Question Number	Scheme	Marks
2(a)	$f(1)=\frac{2(1)^2+3(1)-4}{e^1}-\frac{1}{1^2}=\ldots$ **and** $f(2)=\frac{2(2)^2+3(2)-4}{e^2}-\frac{1}{(2)^2}=\ldots$	M1
	$f(1)=-0.6(321\ldots)[<0]$ **and** $f(2)=1.(103\ldots)[>0]$ $\Rightarrow$ There is a sign change and f(x) is continuous over the interval hence root (in the interval $[1,2]$)	A1
		(2)
(b)	$\frac{2x^2+3x-4}{e^x}-\frac{1}{x^2}=0\Rightarrow 2x^4+3x^3=e^x+4x^2$	M1
	$x^3(2x+3)=e^x+4x^2\Rightarrow x=\sqrt[3]{\frac{e^x+4x^2}{2x+3}}$ *	A1*
		(2)
(c) **(i)**	$x_2=\sqrt[3]{\frac{e^1+4(1)^2}{2(1)+3}}=\text{awrt}\,1.1035\Rightarrow x_3=\text{awrt}\,1.1484$	M1A1
(ii)	1.1813	A1
		(3)
		(7 marks)

Question Number	Scheme	Marks
3(a)	$m=\frac{2.25-2}{5}$	M1
	$\log_{10}V=0.05t+2$	A1
		(2)
(b)	$\log_{10}V=0.05t+2\Rightarrow V=10^{0.05t+2}$	M1
	$a=100$ or $b=1.12$	A1
	$V=100\times(1.12)^t$	A1
		(3)
(c)	$\frac{dV}{dt}=100\times\ln1.12\times(1.12)^t\quad\left(=11.33(1.12)^t\right)$	B1ft
	$100\times\ln1.12\times(1.12)^T=50\Rightarrow(1.12)^T=\frac{50}{100\ln1.12}$	M1
	$(T=)\log_{1.12}\left(\frac{50}{100\ln1.12}\right)=\ldots$	dM1
	$(T=)13$	A1
		(4)
		(9 marks)

Question Number	Scheme	Marks
3(a)	$\log_{10} y = \frac{5}{16}x + 1.5$	M1A1
		(2)
(b)	$\log_{10} y = "\frac{5}{16}"x + "1.5" \Rightarrow y = 10^{"\frac{5}{16}"x + "1.5"}$	M1
	$\Rightarrow y = 10^{"\frac{5}{16}"x} \times 10^{"1.5"}$	M1
	$y = 31.6 \times 2.05^x$	A1
		(3)
		Total 5

Question Number	Scheme	Marks
2(a)	$(f(2) =) 2^4 - 5(2)^2 + 4(2) - 7 = -3 < 0$ **and** $(f(3) =) 3^4 - 5(3)^2 + 4(3) - 7 = 41 > 0$	M1
	There is a change of sign and f(x) is continuous so there is a root (in the interval) *	A1*
		(2)
(b)	$x^3 = \frac{5x^2 - 4x + 7}{x} \Rightarrow x = \sqrt[3]{\frac{5x^2 - 4x + 7}{x}}$ *	B1*
		(1)
(c)(i)	$x_2 = \sqrt[3]{\frac{5(2)^2 - 4(2) + 7}{2}}$	M1
	= awrt 2.1179	A1
(ii)	α = awrt 2.1565	A1
		(3)
		(6 marks)

2(a)	$R = 25$	B1
	$\tan\alpha = \frac{24}{7} \Rightarrow \alpha = ...$	M1
	$\alpha = 1.287$	A1
		(3)
(b)(i)	$\text{Min} = \frac{5}{90 - 3 \times "25" \times (-1)}$	M1
	$= \frac{1}{33}$	A1
(b)(ii)	$(2x + "1.287") = \pi, ... \Rightarrow x = ...$	M1
	$\Rightarrow x = \frac{\pi - "1.287"}{2} = 0.927$	A1
		(4)
		Total 7