

Question			Answer	Marks	AO	Guidance
5	(a)		DR			
			$y = x^{-\frac{3}{2}} - 2x^{\frac{3}{2}}$	M1	2.1	Uses negative or fractional powers, and the laws of indices to rewrite the equation. May be implied by one correct term
			$\frac{dy}{dx} = -\frac{3}{2}x^{-\frac{5}{2}} - 2 \times \frac{3}{2}x^{\frac{1}{2}}$	M1	2.1	Differentiates their non-integer power(s) of x Need not be simplified
			$x = \frac{1}{4} \Rightarrow \frac{dy}{dx} = -\frac{3}{2} \times \left(\frac{1}{4}\right)^{-\frac{5}{2}} - 2 \times \frac{3}{2} \times \left(\frac{1}{4}\right)^{\frac{1}{2}}$	M1	2.1	Substitution seen in their expression for $\frac{dy}{dx}$
			$\frac{dy}{dx} \left[= -\frac{3}{2} \times 32 - 3 \times \frac{1}{2} \right] = -\frac{99}{2}$	A1	2.1	AG Do not allow without clear expression seen
				[4]		
5	(b)		DR			
			Tangent is $y - \frac{31}{4} = -\frac{99}{2}\left(x - \frac{1}{4}\right)$	M1	1.1a	Uses given x - and y -coordinates and gradient in a formula for straight line. Allow if their value for gradient used. Do not allow for gradient 2/99 used
			$396x + 8y - 161 = 0$	A1	1.1	Must be in the form $ax + by + c = 0$ where a, b, c are integers
			Alternative solution			
			Tangent is $y = -\frac{99}{2}x + c$			Uses $y = -\frac{99}{2}x + c$ and attempts to evaluate c .
			So $\frac{31}{4} = -\frac{99}{2} \times \frac{1}{4} + c \Rightarrow c = \frac{161}{8}$	M1		Allow if their value for gradient used. Do not allow for gradient 2/99 used
			$396x + 8y - 161 = 0$	A1		Must be in the form $ax + by + c = 0$ where a, b, c are integers
				[2]		