Question	Answer	Marks	Guidance
1	Use $2\ln(2x) = \ln(2x)^2$	*M1	
	Use addition or subtraction property of logarithms	*M1	
	Obtain $4x^2 = (x+3)(3x+5)$ or equivalent without logarithms	A1	
	Solve 3-term quadratic equation	DM1	dep *M *M
	Conclude with $x = 15$ only	A1	
	Total:	5	

Question	Answer	Marks	Guidance
2(i)	Use identity $\cot\theta = \dfrac{1}{\tan\theta}$	B1	
	Attempt use of identity for $\tan 2\theta$	M1	
	Confirm given $\tan^2\theta = \frac{3}{4}$	A1	
	Total:	3	
2(ii)	Obtain 40.9	B1	
	Obtain 139.1	B1	
	Total:	2	

Question	Answer	Marks	Guidance
3(i)	State or imply non-modulus inequality $(2x-5)^2 < (x+3)^2$ or corresponding equation or pair of linear equations	B1	
	Attempt solution of 3-term quadratic inequality or equation or of 2 linear equations	M1	
	Obtain critical values $\frac{2}{3}$ and 8	A1	
	State answer $\frac{2}{3} < x < 8$	A1	
	Total:	4	

Question	Answer	Marks	Guidance
3(ii)	Attempt to find y from $\ln y$ = upper limit of answer to part **(i)**	M1	
	Obtain 2980	A1	
	Total:	2	

Question	Answer	Marks	Guidance
4	Use product rule for derivative of $x^2 \sin y$	M1	
	Obtain $2x\sin y + x^2 \cos y \frac{dy}{dx}$	A1	
	Obtain $-3\sin 3y \frac{dy}{dx}$ as derivative of $\cos 3y$	B1	
	Obtain $2x\sin y + x^2 \cos y \frac{dy}{dx} - 3\sin 3y \frac{dy}{dx} = 0$	A1	
	Substitute $x = 2,\ y = \frac{1}{2}\pi$ to find value of $\frac{dy}{dx}$	M1	dep $\frac{dy}{dx}$ occurring at least once
	Obtain $-\frac{4}{3}$	A1	from correct work only
	Total:	6	

Question	Answer	Marks	Guidance
5(i)	Integrate to obtain form $k_1x + k_2x^2 + k_3e^{3x}$ for non-zero constants	M1	
	Obtain $x + x^2 + e^{3x}$	A1	
	Apply both limits to obtain $a + a^2 + e^{3a} - 1 = 250$ or equivalent	A1	
	Apply correct process to reach form without e involved	M1	
	Confirm given $a = \frac{1}{3}\ln(251 - a - a^2)$	A1	
	Total:	5	

Question	Answer	Marks	Guidance
5(ii)	Use iterative process correctly at least once	**M1**	
	Obtain final answer 1.835	**A1**	
	Show sufficient iterations to 6 sf to justify answer or show sign change in interval (1.8345, 1.8355)	**A1**	
	Total:	**3**	

Question	Answer	Marks	Guidance
6(i)	Substitute $x = -2$ and equate to zero	**M1**	
	Substitute $x = 2$ and equate to 28	**M1**	
	Obtain $-9a + 4b + 34 = 0$ and $7a + 4b - 62 = 0$ or equivalents	**A1**	
	Solve a relevant pair of simultaneous equations for a or b	**M1**	
	Obtain $a = 6$, $b = 5$	**A1**	
	Total:	**5**	
6(ii)	Divide by $x + 2$, or equivalent, at least as far as $k_1x^2 + k_2x$	**M1**	
	Obtain $6x^2 - 7x - 3$	**A1**	
	Obtain $(x+2)(3x+1)(3x-3)$	**A1**	
	Total:	**3**	
6(iii)	Refer to, or clearly imply, fact that 2^y is positive	**M1**	
	State one	**A1√**	following 3 linear factors from part **(ii)**
	Total:	**2**	

Question	Answer	Marks	Guidance
7(i)	Use $\cos(A+B)$ identity	M1	
	Obtain $2\cos 2x\left(\cos 2x.\frac{1}{2}\sqrt{3}-\sin 2x.\frac{1}{2}\right)$	A1	
	Attempt identity expressing $\cos^2 2x$ in terms of $\cos 4x$	M1	
	Attempt identity expressing $\cos 2x \sin 2x$ in terms of $\sin 4x$	M1	
	Obtain $\frac{1}{2}\sqrt{3}(1+\cos 4x)-\frac{1}{2}\sin 4x$	A1	
	Total:	**5**	
7(ii)	Attempt to find at least one intercept with x-axis	M1	
	Obtain $x=\frac{1}{6}\pi$ at least	A1	
	Integrate to obtain $k_4x+k_5\sin 4x+k_6\cos 4x$	M1	
	Obtain $\frac{1}{2}\sqrt{3}x+\frac{1}{8}\sqrt{3}\sin 4x+\frac{1}{8}\cos 4x$	A1√	following their answer to **(i)** of correct form
	Apply limits 0 and $\frac{1}{6}\pi$ to obtain $\left(\frac{1}{12}\sqrt{3}\right)\pi$ or exact equivalent	A1	following completely correct work
	Total:	**5**	