Question	Answer	Marks	Guidance
3(a)	$b = \frac{1}{8}$	**B1**	
	$11 = a\sin\frac{4\pi}{8} + c$ $5 = a\sin\left(\frac{-4\pi}{3\times 8}\right) + c$	**M1**	For attempt to form two simultaneous equations using given points, together with an attempt to obtain at least one unknown. Allow use of *their b*.
	$a = 4$	**A1**	
	$c = 7$	**A1**	
3(b)	Using symmetry	**M1**	For e.g. period is 16π, symmetrical about the line $x = 8\pi$
	For obtaining max at 4π and min at 12π	**M1**	
	$x = 12\pi$	**A1**	
	$y = 3$	**A1**	
	Alternative method 1		
	Minimum value when $y = 3$	**(B2)**	**FT** on *their* $-a + c$
	When $y = 3$, $x = 12\pi$.	**(2)**	**M1** for attempt to solve *their* $3 = a\sin bx + c$ using *their* values of *a*, *b* and *c* to get *x* = ...
	Alternative method 2		
	Min occurs $\frac{3}{4}$ through sine cycle so $x = 12\pi$	**(B2)**	
	When $x = 12\pi$, $y = 3$	**(2)**	**M1** for attempt to solve $y = a\sin b(12\pi) + c$ using *their* values of *a*, *b* and *c*
	Alternative method 3		
	$\frac{dy}{dx} = ab\cos bx$ $(ab)\cos bx = 0$	**(M1)**	
	$x = 4\pi,\ 12\pi$	**(M1)**	**Dep** for attempt to solve to obtain *x* =
	$x = 12\pi$	**(A1)**	
	$y = 3$	**(A1)**	cao

Question	Answer	Marks	Guidance
4(a)	$\frac{(2x-1)+4}{(2x-1)^2}=\frac{2x+3}{(2x-1)^2}$	**B1**	
	Alternative method		
	$\frac{(2x-1)^2+4(2x-1)}{(2x-1)^3}=\frac{4x^2+4x-3}{(2x-1)^3}$ $=\frac{(2x-1)(2x+3)}{(2x-1)^3}=\frac{2x+3}{(2x-1)^2}$	**(B1)**	
4(b)	Use of $\int \frac{1}{2x-1}+\frac{4}{(2x-1)^2}\,dx$ to obtain $\frac{1}{2}\ln(2x-1)-\frac{2}{(2x-1)}$	**2**	**B1** for $\frac{1}{2}\ln(2x-1)$ or equivalent **B1** for $-\frac{2}{(2x-1)}$, allow unsimplified
	$\left[\frac{1}{2}\ln(2x-1)-\frac{2}{(2x-1)}\right]_2^5$ $\left(\frac{1}{2}\ln 9-\frac{2}{9}\right)-\left(\frac{1}{2}\ln 3-\frac{2}{3}\right)$	**M1**	For application of limits, must be in the form $a\ln(2x-1)+\frac{b}{(2x-1)}$
	$=\frac{4}{9}+\ln\sqrt{3}$	**2**	**A1** for $\ln\sqrt{3}$ **A1** for $\frac{4}{9}$
5(a)	$\frac{dy}{dx}=\frac{\left(3x\times\frac{4x}{(2x^2-3)}\right)-3\ln(2x^2-3)}{9x^2}$ oe	**3**	**B1** for $\frac{4x}{(2x^2-3)}$ **M1** for attempt to differentiate a quotient or product **A1** for all terms other than $\frac{4x}{(2x^2-3)}$ correct.
5(b)	When $x=2$, $\frac{dy}{dx}=0.133$	**M1**	For substitution of $x=2$ into *their* $\frac{dy}{dx}$ and use of h
	$0.133h$	**A1**	
5(c)	$\frac{dx}{dt}=\frac{4}{0.133}$	**M1**	For $\frac{4}{\text{their value of } \frac{dy}{dx} \text{ from (b)}}$
	30.2	**A1**	