Pure Year 2 exam questions (A Level maths)-AQA

NOTE:
Please be aware that in the Year 12 collections, you will find questions from the Year 13 papers. However, these questions are intentionally included because they align with Year 12 content and topics. That's the reason why you are missing some questions here, please have a look at the Year 12 collection!
Happy studying!

Ch 13 Differential equations

June 2019 Question 5 Paper 2

5 Solve the differential equation

$$\frac{dt}{dx} = \frac{\ln x}{x^2 t} \qquad \text{for } x > 0$$

given $x = 1$ when $t = 2$

Write your answer in the form $t^2 = f(x)$

[7 marks]

ANSWER

Q	Marking instructions	AO	Mark	Typical solution
5	Separates the variables – one side correct Condone missing integral signs **PI** by correct integration	3.1a	M1	$\int \frac{1}{x^2}\ln x\,dx = \int t\,dt$
	Integrates their $\int t\,dt$ correctly	1.1b	A1F	$\int t\,dt = \frac{t^2}{2} + c$
	Obtains $u' = \frac{1}{x}$ and $v = -\frac{1}{x}$ **OE**	1.1b	B1	$u = \ln x$ $u' = \frac{1}{x}$
	Integrates $\int \frac{1}{x^2}\ln x\,dx$ Substitutes their u, u', v and v' into the correct formula for integration by parts Condone sign errors in formula	1.1a	M1	$v' = x^{-2}$ $v = -x^{-1}$ $-\frac{1}{x}\ln x - \int \frac{1}{x}\left(-x^{-1}\right)dx$ $-\frac{1}{x}\ln x + \int \frac{1}{x^2}dx$
	Obtains $-\frac{1}{x}\ln x - \frac{1}{x}$	1.1b	A1	$-\frac{1}{x}\ln x - \frac{1}{x}$
	Substitutes $t = 2$ and $x = 1$ into their integrated equation to find their $+c$	1.1a	M1	$-\frac{1}{x}\ln x - \frac{1}{x} = \frac{t^2}{2} + c$
	Substitutes $t = 2$ and $x = 1$ into their integrated equation to find their $+c$	1.1a	M1	$-\frac{1}{x}\ln x - \frac{1}{x} = \frac{t^2}{2} + c$ $t = 2, x = 1 \Rightarrow -1 = 2 + c$
	Obtains correct solution must have t^2 = …. **ACF**	2.5	A1	$c = -3$ $t^2 = 6 - 2\left(\frac{1 + \ln x}{x}\right)$
	Total		**7**	

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