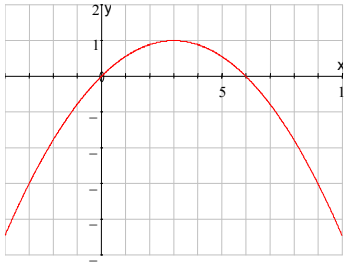
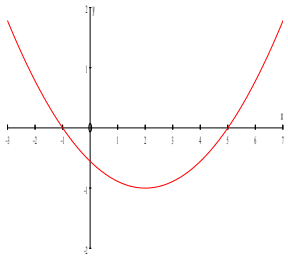
Question	Scheme	Marks
4(a)	$9x-4x^3=x(9-4x^2)$ or $-x(4x^2-9)$	B1
	$9-4x^2=(3+2x)(3-2x)$ or $4x^2-9=(2x-3)(2x+3)$	M1
	$9x-4x^3=x(3+2x)(3-2x)$	A1
		(3)
(b)		M1 B1 A1
		(3)
(c)	$A=(-2,\ 14),\quad B=(1,\ 5)$	B1 B1
	$(AB=)\sqrt{(-2-1)^2+(14-5)^2}\ \left(=\sqrt{90}\right)$	M1
	$(AB=)3\sqrt{10}$ cao	A1
		(4)
		(10 marks)

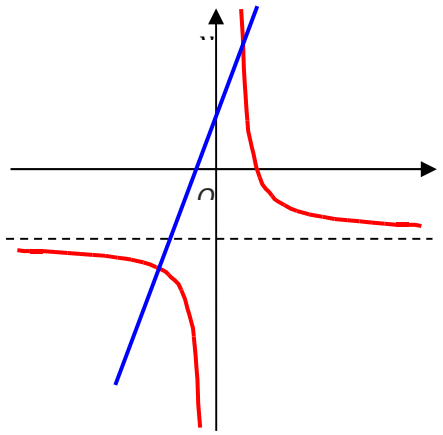
Question	Scheme	Marks
5(a)	 Horizontal translation	B1
	Touching at (–5, 0).	B1
	The right hand tail of their cubic shape crossing at (–1, 0).	B1
		(3)
(b)	$(x+5)^2(x+1)$	B1
		(1)
(c)	When $x = 0$, $y = 25$	M1 A1
		(2)
		(6 marks)

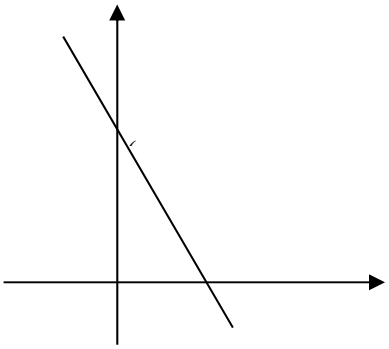
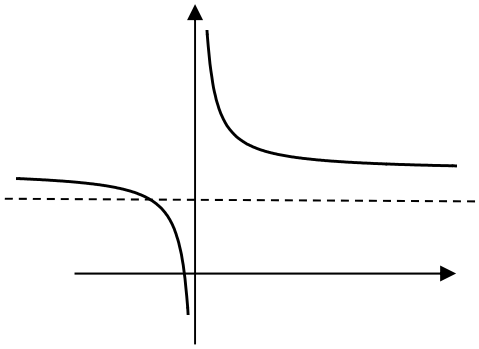
Question	Scheme	Marks
6(a)	$f(x) = (x-4)^2 + 3$	M1A1
		(2)
(b)		B1
		B1
		B1
		(3)
(c)	$PQ^2 = (0-4)^2 + (19-3)^2$	M1
	$PQ = \sqrt{4^2 + 16^2}$	A1
	$PQ = 4\sqrt{17}$	A1
		(3)
		(8 marks)

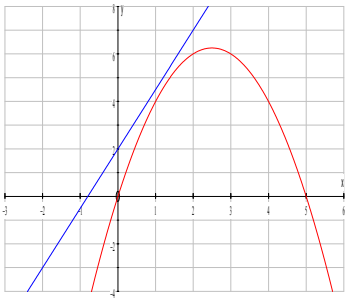
Question	Scheme	Marks
7(a)	- 1 accept (–1, 0)	B1
		(1)
(b)		
	 Shape Touches at (0,0) Crosses at (2,0) **only**	B1 B1 B1
		(3)
(c)	2 solutions as **curves** cross twice	B1 ft
		(1)
		(5 marks)

