Question	Answer	Marks	Guidance
2	**Alternative method**		
	$\ln 4 + \ln e^{2x-3} = \ln 7 + \ln e^{5-x}$ oe, soi	**(M1)**	
	$\ln 4 + 2x - 3 = \ln 7 + 5 - x$ oe	**(A1)**	
	$2x + x = \ln 7 + 5 - \ln 4 + 3$ or $3x - 8 = \ln \frac{7}{4}$ oe or $8 - 3x = \ln \frac{4}{7}$ oe	**(M1)**	**FT** expression of similar structure which has at most one sign or arithmetic slip
	$x = \frac{\ln 7 - \ln 4 + 8}{3}$ oe or 2.85[32…] rot to 3 or more sf	**(A1)**	
3	$\left[m_{\text{tangent}} =\right] -ax^{-2} + 3$ oe	**B1**	
	[When $x = 1$, m_{normal} =] $\frac{-1}{3-a}$ oe or gradient of tangent = 4 soi	**B1**	**FT** $\frac{-1}{their \left.\frac{dy}{dx}\right\|_{x=1}}$ if appropriate
	$\frac{-1}{their(3-a)} = -\frac{1}{4}$ oe or *their* $(3 - a) = 4$ oe	**M1**	**FT** $\frac{-1}{their \left.\frac{dy}{dx}\right\|_{x=1}}$ or *their* $\left.\frac{dy}{dx}\right\|_{x=1}$ and *their* evaluation of $\frac{-1}{-\frac{1}{4}}$
	$a = -1$ nfww	**A1**	
	[When $x = 1$] *their* $0 = -\frac{1}{4}[1] + b$ oe	**M1**	**FT** $y =$ **(***their a***)** + 1 providing at least 2 of the first 3 marks awarded
	$b = \frac{1}{4}$ nfww	**A1**	

Question	Answer	Marks	Guidance
4	$\log_3\left(\frac{11x-8}{x^2}\right)=1$ or $\log_3(11x-8)=\log_3(3x^2)$ soi OR $\log_x\left(\frac{11x-8}{3}\right)=2$ or $\log_x(11x-8)=\log_x(3x^2)$ soi	**M2**	**M1** for correct use change of base in a correct equation so that all logs have consistent base: $\log_x 3=\frac{\log_3 3}{\log_3 x}$ or $\log_x 3=\frac{1}{\log_3 x}$ oe, soi **OR** $\log_3(11x-8)=\frac{\log_x(11x-8)}{\log_x 3}$ oe, soi
	$3x^2-11x+8\,[=0]$ oe, nfww	**A1**	
	$(3x-8)(x-1)$ [= 0]	**M1**	**FT** *their* 3-term quadratic **dep** on at least **M1** previously awarded
	$x=\frac{8}{3}$ or 2.67 or 2.666[6…] rot to 3 or more dp as only solution	**A1**	
5	$6x^3-5x^2-13x+12 \quad [=0]$	**B1**	
	Uses the correct factor $x-1$ to find a quadratic factor with at least 2 terms correct	**M1**	
	$6x^2+x-12$	**A1**	
	Factorises or solves *their* 3-term quadratic: $(2x+3)(3x-4)$ [= 0] or $[x=]\frac{-1\pm\sqrt{1-4(6)(-12)}}{2(6)}$ oe	**M1**	**dep** on previous **M1**
	$x = 1, -1.5, \frac{4}{3}$ nfww	**A1**	**dep** on all previous marks awarded