



November 2003

GCE AS LEVEL

MARK SCHEME

MAXIMUM MARK: 50

SYLLABUS/COMPONENT: 9709/02

MATHEMATICS Pure Mathematics : Paper Two



Image: A AND AS LEVEL - NOVEMBER 2003 Onion of the product product of the produ	Page 1	Mark Scheme	Syllabus	Paper
 1 <i>EITHER:</i> State or imply non-modular inequality e.g2 < 8-3x < 2, or (8-3x)² < 2², or corresponding equation or pair of equations Obtain critical values 2 and 3 ¹/₃ State correct answer 2 < x < 3 ¹/₃ <i>OR:</i> State one critical value (probably x = 2), from a graphical method or by inspection or by solving a linear equality or equation State the other critical value (probably x = 2), from a graphical method or by inspection or by solving a linear equality or equation State the other critical value correctly State correct answer 2 < x < 3 ¹/₃ 2 State or imply at any stage ln y = ln k - xln a Equate estimate of ln y- intercept to ln k Obtain value for k in the range 9.97±0.51 Calculate gradient of the line of data points Obtain value for a in the range 9.212±0.11 3 (i) <i>EITHER:</i> Substitute -1 for x and equate to zero Obtain answer a=6 <i>OR:</i> Carry out complete division and equate remainder to zero Obtain answer a=6 (ii) Substitute 6 for a and either show f(x) = 0 or divide by (x - 2) obtaining a remainder of zero <i>EITHER:</i> State or imply (x + 1)(x - 2)=x² - x - 2 Attempt to find another quadratic factor by division or inspection State factor (x² + x - 3) <i>OR:</i> Obtain x³ + 2x² - 2x - 3 after division by x + 1, or x³ - x² - 5x + 6 after division by x - 2 Attempt to find a quadratic factor by further division by relevant divisor or by inspection State factor (x² + x - 3) 4 (i) State answer R = 2 Use trig formula to find α <i>Otheria ensure R</i> = 1/2 	i uge i	A AND AS LEVEL – NOVEMBER 2003	9709	2
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4 (i) State answer $R = 2$ Use trig formula to find α		State factor $(x + x - 5)$		
4 (i) State answer $R = 2$ Use trig formula to find α				[4]
Use trig formula to find α	4 (i)	State answer $R = 2$		Bl
Obtain answer $\alpha = \frac{1}{2}$		Use trig formula to find α		M
Obtain answer $\alpha = -\frac{\pi}{3}$		Obtain answer $\alpha = \frac{1}{3}\pi$		Al
		Ŭ		[3]

Page 2	Mark Scheme	Syllabus	Paper 2
	A AND AS LEVEL - NOVEMBER 2003	9709	2
(ii)	Carry out, or indicate need for, evaluation of $\cos^{-1}(\sqrt{2}/2)$		M1*
	Obtain, or verify, the solution $\theta = \frac{1}{12}\pi$		A1
	Attempt correct method for the other solution in range i.e. $-\cos^{-1}(\sqrt{2}/2) + \alpha$. M1(dep*)
	Obtain solution $\theta = \frac{1}{12}\pi$: [M1A0 for $\frac{25\pi}{12}$]		A1
			[4]
5 (i)	Make recognisable sketch of $y = 2^x$ or $y = x^2$, for $x < 0$ Sketch the other graph correctly		B1 B1
			[2]
(ii)	Consider sign of $2^x - x^2$ at $x = -1$ and $x = -0.5$, or equivale Complete the argument correctly with appropriate calculate	ent ions	M1 A1
			[2]
(iii)	Use the iterative form correctly		M1
	Obtain final answer -0.77 Show sufficient iterations to justify its accuracy to 2 s.f., or	r show there	A1
	is a sign change in the interval $(-0.775, -0.765)$		A1
			[3]
6 (i)	State A is $(4, 0)$		B1
	State B is $(0, 4)$		BI
			[2]
(ii)	Use the product rule to obtain the first derivative Obtain derivative $(4 - x)e^x - e^x$, or equivalent		M1(dep) A1
	Equate derivative to zero and solve for x Obtain answer $r = 3$ only		M1 (dep)
			[4]
</td <td></td> <td></td> <td>[4]</td>			[4]
(111)	Attempt to form an equation in p e.g. by equating gradien and the tangent at P , or by substituting $(0, 0)$ in the equation	ts of <i>OP</i> on of the	
	tangent at P Obtain equation in any correct form a $a^{4-p} = 2$ in		MI
	Obtain equation in any correct form e.g. $\frac{p}{p}$		
	Attempt to solve a quadratic $p^2 - 4p + 4 = 0$, or equivalent		AI M1
	Obtain answer $p = 2$ only		A1
			[5]
7 (i)	Attempt to differentiate using the quotient, product or cha	in rule	M1
	Obtain the given answer correctly		Al
			[3]

Page 3	Mark Scheme	Syllabus	Paper
	A AND AS LEVEL – NOVEMBER 2003	9709	2
(ii)	State or imply the indefinite integral is -cotx		B
	Substitute limits and obtain given answer correctly		B
			[2
(iii)	Use $\cot^2 x = \csc^2 x - 1$ and attempt to integrate both term or equivalent	ns,	М
	Substitute limits where necessary and obtain a correct un	simplified	171
	answer	simplified	A
	Obtain final answer $\sqrt{3} - \frac{1}{2}\pi$		A
	3		[3
			•
(iv)	Use $\cos 2A$ formula and reduce denominator to $2\sin^2 x$		В
	Use given result and obtain answer of the form $k\sqrt{3}$		М
	Obtain correct answer $\frac{1}{2}\sqrt{3}$		А
	Z		[3