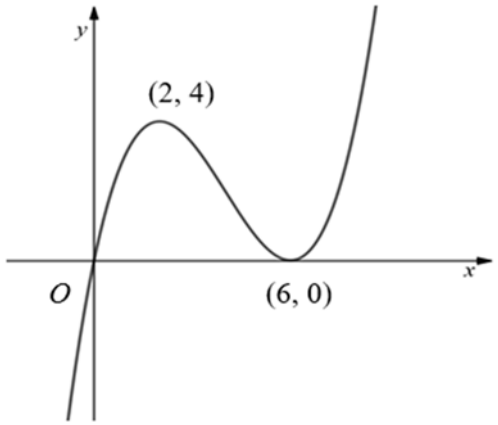
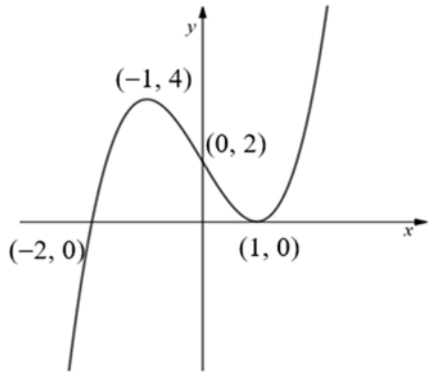
Question	Scheme		Marks
8(a)	{Coordinates of A are} $(4.5, 0)$	See notes below	B1
			(1)
(b)(i)			
		Horizontal translation	M1
		-3 and their ft 1.5 on postitive x-axis	A1 ft
		Maximum at 27 marked on the y-axis	B1
			(3)
(ii)			
		Correct shape, minimum at $(0, 0)$ and a maximum within the first quadrant.	M1
		1.5 on x-axis	A1 ft
		Maximum at $(1, 27)$	B1
			(3)
(c)	$\{k =\}\ -17$		B1
			(1)
			(8 marks)

Question	Scheme		Marks
9(a)		Shape ∪ through (0, 0)	B1
		(3, 0)	B1
		(1.5, –1)	B1
			(3)
(b)		Shape ∩	B1
		(0, 0) and (6, 0)	B1
		(3, 1)	B1
			(3)
(c)		Shape ∪ , <u>not</u> through (0, 0)	M1
		Minimum in 4th quadrant	A1
		$(-p, 0)$ and $(6 - p, 0)$	B1
		$(3 - p, -1)$	B1
			(4)
			(10 marks)

Question	Scheme		Marks
10(a)	 Check graph in question for possible answers and space below graph for answers to part (b)	$y = \frac{2}{x}$ is translated up or down.	M1
		$y = \frac{2}{x} - 5$ is in the correct position.	A1
		Intersection with x-axis at $\left(\frac{2}{5}, \{0\}\right)$ **only** Independent mark.	B1
		$y = 4x + 2$: attempt at straight line, with positive gradient with positive y intercept.	B1
		Intersection with x-axis at $\left(-\frac{1}{2}, \{0\}\right)$ **and** y-axis at $\left(\{0\}, 2\right)$.	B1
			(5)
(b)	Asymptotes : $x = 0$ (or y-axis) and $y = -5$. (Lose second B mark for extra asymptotes)	An asymptote stated correctly. Independent of (a)	B1
		These two lines only. Not ft their graph.	B1
			(2)
(c)	Method 1: $\frac{2}{x} - 5 = 4x + 2$	Method 2: $\frac{y-2}{4} = \frac{2}{y+5}$	M1
	$4x^2 + 7x - 2 = 0 \Rightarrow x =$	$y^2 + 3y - 18 = 0 \rightarrow y =$	dM1
	$x = -2, \frac{1}{4}$	$y = -6, 3$	A1
	When $x = -2$, $y = -6$,When $x = \frac{1}{4}$, $y = 3$	When $y = -6$, $x = -2$ When $y = 3$, $x = \frac{1}{4}$.	M1A1
			(5)
			(12 marks)

