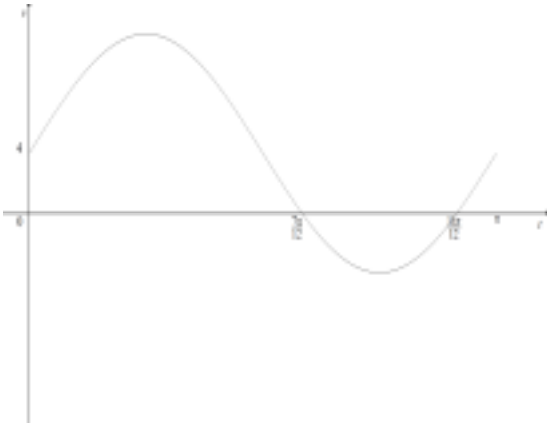
Question	Answer	Marks	Guidance
5(a)	$e^{2y} = mx^3 + c$ soi	**B1**	May be seen later
	Either $7.2 = 6.4m + c$ or $5 = 2m + c$ Or gradient = $m = \frac{1}{2}$	**M1**	For correct use of coordinates at least once or for finding the gradient and equating it to m
	$m = \frac{1}{2}$, $c = 4$	**A1**	For both
	$y = \frac{1}{2}\ln\left(\frac{x^3}{2} + 4\right)$ 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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Question	Answer	Marks	Guidance
7(b)	$\frac{(n+1)!}{(n-12)!13!} = \frac{16n!}{(n-12)!12!}$ soi	**B1**	
	$n+1 = 13\times16$ oe	**B1**	**Dep** on previous **B** mark for either $n+1$ or 13×16
	$n = 207$	**B1**	**Dep** on previous 2 **B** marks
8	When $x=2$, $y=12$	**B1**	
	$\frac{dy}{dx} = \frac{15}{2}(5x+6)^{-\frac{1}{2}}$	**2**	**M1** for $k(5x+6)^{-\frac{1}{2}}$, $k \neq \frac{15}{2}$
	When $x=2$, $\frac{dy}{dx} = \frac{15}{8}$,	**A1**	
	perp gradient = $-\frac{8}{15}$	**M1**	**Dep** on previous **M** mark. Allow for use of *their* gradient to obtain perp gradient
	Normal equation: $y-12 = -\frac{8}{15}(x-2)$	**M1**	Allow for using *their* perp gradient and *their y*
	When $x=-2$ $k = \frac{212}{15}$ or $14\frac{2}{15}$	**A1**	
9(a)	$v = 4+8\sin 2t$	**2**	**M1** for $v = 4+k\sin 2t$, $k \neq 8$
9(b)		**5**	**B1** for a complete correct cycle between $t=0$ and $t=\pi$ **B1** for $v=4$, must have a sine curve **M1** for correct attempt to find one *t*-intercept using their *v*, must be in the form $4+k\sin 2t$ and $0<t<\pi$ Allow **M1** for 105^o or 165^o seen **A1** for $t = \frac{7\pi}{12}$ **A1** for $t = \frac{11\pi}{12}$
9(c)	$a = 16\cos 2t$	**B1**	**FT** on *their v* which must be in the form $4+k\sin 2t$
9(d)	$t = \frac{\pi}{4}$, $\frac{3\pi}{4}$	**2**	**B1** for each Must be from $\cos 2t = 0$

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