Question Number	Scheme/Notes	Marks
4(a)	$\frac{d^2y}{dx^2} = x^2y + \frac{dy}{dx} \Rightarrow \frac{d^3y}{dx^3} = 2xy + x^2\frac{dy}{dx} + \frac{d^2y}{dx^2}$ M1: Differentiates x^2y to $Axy + Bx^2\frac{dy}{dx}$ A1: Any correct expression for the 3rd derivative	**M1** **A1**
	$\frac{d^4y}{dx^4} = 2y + 2x\frac{dy}{dx} + x^2\frac{d^2y}{dx^2} + 2x\frac{dy}{dx} + \frac{d^3y}{dx^3}$ Differentiates again to obtain an expression of the form $\frac{d^4y}{dx^4} = Cy + Dx\frac{dy}{dx} + x^2\frac{d^2y}{dx^2} + \frac{d^3y}{dx^3}$ Terms may be uncollected	**dM1**
	$\frac{d^4y}{dx^4} = \frac{d^3y}{dx^3} + x^2\frac{d^2y}{dx^2} + 4x\frac{dy}{dx} + 2y$ Fully correct 4th derivative in correct form	**A1**
		(4)
(b)	$\frac{dy}{dx} = 3$ and $y = 1$ at $x = 1 \Rightarrow \frac{d^2y}{dx^2} = 1 + 3 = 4$ Correct value for the 2nd derivative	**B1**
	$\left(\frac{d^3y}{dx^3}\right)_{x=1} = 2(1)(1) + 1\times 3 + 4 = 9,\quad \left(\frac{d^4y}{dx^4}\right)_{x=1} = 9 + 4 + 4\times 3 + 2 = 27$ Finds values for their 3rd and 4th derivatives at $x = 1$. Allow slips	**M1**
	$\{y =\} 1 + 3(x-1) + \frac{"4"(x-1)^2}{2!} + \frac{"9"(x-1)^3}{3!} + \frac{"27"(x-1)^4}{4!} + \ldots$ Applies Taylor's expansion correctly with their 3 values. There is no credit for quoting a correct formula - it must be applied appropriately	**dM1**
	$\{y =\} 1 + 3(x-1) + 2(x-1)^2 + \frac{3(x-1)^3}{2} + \frac{9(x-1)^4}{8} + \ldots$ Correct series with simplified coefficients	**A1**
		(4)
		Total 8