

Q	Marking instructions	AO	Marks	Typical solution
19	Uses implicit differentiation, with $Ay^2 \frac{dy}{dx}$ or $2 \frac{dy}{dx}$ seen.	3.1a	M1	$y^3 e^{2x} + 2y - 16x = k$ $3y^2 e^{2x} \frac{dy}{dx} + 2y^3 e^{2x} + 2 \frac{dy}{dx} - 16 = 0$ $\frac{dy}{dx} = 0, x = 0$ $2y^3 - 16 = 0$ $y = 2$ $2^3 e^0 + 4 - 16 \times 0 = k$ $k = 12$
	Uses product rule to differentiate $y^3 e^x$ and obtains $Ay^2 e^{2x} \frac{dy}{dx} + By^3 e^{2x}$	3.1a	M1	
	Obtains correctly $3y^2 e^{2x} \frac{dy}{dx} + 2y^3 e^{2x} + 2 \frac{dy}{dx} - 16 = 0$	1.1b	A1	
	Substitutes $\frac{dy}{dx} = 0, x = 0$ into their differentiated equation or rearranged equation to obtain a value for y . Their equation needs to have contained either $Ay^2 \frac{dy}{dx}$ or $2 \frac{dy}{dx}$ and involve e^{2x}	3.1a	M1	
	Obtains $y = 2$ Must have achieved M1M1A1M1 so far. PI substituting $y = \frac{2}{e^{\frac{2x}{3}}}$ and $x=0$ into $y^3 e^{2x} + 2y - 16x$	1.1b	A1	
	Substitutes $x = 0$ and their $y = 2$ into $y^3 e^{2x} + 2y - 16x$ to obtain a value of k	3.1a	M1	
	Deduces $k = 12$ Must have achieved all previous marks	2.2a	R1	
	Question 19 Total		7	