How to get marks for AQA Core 4 Differential Equation questions

1. Correct separation of variables (x terms on one side, y terms on the other)

2. Correctly integrate one side

3. Correctly integrate the other side

4. Find C

5. Put together and rearrange into required form

(Note that there may be more marks available if question is more complicated)

How to get marks for AQA Core 4 Differential Equation Questions

Question & initial condition	$\frac{dx}{dt} = \frac{1}{15x\sqrt{2x-1}}$ $t = 0, x = 1$	$\frac{dy}{dx} = \frac{x\sqrt{x^2+3}}{e^{2y}}$ $y = 0, x = 1$	$\frac{dx}{dt} = \frac{t\cos\left(\frac{\pi}{4}t\right)}{32x}$ $t = 0, x = 4$	$\frac{dy}{dx} = \frac{16xe^{2y}}{(1-3x)(1+x)^2}$ $y = 0, x = 0$	$\frac{dx}{dt} = \frac{\sqrt{4+5x}}{5(1+t)^2}$ $t = 0, x = 0$
Separation of variables					
Correctly integrate one side					
Correctly integrate the other side					
Find C					
Put together and rearrange into required form					
Exam Paper Ref.	AQA Jun 12 (8b)	AQA Jan 13 (5b)	AQA June 13 (8b)	AQA June 14 (8b)	AQA June 15 (8a)

How to get marks for AQA Core 4 Differential Equation Questions - Answers

Question & initial condition	$\frac{dx}{dt} = \frac{1}{15x\sqrt{2x-1}}$ $t=0, x=1$	$\frac{dy}{dx} = \frac{x\sqrt{x^2+3}}{e^{2y}}$ $y=0, x=1$	$\frac{dx}{dt} = \frac{t\cos\left(\frac{\pi}{4}t\right)}{32x}$ $t=0, x=4$	$\frac{dy}{dx} = \frac{16xe^{2y}}{(1-3x)(1+x^2)}$ $y=0, x=0$	$\frac{dx}{dt} = \frac{\sqrt{4+5x}}{5(1+t)^2}$ $t=0, x=0$
Separation of variables	$x\sqrt{2x-1}\,dx$ $=\frac{1}{15}\,dt$	$e^{2y}\,dy$ $=x\sqrt{x^2+3}\,dx$	$32x\,dx$ $=t\cos\left(\frac{\pi}{4}t\right)\,dt$	$\frac{1}{e^{2y}}\,dy$ $=\frac{16x}{(1-3x)(1+x)^2}\,dx$	$\frac{1}{\sqrt{4+5x}}\,dx$ $=\frac{dt}{5(1+t)^2}$
Correctly integrate one side	$\frac{x}{3}(2x-1)^{\frac{3}{2}}$ $+\frac{1}{15}(2x-1)^{\frac{5}{2}}$	$\frac{e^{2y}}{2}$	$16x^2$	$-\frac{e^{2y}}{2}$	$\frac{2}{5}\sqrt{4+5x}$
Correctly integrate the other side	$\frac{t}{15}$	$\frac{(x^2+3)^{\frac{3}{2}}}{3}$	$\frac{4t}{\pi}\sin\left(\frac{\pi t}{4}\right)$ $+\frac{16}{\pi^2}\cos\left(\frac{\pi t}{4}\right)$	$-\ln(1-3x)$ $+\ln(1+x)+\frac{4}{1+x}$	$-\frac{1}{5(1+t)}$
Find C	$C=-\frac{4}{15}$	$C=-\frac{13}{6}$	$C=256-\frac{16}{\pi^2}$	$C=-\frac{9}{2}$	$C=1$
Put together and rearrange into required form	$t=\frac{3}{2}(2x-1)^{\frac{5}{2}}$ $+\frac{5}{2}(2x-1)^{\frac{3}{2}}-4$	$y=\frac{1}{2}\ln\left(\frac{2}{3}(x^2+3)^{\frac{3}{2}}\right.$ $\left.-\frac{13}{3}\right)$	$t=45, x=3.65$	$f(y)=g(x)$ $-\frac{e^{2y}}{2}=-\ln(1-3x)+\ln(1+x)$ $+\frac{4}{1+x}-\frac{9}{2}$	$x=\frac{5}{4}\left(1-\frac{1}{5(1+t)}\right)^2$ $-\frac{4}{5}$
Exam Paper Ref.	AQA Jun 12 (8b)	AQA Jan 13 (5b)	AQA June 13 (8b)	AQA June 14 (8b)	AQA June 15 (8a)