

Question			Answer	Marks	AO	Guidance	
5	(a)		$\left(\frac{dy}{dx}\right) 3e^{3x} - 21$	B1	1.1	Correct derivative	
			$3e^{3x} - 21 = 3 \Rightarrow e^{3x} = 8$	M1*	1.1	Setting derivative equal to 3 and re-arranging to $e^{3x} = k$ where $k > 0$	
			$\ln e^{3x} = \ln 8$	M1dep*	1.1	Correctly taking the natural log of both sides of an equation of the form $e^{3x} = k$ or $e^x = \sqrt[3]{k}$ where $k > 0$	
			$x = \frac{1}{3} \ln 8 \therefore x = \ln 2$	A1	1.1	cao – not necessary to explicitly state $a = 2$	
				[4]			
5	(b)		$y = e^{3 \ln 2} - 21 \ln 2 - 8$	B1FT	1.1	Substitute their x involving “ln” to find the corresponding exact y -coordinate	Need not be simplified
			$y - (e^{3 \ln 2} - 21 \ln 2 - 8) = 3(x - \ln 2)$	M1	1.1	Tangent must be of the of the form $y - (e^{3x_1} - 21x_1 - 8) = 3(x - x_1)$ Could use $y = mx + c$ to obtain $c = e^{3x_1} - 24x_1 - 8$	Allow non-exact working
			$y = 3x - 24 \ln 2$	A1	1.1	oe c must be exact	
				[3]			