Question	Answer	Marks	Guidance
1	State or imply non-modulus equation $(x+a)^2=(2x-5a)^2$ or pair of linear equations	B1	SR **B1** for $x=6a$
	Attempt solution of quadratic equation or of pair of linear equations	M1	Allow **M1** if $\frac{4}{3}$ and 6 seen
	Obtain, as final answers, $6a$ and $\frac{4}{3}a$	A1	
	Total:	**3**	
2	Apply logarithms to both sides and apply power law	*M1	
	Obtain $(x+4)\log 3=2x\log 5$ or equivalent	A1	
	Solve linear equation for x	DM1	dep *M
	Obtain 2.07	A1	Allow greater accuracy
	Total:	**4**	
3(i)	Draw sketch of $y=x^3$	*B1	May be implied by part graph in first quadrant
	Draw straight line with negative gradient crossing positive y-axis and indicate one intersection	DB1	dep *B
	Total:	**2**	
3(ii)	Use iterative formula correctly at least once	M1	
	Obtain final answer 1.926	A1	
	Show sufficient iterations to justify 4 sf or show sign change in interval $(1.9255, 1.9265)$	A1	
	Total:	**3**	

Question	Answer	Marks	Guidance
4	Use quotient rule (or product rule) to find first derivative	**M1**	
	Obtain $\dfrac{8xe^{4x}+10e^{4x}}{(2x+3)^2}$ or equivalent	**A1**	
	Substitute $x=0$ to obtain gradient $\frac{10}{9}$	**A1**	
	Form equation of tangent through $\left(0,\frac{1}{3}\right)$ with numerical gradient	**M1**	
	Obtain $10x-9y+3=0$	**A1**	
	Total:	**5**	

Question	Answer	Marks	Guidance
5	State or imply $\ln y = \ln K - 2x\ln a$	**B1**	
	EITHER:		
	Obtain -0.525 as gradient of line	**(M1**	
	Equate their $-2\ln a$ to their gradient and solve for a	**M1**	Allow $2\ln a$ = their gradient for **M1**
	Obtain $a = 1.3$	**A1**	
	Substitute to find value of K	**M1**	
	Obtain $K = 8.4$	**A1)**	
	OR:		
	Obtain two equations using coordinates correctly	**(M1**	
	Solve these equations to obtain $2\ln a$ or equivalent	**M1**	
	Obtain $a = 1.3$	**A1**	
	Substitute to find value of K	**M1**	
	Obtain $K = 8.4$	**A1)**	
	Total:	**6**	

Question	Answer	Marks	Guidance
6(i)	Evaluate expression when $x=-2$	**M1**	
	Obtain 0 with all necessary detail present	**A1**	Use of $\mathrm{f}(x)=(x+2)(ax^2+bx+c)$ to find *a*, *b* and *c*, allow **M1 A0** Use of $\mathrm{f}(x)=(x+2)(ax^2+bx+c)+d$ to find *a*, *b* and *c*, and show $d=0$, allow **M1 A1**
	Carry out division, or equivalent, at least as far as x^2 and x terms in quotient	**M1**	
	Obtain $6x^2+x-35$	**A1**	
	Obtain factorised expression $(x+2)(2x+5)(3x-7)$	**A1**	
	Total:	**5**	
6(ii)	State or imply substitution $x=\frac{1}{y}$ or equivalent	**M1**	
	Obtain $-\frac{1}{2},\ -\frac{2}{5},\ \frac{3}{7}$	**A1**	
	Total:	**2**	
7(a)	Obtain $\int(2\cos^2\theta-\cos\theta-3)\,\mathrm{d}\theta$	**B1**	
	Attempt use of identity to obtain integrand involving $\cos 2\theta$ and $\cos\theta$	**M1**	
	Integrate to obtain form $k_1\sin 2\theta+k_2\sin\theta+k_3\theta$ for non-zero constants	**M1**	
	Obtain $\frac{1}{2}\sin 2\theta-\sin\theta-2\theta+c$	**A1**	
	Total:	**4**	

Question	Answer	Marks	Guidance
7(b)(i)	Integrate to obtain form $k_1\ln(2x+1)+k_2\ln(x)$ or $k_1\ln(2x+1)+k_2\ln(2x)$	**M1**	
	Obtain $2\ln(2x+1)+\frac{1}{2}\ln x$ or $2\ln(2x+1)+\frac{1}{2}\ln(2x)$	**A1**	
	Total:	**2**	
7(b)(ii)	Use relevant logarithm power law for expression obtained from application of limits	**M1**	
	Use relevant logarithm addition / subtraction laws	**M1**	
	Obtain $\ln 18$	**A1**	
	Total:	**3**	
8(i)	Obtain $\frac{dx}{dt}=2\sin 2t$	**B1**	
	Obtain $\frac{dy}{dt}=6\sin^2 t\cos t-9\cos^2 t\sin t$	**B1**	
	Use $\frac{dy}{dx}=\frac{dy}{dt}/\frac{dx}{dt}$ for their first derivatives	**M1**	
	Use identity $\sin 2t=2\sin t\cos t$	**B1**	
	Simplify to obtain $\frac{3}{2}\sin t-\frac{9}{4}\cos t$ with necessary detail present	**A1**	
	Total:	**5**	

Question	Answer	Marks	Guidance
8(ii)	Equate $\frac{dy}{dx}$ to zero and obtain $\tan t = k$	M1	
	Obtain $\tan t = \frac{3}{2}$ or equivalent	A1	
	Substitute value of t to obtain coordinates $(2.38,\ 2.66)$	A1	
	Total:	**3**	
8(iii)	Identify $t = \frac{1}{4}\pi$	B1	
	Substitute to obtain exact value for gradient of the normal	M1	
	Obtain gradient $\frac{4}{3}\sqrt{2}$, $\frac{8}{3\sqrt{2}}$ or similarly simplified exact equivalent	A1	
	Total:	**3**	