-			<u>9709</u> s	<u>16 m</u>	<u>s_2</u> 2	
F	age 4	Mark Scheme	Syllabus	Pap	Paper	
		Cambridge International AS/A Level – May/June 2016	9709	22		
1	Use	nower law for logarithms correctly at least once		M1		
1	Obta	$\sin 3x \log 5 = 4y \log 7$ or $3x \ln 5 = 4y \ln 7$ or equivalent		A1		
	Obta	un 1.612		A1	[3]	
					[-]	
2	(i)	Carry out division, or equivalent, at least as far as quotient $2x + k$		M1		
		Obtain quotient $2x-3$		Al	[2]	
		Obtain remainder $-25x+18$		AI	[3]	
	(ii)	Subtract remainder of form $ar + b$ $(ab \neq 0)$ from $2r^3 - 7r^2 - 9r + 3$ or multir	lv			
	(11)	their quotient by $x^2 - 2x + 5$	JIY	M1		
		Obtain $p=16$ and $q=-15$		A1	[2]	
		$\frac{1}{2}$		111	[-]	
3	(i)	State or imply non-modular equation $(3u+1)^2 = (2u-5)^2$ or corresponding particular equation $(3u+1)^2 = (2u-5)^2$	air			
		of linear equations		B1		
		Attempt solution of 3-term quadratic equation or of 2 linear equations		M1	503	
		Obtain -6 and $\frac{4}{5}$		A1	[3]	
	(ii)	Evaluate $\tan^{-1} \frac{1}{k}$ for at least one of their solutions k from part (i)		M1		
		Obtain 0.896		A1	[2]	
					[-]	
4		State $\sin \theta \cos 60 + \cos \theta \sin 60 + \sin \theta \cos 120 + \cos \theta \sin 120$		*D1		
4	(1)	State $\sin\theta \cos \theta + \cos\theta \sin \theta \theta + \sin\theta \cos 12\theta + \cos\theta \sin 12\theta$		"BI		
		Use $\sin 60 = \sin 120 = \frac{1}{2}\sqrt{3}$ and $\cos 60 = \frac{1}{2}$, $\cos 120 = -\frac{1}{2}$		*B1		
		Confirm result $\sqrt{3}\cos\theta$, dependent on *B *B		DB1	[3]	
	(ii)	(a) $\cos 45$ seen		*B1		
		State $\sqrt{\frac{3}{2}}$ or $\frac{1}{2}\sqrt{6}$ or exact equivalent, dependent *B		DB1	[2]	
		(b) Carry out correct process to find at least one value of θ from $\cos^2 \theta = k$		M1		
		Obtain 40.6		A1		
		Obtain 139.4		A1	[3]	
5	(i)	Use product rule to obtain form $k_1 e^{\frac{1}{3}x} + k_2 x e^{\frac{1}{3}x}$		*M1		
		Obtain correct $6e^{\frac{1}{3}x} + 2re^{\frac{1}{3}x}$		۸1		
		Equate first derivative to 40 and obtain equation without e present, dep *M		DM1		
		Confirm $p = 3 \ln \frac{20}{10}$ or $x = 3 \ln \frac{20}{10}$		A1	[4]	
		$p = 1 \qquad p+3 \qquad p+3 \qquad x+3$			L .]	
	(ii)	Consider sign of $p - 3 \ln \frac{20}{p+3}$ at 3.3 and 3.5 or equivalent		M1		
		Complete argument correctly with appropriate calculations		A1	[2]	
	(;;;)	Carry out iterative process correctly at least once		M1		
	(111)	Obtain final answer 3 412		A 1		
		Show sufficient iterations to justify accuracy to 3 dp or show sign change in				
		interval (3.4115, 3.4125)		B1	[3]	

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6	(a)	Obtain integrand $2e^{-2x} + \frac{1}{2}e^{-x}$		B 1	
		Obtain integral of form $k_1 e^{-2x} + k_2 e^{-x}$		M1	
		Obtain answer $-e^{-2x} - \frac{1}{2}e^{-x}$, condoning absence of $+c$		A1	[3]
	(b)	Integrate to obtain $\frac{1}{2}\ln(2x+5)$		B1	
		Show correct use of $p \ln k = \ln k^p$ law at least once		M1	
		Show correct use of $\ln m - \ln n = \ln \frac{m}{n}$ law		M1	
		Obtain $\ln \frac{5}{3}$		A1	[4]
	(c)	State or imply correct ordinates log2, log5, log8 or decimal equivalents		B 1	
		Use correct formula, or equivalent, correctly with $h=3$ and 3 ordinates		M1	
		Obtain answer 3.9 with no errors seen		A1	[3]
7	(i)	State $\frac{dx}{dt} = \sin t$ and $\frac{dy}{dt} = -6\sin 2t$		B 1	
		Use $\sin 2t = 2\sin t \cos t$		B 1	
		Form expression for $\frac{dy}{dx}$ in terms of t		M1	
		Confirm $-12\cos t$		A1	[4]
	(ii)	Identify $\frac{1}{2}\pi$ as value of t		B 1	
		Obtain (2, -2)		B 1	[2]
	(iii)	Identify $\cos 2t = -\frac{1}{3}$		B1	
		Attempt to find value of t (or of $\cos t$) for at least one of the two points		M1	
		Obtain 0.955 (or $\frac{1}{\sqrt{3}}$) or 2.186 (or $-\frac{1}{\sqrt{3}}$)		A1	
		Obtain $-\frac{12}{\sqrt{3}}$ or $-4\sqrt{3}$ or -6.93 and $\frac{12}{\sqrt{3}}$ or $4\sqrt{3}$ or 6.93		A1	[4]