Question	Scheme	Marks
11(a)(i)		B1
		B1
(a)(ii)		B1
		B1
		(4)
(b)	$\frac{1}{x}+5=-3x+c \Rightarrow 1+5x=-3x^2+cx$ $\Rightarrow 3x^2+5x-cx+1=0$	M1
	$b^2-4ac=(5-c)^2-4\times1\times3$	M1
	$(5-c)^2>12$ *	A1*
		(3)
(c)	$(5-c)^2=12\Rightarrow(c=)5\pm\sqrt{12}$ or $(5-c)^2=12\Rightarrow c^2-10c+13=0$ $\Rightarrow(c=)\frac{-10\pm\sqrt{(-10)^2-4\times13}}{2}$	M1A1
	$c<"5-\sqrt{12}"$, $c>"5+\sqrt{12}"$	M1
	$0<c<5-\sqrt{12}$, $c>5+\sqrt{12}$	A1
		(4)
		(11 marks)

Question	Scheme	Marks
12(a)	$x(5-x)=\frac{1}{2}(5x+4)$ (o.e.)	M1
	$2x^2-5x+4(=0)$ (o.e.) e.g. $x^2-2.5x+2(=0)$	A1
	$b^2-4ac=(-5)^2-4\times2\times4$	M1
	$=25-32$ <0, so no roots <u>or</u> no intersections <u>or</u> no solutions	A1
		(4)
(b)	 Curve: ∩ shape and passing through (0, 0) ∩ shape and passing through (5, 0) Line : +ve gradient and no intersections with *C*. If no *C* drawn score B0 Line passing through (0, 2) and $(-0.8, 0)$ marked on axes	B1 B1 B1 B1
		(4)
		(8 marks)

Question	Scheme		Marks
13(a)(i)		Similar shape to the given figure passing through O (be generous if it just misses O but the intention is clear) **and** with evidence of a horizontal stretch taken from the x coordinates of the max/min point(s) but with no contradiction if both points are given. There should be no change in the y coordinates. **The origin does not need to be labelled.**	B1
		Maximum at (2, 4)	B1
		Minimum at (6, 0)	B1
	The coordinates may appear on the sketch, or separately in the text. If a point on an axis appears on the sketch it is not necessary to give both coordinates. So, for example, 6 or (0, 6) on the x - axis would get credit, but if the answer is given in the text (6, 0) is needed. If there is any ambiguity, the sketch has precedence.		
(a)(ii)		Similar shape translated horizontally. Ignore any coordinates given.	M1
		Minimum at (1, 0) and crosses or at least reaches x-axis at (–2, 0)	A1
		Maximum at (–1, 4) – must correspond to a maximum in the 2nd quadrant **and** crosses the y-axis at (0, 2)	A1
			(6)
	The coordinates may appear on the sketch, or separately in the text. If a point on an axis appears on the sketch it is not necessary to give both coordinates. So, for example, 2 or (2, 0) on the y-axis would get credit but if the answer is given in the text (0, 2) is needed. If there is any ambiguity, the sketch has precedence.		
(b)	$a = 1$ **or** $k = -4$	One correct value	B1
	$a = 1$ **and** $k = -4$	Both correct	B1
	Note that these marks may be implied by sight of e.g. "f(x) – 4" and/or "(1, 0)"		
	Note that the answer to (b) often appears at the bottom of page 1		
			(2)
			(8 marks)

Question	Scheme		Marks
14(a)	(4, 7)	Accept (4, 7) or $x = 4$, $y = 7$ or a sketch of $y = \mathrm{f}(x-2)$ with a maximum point marked at (4, 7). (Condone missing brackets) There should be no other coordinates.	B1
			(1)
(b)	(x =) 2.5	Allow (2.5, 0) (condone missing brackets) but no other values or points. Allow a sketch of f($2x$) with the only x-intercept marked at $x = 2.5$ (Allow (0, 2.5) marked in the correct place.	B1
			(1)
(c)	$y = 1$ (oe e.g. $y - 1 = 0$)	Must be an equation and not just '1' and no other asymptotes stated.	B1
			(1)
(d)	$k \leq 1$ **or** $k = 7$	Either of $k \leq 1$ or $k = 7$ Accept either of $y \leq 1$ or $y = 7$ Note that $k = 7$ may sometimes be seen embedded in e.g. $k = 0, 1, 7$ and can score B1 here.	B1
	$k \leq 1$ $k = 7$	Both correct and in terms of k with no other solutions.	B1
			(2)
			(5 marks)

Question	Scheme	Marks
15(a)	$(4, -3)$	B1
		(1)
(b)	$x = 6$	B1
		(1)
(c)	x ,, **4**	B1
		(1)
(d)	$k > 1.5$	B1
		(1)
		(4 marks)