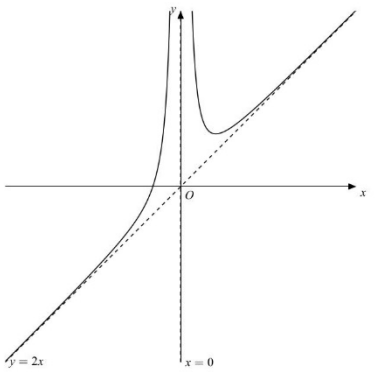
Question	Scheme	Marks
8(a)	$\frac{dv}{dx} = \frac{dy}{dx} - 2$	**B1**
	$\frac{dy}{dx} + 2yx(y-4x) = 2-8x^3 \rightarrow \frac{dv}{dx} + 2 + 2(v+2x)x(v+2x-4x) = 2-8x^3$	
	$\rightarrow \frac{dv}{dx} + 2 + 2x(v^2 - 4x^2) = 2-8x^3$	**M1**
	$\rightarrow \frac{dv}{dx} = -2xv^2$ *	**A1***
		(4)
(b)	$\frac{1}{v^2}\frac{dv}{dx} = -2x \Rightarrow \int v^{-2}\,dv = -2\int x\,dx$	**B1**
	$\Rightarrow \frac{v^{-1}}{-1} = -2\frac{x^2}{2}(+c)$	**M1**
	$\Rightarrow \frac{1}{v} = x^2 + c$	**A1**
	$\Rightarrow v = \frac{1}{x^2+c}$	**A1**
		(4)
(c)	$y = 2x + \frac{1}{x^2+c}$	**B1ft**
		(1)
(d)	$-1 = 2\times -1 + \frac{1}{1+c} \Rightarrow c = \ldots$	**M1**
	$y = 2x + \frac{1}{x^2}$	**A1**
	 Attempts the sketch for their equation, with at least one of - One branch correct - Vertical asymptote for their equation - Long term behaviour tends to infinity - Minimum in quadrant 1	**M1**
	Fully correct shape, two branches tending to infinity as x tends to infinity both directions, with minimum in first quadrant No need for oblique asymptote marked.	**A1**
	y-axis a vertical asymptote labelled	**B1ft**
		(5)
		(14 marks)
Notes:		
(a)		

B1: Correct differentiation of the given transformation. Allow any correct connecting derivative, e.g. $\frac{\mathrm{d}y}{\mathrm{d}v}=1+2\frac{\mathrm{d}x}{\mathrm{d}v}$ or $\frac{\mathrm{d}v}{\mathrm{d}y}=1-2\frac{\mathrm{d}x}{\mathrm{d}y}$

M1: For a complete substitution into the equation (*I*).

M1: Applies difference of squares, or completely expands brackets of the left hand side. Alternatively, may rearrange and factorise to give $8x^2y-2xy^2-8x^3=-2x\left(y^2-4xy+4x^2\right)=-2x(y-2x)^2$ before substituting.

A1*: Reaches the given answer with no errors seen.

(b)

B1: Correct separation of the variables.

M1: Attempts the integration, usual rule, power increased by 1 on at least one term. No need for + *c* for the method.

A1: Correct integration including the + *c*

A1: Correct expression for *v*.

(c)

B1: Follow through their answer to (b), so $y=2x+$ their v from (b)

(d)

M1: Uses the point $(-1,-1)$ to find a value for the constant in their equation. Must have had a constant of integration in their equation to score this mark.

A1: Correct equation for *y* following a correct general solution. Withhold this mark for $y=2x+\frac{1}{x^2}+c$ leading to the correct equation.

Note: the following three marks may be scored from a correct equation that arose from having no constant in (b) or from $y=2x+\frac{1}{x^2}+c$ (which gives the same equation).

M1: Attempts a sketch for their curve. See scheme. Look for at least one of the key features for their equation shown.

A1: Correct shape, two branches tending to infinity as *x* tends to infinity both directions with a minimum in first quadrant. Not a follow through mark, so must be the correct curve.

B1ft: Correct vertical asymptote at $x = 0$. Need not be labelled if it is clearly the *y*-axis. Follow through their equation as long as there is at least one vertical asymptote (ie for a negative *c* they need a pair of asymptotes symmetric about the *y*-axis).

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