6			DR				
6	(i)		$\dfrac{\ln x}{x} = 0$			May not be seen	
			$\Rightarrow \ln x = 0$ $\qquad$ or $\dfrac{\ln 1}{1} = 0$	M1	1.1a	May be implied	
			$\Rightarrow x = 1$	A1 [2]	1.1		
6	(ii)		y-coordinates are $\dfrac{\ln 2}{2}$ and $\dfrac{\ln 4}{4}$				
			$\dfrac{\ln 4}{4} = \dfrac{2\ln 2}{4} = \dfrac{\ln 2}{2}$ $\qquad$ oe	B1*	1.1	Allow $\dfrac{\ln 4}{4} = \ln 4^{\frac{1}{4}} = \ln\sqrt{2} = \dfrac{\ln 2}{2}$	Both = 0.346... B0B0
			$\Rightarrow AB$ is // to x-axis $\quad$ **AG**	B1dep* [2]	3.1a	Show that $\dfrac{\ln 4}{4} = \dfrac{2\ln 2}{4}$ and conclusion	use of $\dfrac{\ln 4}{4} - \dfrac{\ln 2}{2} = 0$ unjustified $\qquad$ B0B0
6	(iii)		$\dfrac{dy}{dx} = \dfrac{x\times\frac{1}{x}-1\times\ln x}{x^2}$ or $\dfrac{1}{x}\times\dfrac{1}{x}+\ln x\times(-\dfrac{1}{x^2})$ oe	M1	3.1a	Attempt diff, $\geq$ one term correct	
			$\dfrac{1}{x^2}-\dfrac{\ln x}{x^2}=0$ or $\dfrac{1-\ln x}{x^2}=0$	M1	1.1	oe, their $\dfrac{dy}{dx}=0$	
			$1-\ln x=0$ oe $x = $ e or 2.72 or 2.7 (2 sf)	A1	1.1		
			Coordinates are (e, $\dfrac{1}{e}$)	A1 [4]	1.1	Allow (e, 0.368) or (e, 0.37)	or (2.7, 0.37) (2 sf)

	Question		Answer	Mks	AO	Guidance	
6	**(iv)**		Attempt $\dfrac{\mathrm{d}^2 y}{\mathrm{d}x^2}$	**M1**	**2.1**	Attempt diff their $\dfrac{\mathrm{d}y}{\mathrm{d}x}$	Example of grad method Sub 2.7 & 2.8 in $\dfrac{\mathrm{d}y}{\mathrm{d}x}$ M1
			$= \dfrac{x^2(-\frac{1}{x})-2x(1-\ln x)}{x^4}$ or $\dfrac{-3+2\ln x}{x^3}$ oe	**A1**	**1.2**	All correct, not necessarily simplified cao	0.00093, –0.0038 A1A1
			Substitute $x = \mathrm{e}$ (or 2.72) into $\dfrac{\mathrm{d}^2 y}{\mathrm{d}x^2}$	**M1**	**1.1**	Sub their x from (iii) into their $\dfrac{\mathrm{d}^2 y}{\mathrm{d}x^2}$	State grad +ve & -ve or show on diag dep A1A1 M1
			$\dfrac{\mathrm{d}^2 y}{\mathrm{d}x^2} = -\dfrac{1}{\mathrm{e}^3}$ oe or –0.0498	**A1**	**1.1**	cao Allow or – 0.0497 or –0.05	
			$\dfrac{\mathrm{d}^2 y}{\mathrm{d}x^2} < 0$, hence maximum	**B1f**	**3.2a**	ft their result of sub their x into their $\dfrac{\mathrm{d}^2 y}{\mathrm{d}x^2}$ dep see result	Hence max B1f dep M1A1A1 No proof, no marks
				[5]			