Question	Answer	Marks	Partial Marks
7(a)	$\frac{10(4x-2)^4}{\sqrt{3+(4x-2)^5}}$ or $\frac{10(4x-2)^4}{\left(3+(4x-2)^5\right)^{\frac{1}{2}}}$ isw	**3**	**B2** for correct unsimplified form e.g. $\frac{1}{2}\left(3+(4x-2)^5\right)^{-\frac{1}{2}}\times 5\left(4x-\ 2\right)^4\times 4$ or $10\left(3+(4x-2)^5\right)^{-\frac{1}{2}}\left(4x-\ 2\right)^4$ or **B1** for $5(4x-2)^4\times 4$ soi or $\frac{1}{2}\left(3+(4x-2)^5\right)^{-\frac{1}{2}}\times \mathrm{g}(x)$
7(b)	$\frac{\mathrm{d}y}{\mathrm{d}x}=\frac{5(3x+2)-3(5x)}{(3x+2)^2}$ oe isw or $\frac{\mathrm{d}y}{\mathrm{d}x}=5x\left(-\left(3x+2\right)^{-2}\times 3\right)+5\left(3x+2\right)^{-1}$ oe isw	**B1**	
	[$y = 10$] $x = –0.8$	**B1**	
	$\frac{0.01}{\delta x}=\left(\textit{their}\left.\frac{\mathrm{d}y}{\mathrm{d}x}\right\|_{x=-0.8}\right)$ oe	**M1**	**FT** *their x* providing *their* $x \neq 10$ or 0.01and *their* genuine attempt at a derivative using product or quotient rule
	$\frac{1}{6250}$ or 0.00016 or 1.6×10^{-4} isw	**A1**	**dep** on all previous marks awarded
	Alternative method		
	$x=\frac{-2y}{3y-5}$ oe	**(B1)**	
	$\frac{\mathrm{d}x}{\mathrm{d}y}=\frac{-2(3y-5)-3(-2y)}{(3y-5)^2}$ oe isw or $\frac{\mathrm{d}x}{\mathrm{d}y}=-2y\left(-\left(3y-5\right)^{-2}\times 3\right)+(-2)\left(3y-5\right)^{-1}$	**(B1)**	
	$\frac{\delta x}{0.01}=\left(\textit{their}\left.\frac{\mathrm{d}x}{\mathrm{d}y}\right\|_{y=10}\right)$ oe	**(M1)**	**FT** *their* genuine attempt at a derivative using product or quotient rule
	$\frac{1}{6250}$ or 0.00016 or 1.6×10^{-4} isw	**(A1)**	**dep** on all previous marks awarded
7(c)(i)	$3x^2\ln x + x^3 \times \frac{1}{x}$ or better, isw	**B2**	**B1** for (*their* $3x^2$)ln$x + x^3 \times$ (*their* $\frac{1}{x}$)

Question	Answer	Marks	Partial Marks
7(c)(ii)	$\frac{x^3 \ln x}{6} + \frac{x^3}{18} + c$ oe, isw	**B3**	must have arbitrary constant **B2** for $\frac{x^3 \ln x}{6} + \frac{x^3}{18}$ or $\frac{x^3 \ln x}{6} + \frac{kx^3}{3} + c$, $k > 0$ nfww or **B1** for $\frac{1}{6}\int\left(3x^2 \ln x + x^2\right)\mathrm{d}x + \frac{1}{6}\int x^2\,\mathrm{d}x$ soi or $\frac{x^3 \ln x}{6} + \int \frac{x^2}{6}\mathrm{d}x$ soi or $\int\left(3x^2 \ln x\right)\mathrm{d}x = x^3 \ln x - \int x^2\,\mathrm{d}x$ soi or $\int\left(3x^2 \ln x\right)\mathrm{d}x = x^3 \ln x - \frac{x^3}{3}$ soi
8	$\frac{\mathrm{d}y}{\mathrm{d}x} = -\frac{1}{4}\sin\frac{x}{4}$	**M2**	**M1** for $\frac{\mathrm{d}y}{\mathrm{d}x} = k\sin\frac{x}{4}$, $k < 0$ or $k = \frac{1}{4}$
	$y = 0.5$	**B1**	
	$\left.\frac{\mathrm{d}y}{\mathrm{d}x}\right\|_{x=\frac{4\pi}{3}} = -\frac{1}{4} \times \frac{\sqrt{3}}{2}$ or $-\frac{\sqrt{3}}{8}$	**M1**	**FT** (*their k*) $\times \frac{\sqrt{3}}{2}$ providing at least **M1** awarded
	$[m_{\text{normal}} =] \frac{8}{\sqrt{3}}$ soi	**M1**	**FT** $\frac{-1}{\textit{their}\left.\frac{\mathrm{d}y}{\mathrm{d}x}\right\|_{x=\frac{4\pi}{3}}}$
	$y - 0.5 = \frac{8}{\sqrt{3}}\left(x - \frac{4\pi}{3}\right)$ oe	**A1**	**dep** on previous **M1**; must have exact values **FT** *their* m_{normal} and *their* 0.5 providing both are non-zero, exact values
	$\left(\frac{4\pi}{3} - \frac{\sqrt{3}}{16}, 0\right)$ or exact equivalent; mark final answer	**A1**	