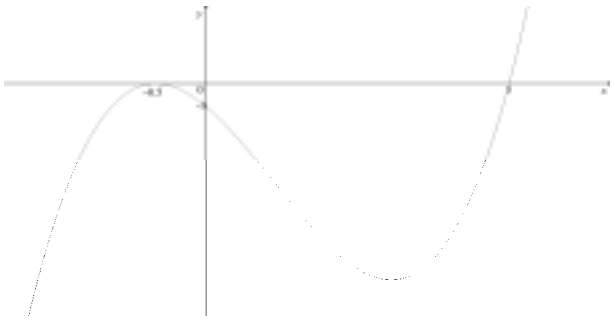
Question	Answer	Marks	Guidance
3(a)	$\frac{dy}{dx} = (2x+1)^2 + 4(2x+1)(x-3)$ or $\frac{dy}{dx} = 12x^2 - 16x - 11$	**M1**	For correct attempt to differentiate a product or expansion and then differentiate.
	$x = -\frac{1}{2}, \quad \frac{11}{6}$	**2**	**M1** for setting *their* quadratic $\frac{dy}{dx}$ to zero and attempting to solve to obtain two x values.
	$y = 0, \quad -\frac{686}{27}$ or -25.4	**A1**	For both Must be separate inequalities
3(b)		**3**	**B1** for correct shape with max on the negative x-axis and a min in the 4th quadrant **B1** for correct x intercepts $-\frac{1}{2}$ and 3. Must have a cubic curve **B1** for correct y intercept -3. Must have a cubic curve
3(c)	$k > 0$	**B1**	
	$k < -\frac{686}{27}$ or $k < -25.4$	**B1**	**FT** on *their* $-\frac{686}{27}$ or -25.4 from part (a)
4	$1 + 2e^{2x} + e^{4x}$	**B1**	For correct integrand
	$x + e^{2x} + \frac{e^{4x}}{4}$	**B2**	**B1** for 2 correct terms in integral
	$\left(2 + e^4 + \frac{e^8}{4}\right) - \left(1 + \frac{1}{4}\right)$	**M1**	For correct application of limits. Must be in the form $me^{4x} + ne^{2x} + x$
	$\frac{3}{4} + e^4 + \frac{e^8}{4}$	**A1**	

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Question	Answer	Marks	Guidance
5(a)	$e^{2y} = mx^3 + c$ soi	**B1**	May be seen later
	Either $7.2 = 6.4m + c$ or $5 = 2m + c$ Or gradient = $m = \frac{1}{2}$	**M1**	For correct use of coordinates at least once or for finding the gradient and equating it to m
	$m = \frac{1}{2}$, $c = 4$	**A1**	For both
	$y = \frac{1}{2}\ln\left(\frac{x^3}{2} + 4\right)$ oe	**A1**	
5(b)	$\frac{x^3}{2} + 4 > 0$	**M1**	Allow *their* $\frac{x^3}{2} + 4 > 0$
	$x > -2$	**A1**	
6(a)	$\frac{(x+2)\frac{4x}{(2x^2+1)} - \ln(2x^2+1)}{(x+2)^2}$	**3**	**B1** for $\frac{4x}{(2x^2+1)}$ **M1** for correct attempt at a quotient or equivalent product **A1** for all other terms correct
6(b)	When $x = 1$, $\frac{dy}{dx} = \frac{4 - \ln 3}{9}$ or 0.322	**B1**	
	$\frac{4 - \ln 3}{9}h$ or $0.322h$	**B1**	**FT** on *their* $\frac{4 - \ln 3}{9}$ or 0.322
6(c)	$\frac{dx}{dt} = \frac{3}{\text{their } 0.322}$	**M1**	
	9.31 or 9.32	**A1**	
7(a)	Ending in 0: 15120 or ${}^9P_5$ or $9 \times 8 \times 7 \times 6 \times 5$ oe	**B1**	
	Ending in 5: 13440 or ${}^8P_1 \times {}^8P_4$ or $8 \times 8 \times 7 \times 6 \times 5$ oe	**B1**	
	Total: 28560	**B1**	

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