

JUNE 2002

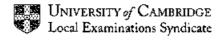
GCE Advanced Subsidiary Level

MARK SCHEME

MAXIMUM MARK: 50

SYLLABUS/COMPONENT:9709/2

MATHEMATICS (Pure 2)



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l	EITHER:	State or imply non-modular inequality $(x+2)^2 < (5-2x)^2$, or corresponding equation Expand and make reasonable solution attempt at 2- or 3-term quadratic, or equivalent	B1 M1	
		Obtain critical values 1 and 7	Al	
		State correct answer $x < 1, x > 7$	ΑI	
	OR:	State one correct equation for a critical value e.g. $x + 2 = 5 - 2x$	MI	
		State two relevant equations separately e.g. $x + 2 = 5 - 2x$ and $x + 2 = -(5 - 2x)$	Αl	
		Obtain critical values 1 and 7	AI	
	OR:	State correct answer $x \le 1$, $x \ge 7$ State one critical value (probably $x = 1$), from a graphical method or by inspection or by	Al	
	OK.	solving a linear inequality	В1	
		State the other critical value correctly	B2	
		State correct answer $x < 1$, $x > 7$	B1	4
_		[The answer $7 \le x \le 1$ scores B0.]		
	(i) EITHI	ER: Substitute –2 for x and equate to zero	MI	
	(-) (-)	Obtain answer $a = 7$	Al	
	OR:	Carry out complete division and equate remainder to zero	MI	
		Obtain answer $a = 7$	A1	2
	(ii) EITHI	ER: Find quadratic factor by division or inspection	MI	
		Obtain answer $3x^2 + x - 4$	A1	
		Factorise completely to $(x+2)(x-1)(3x+4)$	A1	
		[To earn the M1 the quotient (or factor) must contain $3x^2$ and another term, at least.]		
	OR:	State $(x-1)$ is a factor	Bl	
		Find remaining linear factor by division or by inspection Factorise completely to $(x + 2)(x - 1)(3x + 4)$	Ml	
		ractionise completely to $(x + 2)(x - 1)(3x + 4)$	Al	3
_		imply the relation $\ln y = \ln A + n \ln x$	B1	_
		imply $\ln A = 2.3$	B1.∕	
		nswer $A = 9.97$	Bl	
		e gradient of the given line	Mi	_
	Obtain a	nswer $n = -0.15$	Al	5
	(i) State	answer $R = \sqrt{13}$	Bl	
		rig formula to find α	Ml	
		in answer $\alpha = 33.7^{\circ}$	Al	3
		y out, or indicate need for, evaluation of $\cos^{-1}(3.5/\sqrt{13})$ ($\approx 13.9^{\circ}$)		
		in answer 47.6°	M1	
		out correct method for second answer	Al	
	*	in second answer 19.8°	M1	
			Al	4
	(m) State	coordinates (33.7, $\sqrt{13}$), or equivalent	B1.✓	1

Page 2	Mark Scheme	Syllabus	Paper
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5	(i)	Obtain a derivative of the form $k e^{-x} + lx e^{-x}$ where $kl \neq 0$	Вί	
	` ′	Obtain correct derivative $2 e^{-x} - 2x e^{-x}$, or equivalent	Вl	
		Equate $\frac{dy}{dx}$ to zero and solve for x	MI	
		Obtain coordinates $(1, 2e^{-1})$ for P	Αï	4
	(ii)	State that $\frac{1}{2} = 2x e^{-x}$ and deduce the given answer correctly	Bl	1
	(iii)	State or imply that $x_2 = 0.25$	Bl	
	• •	Continue the iteration correctly	Ml	
		Obtain final answer 0.36 after sufficient iterations to justify its accuracy to 2d.p., or after showing there		
		is a sign change in (0.355, 0.365)	Αl	3

6	(a) (i) State indefinite integral $k \sin 2x$ and use limits	M1	
	Obtain given answer correctly	A!	2
	(ii) Use double-angle formula to convert integrand to the form $a + b \cos 2x$, where $ab \neq 0$	Ml*	
	Integrate and use limits (both terms)	M I (dep	*)
	Obtain answer $\frac{1}{8}(\pi-2)$, or equivalent	Al	3
	(b) (i) Show or imply correct ordinates 1, 1.08239, √2 (1.41421)	B1	
	Use correct formula, or equivalent, with $h = \pi/8$ and three ordinates	Ml	
	Obtain correct answer 0.90 with no errors seen	Αl	3
	(ii) Make a correct relevant sketch of $y = \sec x$	B1*	
	State that the rule gives an over-estimate	B1(den*	ኅ 2

7 (i) State $\frac{dx}{dt} = 1 \div \frac{2}{t}$, $\frac{dy}{dt} = 2 - \frac{1}{t}$	Ві	
w .	D.	
Use $\frac{dy}{dx} = \frac{dy}{dt} \div \frac{dx}{dt}$	Mi	
Obtain $\frac{dy}{dx}$ in any correct form e.g. $\frac{2t-1}{t+2}$	Al	3
(ii) Substitute $t = 1$ in $\frac{dy}{dx}$ and both parametric equations	MI	
Obtain $\frac{dy}{dx} = \frac{1}{3}$ and coordinates (1, 2)	Al 🖍	
Obtain equation $3y = x + 5$, or any 3-term equivalent	A۱✓	3
(iii) Equate $\frac{dy}{dx}$ to zero and solve for t	Ml	
Obtain answer $t = \frac{1}{2}$	Al	
Obtain the given value of y correctly Show by any method that this is a minimum	A1 A1	4