

Question	Answer	Marks
1	Apply logarithms to both sides and apply power law at least once	M1
	Rearrange to the form $y = \frac{3 \ln 9}{\ln 2} x$ OE	A1
	Obtain $k = 9.51$	A1
		3

Question	Answer	Marks
2	Differentiate using product rule to obtain $ae^{\frac{1}{2}x} + bxe^{\frac{1}{2}x}$	*M1
	Obtain correct $5e^{\frac{1}{2}x} + \frac{5}{2}xe^{\frac{1}{2}x}$ OE	A1
	Equate first derivative to zero and solve for x	DM1
	Obtain x -coordinate -2	A1
	Obtain y -coordinate $-10e^{-1}$	A1
		5

Question	Answer	Marks
3	Differentiate $\cos 3x$ to obtain $-3\sin 3x$	B1
	Differentiate $5\sin y$ to obtain $5\cos y \frac{dy}{dx}$	B1
	Obtain $-3\sin 3x + 5\cos y \frac{dy}{dx} = 0$ OE	B1
	Substitute x and y values to find value of first derivative	M1
	Obtain $\frac{3}{5}$	A1
		5

Question	Answer	Marks
4	State or imply equation is $\ln y = \ln A - 2p \ln x$	B1
	Equate gradient of line to $-2p$	M1
	Obtain $-2p = -2.6$ and hence $p = 1.3$	A1
	Substitute appropriate values to find $\ln A$	M1
	Obtain $\ln A = 1.252$ and hence $A = 3.5$	A1
	Alternative method for question 4	
	State or imply equation is $\ln y = \ln A - 2p \ln x$	B1
	Substitute given coordinates to obtain 2 simultaneous equations and solve to obtain $3.5p$	M1
	Obtain $3.5p = 4.55$ and hence $p = 1.3$	A1
	Substitute appropriate values to find $\ln A$	M1
	Obtain $\ln A = 1.252$ and hence $A = 3.5$	A1
		5

Question	Answer	Marks
5(a)	Draw V-shaped graph with vertex on positive x -axis	B1
	Draw (more or less) correct graph of $y = 3x + 5$	B1
		2
5(b)	State equation $3x + 5 = -(2x - 3)$ or corresponding inequality	B1
	Attempt solution of linear equation / inequality where signs of $3x$ and $2x$ are different	M1
	State answer $x < -\frac{2}{5}$	A1
	Alternative method for question 5(b)	
	Square both sides of equation / inequality and attempt solution of 3-term quadratic equation / inequality	M1
	Obtain (eventually) only $-\frac{2}{5}$	A1
	State answer $x < -\frac{2}{5}$	A1
		3

Question	Answer	Marks
6(a)	Substitute $x = -3$, equate to zero and attempt solution for a	M1
	Obtain $a = 17$	A1
		2
6(b)	Divide by $x + 3$ at least as far as the x term	M1
	Obtain $6x^2 - x - 1$	A1
	Conclude $(x + 3)(3x + 1)(2x - 1)$	A1
		3
6(c)	Attempt solution of $\sin \theta = k$ where $-1 \leq k \leq 1$	M1
	Obtain 199.5	A1
	Obtain 340.5	A1
		3

Question	Answer	Marks
7(a)	Integrate to obtain the form $k_1 \ln(2x + 1) + k_2 x^2$	*M1
	Obtain correct $2 \ln(2x + 1) + 4x^2$	A1
	Use limits correctly and attempt rearrangement	DM1
	Confirm $a = \sqrt{2.5 - 0.5 \ln(2a + 1)}$ AG	A1
		4

Question	Answer	Marks
7(b)	Consider sign of $a - \sqrt{2.5 - 0.5 \ln(2a + 1)}$ or equivalent for 1 and 2	M1
	Obtain $-0.3\dots$ and $0.6\dots$ or equivalents and justify conclusion	A1
		2
7(c)	Use iteration process correctly at least once	M1
	Obtain final answer 1.358	A1
	Show sufficient iterations to 6 sf to justify answer or show a sign change in the interval $[1.3575, 1.3585]$	A1
		3

Question	Answer	Marks
8(a)	Use at least one of $\sin 2\theta = 2 \sin \theta \cos \theta$ and $\cot \theta = \frac{\cos \theta}{\sin \theta}$	B1
	Use both and conclude $6 \cos^2 \theta$ AG	B1
		2
8(b)	Attempt solution of $\cos^2 \theta = \frac{5}{6}$ to find at least one value	M1
	Obtain 0.421	A1
	Obtain 2.72	A1
		3

Question	Answer	Marks
8(c)	Express integrand in form $a + b \cos x$	M1
	Obtain correct integrand $3 + 3 \cos x$	A1
	Integrate to obtain $px + q \sin x$	*M1
	Apply limits correctly	DM1
	Obtain $\frac{3}{4}\pi + 3 - \frac{3}{\sqrt{2}}$ or exact equivalent	A1
		5