Question Number	Scheme	Notes	Marks
4	$x\dfrac{\mathrm{d}y}{\mathrm{d}x}+2y=12x^2\sqrt{x^4+9}$	$x>0$	
(a)	$\dfrac{\mathrm{d}y}{\mathrm{d}x}+\dfrac{2}{x}y=12x\sqrt{x^4+9}\Rightarrow \text{IF}=\mathrm{e}^{\int\frac{2}{x}\mathrm{d}x}$	$\text{IF}=\mathrm{e}^{\int\pm\frac{2}{x}(\mathrm{d}x)}$	**M1**
	$\mathrm{e}^{\int\frac{2}{x}\mathrm{d}x}=\mathrm{e}^{2\ln x}=\mathrm{e}^{\ln x^2}=x^2$	$\text{IF}=x^2$ (may be simplified later)	**A1**
	$x^2y=\int 12x^3\sqrt{x^4+9}\,(\mathrm{d}x)$	$\text{IF}\times y=\int(\text{IF}\times \text{f}(x))(\mathrm{d}x)$ with their IF and f(x)	**M1**
	$\int 12x^3\sqrt{x^4+9}\,\mathrm{d}x=2\left(x^4+9\right)^{\frac{3}{2}}\ (+c)$	$\int\ldots x^3\sqrt{x^4+9}\,(\mathrm{d}x)\rightarrow\ldots\left(x^4+9\right)^{\frac{3}{2}}$	**M1**
	$y=\dfrac{2\left(x^4+9\right)^{\frac{3}{2}}+c}{x^2}$ or $y=\dfrac{2\left(x^4+9\right)^{\frac{3}{2}}}{x^2}+\dfrac{c}{x^2}$	Correct answer in $y=\text{f}(x)$ form with constant correctly placed	**A1**
			(5)
(b)	$y=\dfrac{715}{12},\ x=2\Rightarrow\dfrac{715}{12}=\dfrac{250+c}{4}\Rightarrow c=\ldots\left\{\dfrac{-35}{3}\right\}$	Uses $y=\dfrac{715}{12}$ and $x=2$ to find a value for c	**M1**
	$y=\dfrac{2\left(x^4+9\right)^{\frac{3}{2}}-\dfrac{35}{3}}{x^2}$ oe e.g., $y=\dfrac{6\left(x^4+9\right)^{\frac{3}{2}}-35}{3x^2}$	Correct particular solution	**A1**
			(2)
			Total 7

Further Notes

(a)

M1A1 may be implied by sight of a correct integrating factor stated or used.

2nd M, condone slips in simplifying $\sqrt{x^4+9}$ to x^2+3 for the method mark, but must have had correct form of expression to score the 3rd M. Condone using $12x^2\sqrt{x^4+9}$ for f(x).

Final A, the constant of integration must have been correctly treated. Accept unsimplified coefficients.

(b)

The M may be scored from their answer to (a) as long as it included a constant of integration.

If no method is shown you will to check their value is correct for their equation.

For the A mark coefficients should be simplified.