Question	Answer	Marks	Guidance
3(a)	$\frac{dy}{dx} = \frac{1}{2}(1+3x)^{-\frac{1}{2}} \times 3$ oe, isw	**B2**	**B1** for $\frac{dy}{dx} = \frac{1}{2}(1+3x)^{-\frac{1}{2}} \times ...$ or $\frac{dy}{dx} = \frac{1}{2}(...)^{-\frac{1}{2}} \times 3$ or $\frac{dy}{dx} = their\ \frac{1}{2}(1+3x)^{\left(their\frac{1}{2}\right)-1} \times 3$ or $\frac{dy}{dx} = k(1+3x)^{-\frac{1}{2}} \times 3$, k is a constant, $k \neq \frac{1}{2}$
	$m_{tangent} = \frac{3}{8}$ or 0.375 or $m_{normal} = \frac{-2}{3(1+3x)^{-\frac{1}{2}}}$ oe	**B1**	**FT** *their* $\frac{dy}{dx}$ if necessary providing at least **B1** previously awarded
	$\left(their\frac{dy}{dx}\right) = \frac{3}{8}$ or $\left(their\left(-\frac{dx}{dy}\right)\right) = -\frac{8}{3}$	**M1**	**FT** *their* $\frac{dy}{dx}$ if necessary providing at least **B1** previously awarded
	(5, 4)	**A1**	
3(b)	$m_{normal} = -\frac{10}{3}$	**B1**	
	$y - 5 = -\frac{10}{3}(x - 8)$ or $y = \frac{-10}{3}x + c$ and $5 = \left(\frac{-10}{3}\right)(8) + c$ oe soi	**M1**	**FT** *their* m_{normal}
	$y = -\frac{10}{3}x + \frac{95}{3}$	**A1**	**FT** *their* m_{normal}
4(a)	$(3x + 1)\log 2 = (x - 2)\log 5$ oe	**B1**	
	$(3\log 2 - \log 5)x = -\log 2 - 2\log 5$	**M1**	**FT** if of equivalent difficulty
	$x = -8.32$	**A1**	

Question	Answer	Marks	Guidance
4(b)	Writes as a quadratic in e^{2y+1} or states $u = e^{2y+1}$ and writes as a quadratic in u oe, soi	**M1**	condone one error
	$(e^{2y+1})^2 - e^{2y+1} - 6 \quad [=0]$ oe or $u^2 - u - 6 \quad [=0]$ oe	**A1**	
	$(e^{2y+1} + 2)(e^{2y+1} - 3) \quad [=0]$ leading to $e^{2y+1} = 3$ or $(u + 2)(u - 3)$ [=0] leading to $e^{2y+1} = 3$	**A1**	
	$y = 0.0493$ and no other solutions	**A1**	
5(a)	$\frac{dy}{dx} = -(\cos 2x)^{-2} \times -2\sin 2x = \frac{2\sin 2x}{\cos^2 2x}$ or $\frac{dy}{dx} = \frac{0[\cos 2x] - (-2\sin 2x)}{\cos^2 2x} = \frac{2\sin 2x}{\cos^2 2x}$	**B2**	**B1** for $-(\cos 2x)^{-2} \times m\sin 2x$ or $\frac{0[\cos 2x] - (m\sin 2x)}{\cos^2 2x}$ where $m = 2$ or $m < 0$
5(b)	$2\tan^2 2x = 5$ or $7\cos^2 2x = 2$ or $7\sin^2 2x = 5$	**M1**	**FT** *their k*
	$\tan 2x = [\pm]\sqrt{\frac{5}{2}}$ or $\cos 2x = [\pm]\sqrt{\frac{2}{7}}$ or $\sin 2x = [\pm]\sqrt{\frac{5}{7}}$	**A1**	
	0.503 or 0.5034[26…] rot to 4 or more sf 1.07 or 1.067[36…] rot to 4 or more sf and no extras in range	**A2**	**A1** for either, ignoring extras
6(a)	$3\left(x + \frac{5}{2}\right)^2 - \frac{155}{4}$	**B4**	**B2** for $3\left(x + \frac{5}{2}\right)^2$ or $3(x + 2.5)^2$ or **B1** for $\left(x + \frac{5}{2}\right)^2$ or $(x + 2.5)^2$ **B2** for $c = -\frac{155}{4}$ or -38.75 or **B1** for $-\frac{25}{4} \times 3 - 20$ oe
6(b)	Min value $-\frac{155}{4}$ when x is $-\frac{5}{2}$	**B2**	**FT** *their c* from part **a** and **–***their b* from **(a)** **B1** for either without contradiction