Question Number	Scheme	Marks
8(a)	$v = y^{-2} \quad \dfrac{\mathrm{d}v}{\mathrm{d}y} = -2y^{-3}$ $\dfrac{\mathrm{d}y}{\mathrm{d}x} = \dfrac{\mathrm{d}y}{\mathrm{d}v} \times \dfrac{\mathrm{d}v}{\mathrm{d}x} = -\dfrac{y^3}{2}\dfrac{\mathrm{d}v}{\mathrm{d}x}$ $-\dfrac{y^3}{2}\dfrac{\mathrm{d}v}{\mathrm{d}x} + 6xy = 3x\mathrm{e}^{x^2}y^3$ $\dfrac{1}{2}\dfrac{\mathrm{d}v}{\mathrm{d}x} - \dfrac{6xy}{y^3} = -3x\mathrm{e}^{x^2}$ $\dfrac{\mathrm{d}v}{\mathrm{d}x} - 12vx = -6x\mathrm{e}^{x^2}$ *	B1 M1A1 dM1A1* (5)
ALT 1	$y = v^{-\frac{1}{2}} \quad \dfrac{\mathrm{d}y}{\mathrm{d}v} = -\dfrac{1}{2}v^{-\frac{3}{2}}$ $\dfrac{\mathrm{d}y}{\mathrm{d}x} = \dfrac{\mathrm{d}y}{\mathrm{d}v} \times \dfrac{\mathrm{d}v}{\mathrm{d}x} = -\dfrac{1}{2}v^{-\frac{3}{2}}\dfrac{\mathrm{d}v}{\mathrm{d}x}$ $-\dfrac{1}{2}v^{-\frac{3}{2}}\dfrac{\mathrm{d}v}{\mathrm{d}x} + 6xv^{-\frac{1}{2}} = 3x\mathrm{e}^{x^2}v^{-\frac{3}{2}}$ $-\dfrac{1}{2}\dfrac{\mathrm{d}v}{\mathrm{d}x} + 6xv = 3x\mathrm{e}^{x^2}$ $\dfrac{\mathrm{d}v}{\mathrm{d}x} - 12vx = -6x\mathrm{e}^{x^2}$ *	B1 M1A1 dM1 A1* (5)
ALT 2	$v = y^{-2} \quad \dfrac{\mathrm{d}v}{\mathrm{d}y} = -2y^{-3}$ $\dfrac{\mathrm{d}v}{\mathrm{d}x} = \dfrac{\mathrm{d}v}{\mathrm{d}y} \times \dfrac{\mathrm{d}y}{\mathrm{d}x} = -2y^{-3}\dfrac{\mathrm{d}y}{\mathrm{d}x}$ $-2y^{-3}\dfrac{\mathrm{d}y}{\mathrm{d}x} - 12y^{-2}x = -6x\mathrm{e}^{x^2}$ $\dfrac{\mathrm{d}y}{\mathrm{d}x} + 6xy = 3x\mathrm{e}^{x^2}y^3 \qquad x > 0$	B1 M1A1 dM1 A1* (5)
8(a) **B1** **M1** **A1** **dM1** **A1***	**All Methods:** Correct derivative Attempt $\dfrac{\mathrm{d}y}{\mathrm{d}x}$ or $\dfrac{\mathrm{d}v}{\mathrm{d}x}$ using the chain rule Correct derivative Substitute in equation (I) to obtain an equation in v and x only OR in equation (II) to obtain an equation in x and y only (ALT 2) Correct completion with no errors seen	

Question Number	Scheme	Marks
8(b)	IF: $\mathrm{e}^{\int -12x\mathrm{d}x} = \mathrm{e}^{-6x^2}$	M1A1
	$v\mathrm{e}^{-6x^2} = \int -6x\mathrm{e}^{x^2} \times \left(\mathrm{e}^{-6x^2}\right)\mathrm{d}x = \int -6x\mathrm{e}^{-5x^2}\,\mathrm{d}x$	dM1
	$v\mathrm{e}^{-6x^2} = \frac{6}{10}\mathrm{e}^{-5x^2}\ (+c)$	A1
	$v\left(=y^{-2}\right) = \frac{6}{10}\mathrm{e}^{x^2} + c\mathrm{e}^{6x^2}$	ddM1
	$y^2 = \frac{1}{\frac{6}{10}\mathrm{e}^{x^2} + c\mathrm{e}^{6x^2}}$ oe eg $y^2 = \frac{10}{6\mathrm{e}^{x^2} + k\mathrm{e}^{6x^2}}$	A1 (6)
		[11]

(b)	
M1	IF of form $\mathrm{e}^{\int \pm 12x\mathrm{d}x}$ and attempt the integration.
A1	Correct IF
dM1	Multiply through by their IF and integrate the LHS. Depends on first M mark of (b)
A1	Correct integration of the complete equation with or without constant
ddM1	Include the constant and multiply through by e^{6x^2} Depends on both previous M marks of (b)
A1	Any equivalent to that shown. (No need to change letter used for constant when rearranging)

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