Question Number	Scheme	Notes	Marks
3(a)	$4\dfrac{\mathrm{d}y}{\mathrm{d}x} = y - 2xy^5 \qquad u = y^{-4} \quad \left\{ y = u^{-\frac{1}{4}} \right\}$		
	e.g., $\dfrac{\mathrm{d}u}{\mathrm{d}x} = -\dfrac{4}{y^5}\dfrac{\mathrm{d}y}{\mathrm{d}x}, \qquad \dfrac{\mathrm{d}y}{\mathrm{d}x} = -\dfrac{1}{4}u^{-\frac{5}{4}}\dfrac{\mathrm{d}u}{\mathrm{d}x}$	Correct differentiation of $u = y^{-4}$ to obtain an equation in $\dfrac{\mathrm{d}u}{\mathrm{d}x}$ and $\dfrac{\mathrm{d}y}{\mathrm{d}x}$ May be implied by later work	**B1**
	$4\left(-\dfrac{y^5}{4}\right)\dfrac{\mathrm{d}u}{\mathrm{d}x} = y - 2xy^5, \qquad -u^{-\frac{5}{4}}\dfrac{\mathrm{d}u}{\mathrm{d}x} = y - 2xy^5$	Use the given differential equation and substitutes. Requires a correct form from differentiation of $u = y^{-4}$	**M1**
	$4\left(-\dfrac{y^5}{4}\right)\dfrac{\mathrm{d}u}{\mathrm{d}x} = y - 2xy^5 \Rightarrow \dfrac{\mathrm{d}u}{\mathrm{d}x} + \dfrac{1}{y^4} = 2x \Rightarrow \dfrac{\mathrm{d}u}{\mathrm{d}x} + u = 2x^*$ or, e.g., $-u^{-\frac{5}{4}}\dfrac{\mathrm{d}u}{\mathrm{d}x} = y - 2xy^5 \Rightarrow \dfrac{\mathrm{d}u}{\mathrm{d}x} = 2u^{\frac{5}{4}}xy^5 - u^{\frac{5}{4}}y$ or $2x - u \Rightarrow \dfrac{\mathrm{d}u}{\mathrm{d}x} + u = 2x^*$ Achieves the given answer with no errors and an intermediate step after substitution shown		**A1***
			(3)
(b)	$I = \mathrm{e}^{\int \mathrm{d}x} = \mathrm{e}^x$	Correct integrating factor	**B1**
	$u\mathrm{e}^x = \int 2x\mathrm{e}^x \,\mathrm{d}x$	For $Iu = \int 2xI \,\mathrm{d}x$ Allow with y for u. I must be a function of x	**M1**
	Note that a tabular "DI" approach may be used for parts. dM1 for a correct form		
	$u\mathrm{e}^x = 2x\mathrm{e}^x - \int 2\mathrm{e}^x \,\mathrm{d}x$	Applies parts to RHS and achieves correct form - allow with y for u and condone + used for - in the parts formula	**dM1**
	$u\mathrm{e}^x = 2x\mathrm{e}^x - 2\mathrm{e}^x\left(+c\right)$	Correct equation with or without a constant of integration. Must have u	**A1**
	$u = 2x - 2 + c\mathrm{e}^{-x}$	Any correct equation with "u=..." and the constant correctly placed	**A1**
	Ifa 2nd order method is used, CF : $\{A\}e^{-x}$(Bl), PF : $\lambda x + \mu$(M1), valid method for λ and μ(dM1), A marks as above		**(5)**
(c)	$1 = c - 2 \Rightarrow c = 3$	Uses the given conditions (y=1 or u=1 and x=0) to find the constant of integration. Condone poor algebra e.g, $\frac{1}{a} + \frac{1}{b}$ used for $\frac{1}{a+b}$	**M1**
	$y^4 = \dfrac{1}{2x - 2 + 3\mathrm{e}^{-x}}$	Any correct equation in the required $y^4 = \ldots$ form e.g., $y^4 = \dfrac{1}{2(x-1) + \frac{3}{\mathrm{e}^x}}$ Allow $y^4 = \dfrac{1}{2x - 2 + c\mathrm{e}^{-x}}$, $c = 3$	**A1**
			(2)
			Total 10