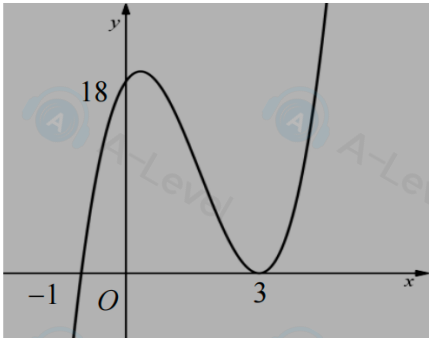


Question	Answer	Marks	Guidance
1	{Reflection} {[in the] x-axis} or {Stretch of scale factor -1} {parallel to y-axis}	*B1 DB1	{ } indicate how the B1 marks should be awarded throughout.
	Then {Translation} $\left\{\begin{pmatrix} 0 \\ 3 \end{pmatrix}\right\}$	B1 B1	Or Translation 3 units in the positive y-direction. N.B. If order reversed a maximum of 3 out of 4 marks awarded.
	Alternative method for question 1		
	{Translation} $\left\{\begin{pmatrix} 0 \\ -3 \end{pmatrix}\right\}$	B1 B1	Or Translation 3 units in the negative y-direction.
	Then {Reflection} {[in the] x-axis} or {Stretch of scale factor -1} {parallel to y-axis}	*B1 DB1	N.B. If order reversed a maximum of 3 out of 4 marks awarded.
		4	

Question Number	Scheme	Marks
6.(a)		M1
	Positive cubic shape anywhere with 1 maximum and 1 minimum	A1
	Positive cubic shape that at least reaches the x-axis at $x = -1$ and with a minimum on the x-axis at $x = 3$	B1
	y intercept at 18. Must correspond with their sketch	
	For the intercepts allow as numbers as above or allow as coordinates e.g. (18, 0), (0, -1), (0, 3) as long as they are marked in the correct place.	(3)
(b)	E.g. $(2x+2)(x^2-6x+9) = \dots$	M1
	$= 2x^3 - 10x^2 + 6x + 18$	A1 A1
		(3)
(c)	$(f'(x) =) 6x^2 - 20x + 6$	B1ft
	$f'\left(\frac{1}{3}\right) = 6\left(\frac{1}{3}\right)^2 - 20\left(\frac{1}{3}\right) + 6$	M1
	$f'\left(\frac{1}{3}\right) = 0$	A1
	$y = \frac{512}{27}$	A1
		(4)
		(10 marks)

Question	Answer	Marks	Guidance
6(b)	$y = \frac{-x}{\sqrt{4-x^2}}$ leading to $x^2 = y^2(4-x^2)$	*M1	Squaring and clearing the fraction. Condone one error in squaring $-x$ or y
	$x^2(1+y^2) = 4y^2$	DM1	OE. Factorisation of the new subject with order of operations correct. Condone sign errors.
	$x = (\pm) \frac{2y}{\sqrt{1+y^2}}$	DM1	$x = (\pm) \sqrt{\frac{4y^2}{(1+y^2)}}$ OE is acceptable for this mark. Isolating the new subject. Order of operations correct. Condone sign errors.
	$f^{-1}(x) = \frac{-2x}{\sqrt{1+x^2}}$	A1	Selecting the correct square root. Must not have fractions in numerator or denominator.
		4	
6(c)	1 or $a = 1$	B1	Do not allow $x = 1$ or $-1 < x < 1$
		1	
6(d)	$[fg(x) = f(2x)] \frac{-2x}{\sqrt{4-4x^2}}$	B1	Allow $\frac{-2x}{\sqrt{4-(2x)^2}}$ or any correct unsimplified form.
	$fg(x) = \frac{-x}{\sqrt{1-x^2}}$ or $\frac{-x}{1-x^2}\sqrt{1-x^2}$ or $\frac{x}{x^2-1}\sqrt{1-x^2}$	B1	Result of cancelling 2 in numerator and denominator.
		2	

Question	Answer	Marks
9(a)	$[(x-2)^2] [-1]$	B1 B1
		2
9(b)	Smallest $c = 2$ (FT on <i>their</i> part (a))	B1FT
		1
9(c)	$y = (x-2)^2 - 1 \rightarrow (x-2)^2 = y+1$	*M1
	$x = 2(\pm)\sqrt{y+1}$	DM1
	$(f^{-1}(x)) = 2 + \sqrt{x+1}$ for $x > 8$	A1
		3

Question	Answer	Marks
9(d)	$gf(x) = \frac{1}{(x-2)^2 - 1 + 1} = \frac{1}{(x-2)^2}$ OE	B1
	Range of gf is $0 < gf(x) < \frac{1}{9}$	B1 B1
		3

Question	Answer	Marks
1	$3x^2 + 2x + 4 = mx + 1 \rightarrow 3x^2 + x(2-m) + 3 (=0)$	B1
	$(2-m)^2 - 36$ SOI	M1
	$(m+4)(m-8) (>=0)$ or $2-m >= 6$ and $2-m <= -6$ OE	A1
	$m < -4, m > 8$ WWW	A1
	Alternative method for question 1	
	$\frac{dy}{dx} = 6x + 2 \rightarrow m = 6x + 2 \rightarrow 3x^2 + 2x + 4 = (6x + 2)x + 1$	M1
	$x = \pm 1$	A1
	$m = \pm 6 + 2 \rightarrow m = 8$ or -4	A1
	$m < -4, m > 8$ WWW	A1
		4