

NOVEMBER 2001

ADVANCED SUBSIDIARY LEVEL

MARK SCHEME

MAXIMUM MARK : 50

SYLLABUS/COMPONENT : 8709/2

MATHEMATICS



UNIVERSITY *of* CAMBRIDGE
Local Examinations Syndicate

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4	Attempt at $Y = mX + c$ $Y = -0.6X + c$ Puts $Y = \ln y$ and $X = \ln x$ $\ln y = -0.6 \ln x + 3$ $y = e^3 x^{-0.6}$ $n = -0.6$ and $A = e^3 = 20.1$	M1 A1 M1 M1 A1A1	Attempt at any $y = mx + c$ eqn m and c correct Putting $Y = \ln y$ and $X = \ln x$ Correct elimination of logs	6
5	(a) $y = \frac{e^{2x}}{2x+3}$ $dy/dx = \frac{(2x+3)2e^{2x} - e^{2x}.2}{(2x+3)^2}$ If $x = 0$, $dy/dx = 4/9$ (b) Implicit differentiation. $2x + 2ydy/dx = y + xdy/dx$ At $(3,2)$, $dy/dx = -4$ Eqn of tangent $y - 2 = -4(x - 3)$ or $y + 4x = 14$	M1 A1 A1 M1 A1A1 M1 A1	Correct u/v formula – or uv with $e^{2x}(2x+3)^{-1}$ Correct unsimplified Co Some evidence of implicit needed A1 LHS, A1 RHS Must have used calculus, not for normal Any form ok.	8
6	(i) $y = x^2 \cos x$ $dy/dx = 2x \cos x - x^2 \sin x$ $= 0$ when $x = 0$ or $2 \cos x = x \sin x$ $\rightarrow x \tan x = 2$. (ii) $u_2 = 1.107$ $u_3 = 1.065$ $u_4 = 1.081$ $u_5 = 1.075$ $u_6 = 1.078$ $u_7 = 1.077$ $\rightarrow$ Limit of 1.08 (iii) Since a limit is reached ($=L$) $u_{n+1} = u_n = L$ $L = \tan^{-1}(2/L)$ $L \tan L = 2$.	M1 A1 M1 A1 M1 A1 A1 M1 A1	Correct uv formula Unsimplified ok Putting his $dy/dx = 0$ Co Correct manipulation of u_{n+1} from u_n First two correct Correct limit Putting $u_{n+1} = u_n = L$ Co	9

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7	(i)	$\int_0^{\frac{\pi}{4}} \sin 2x dx = \left[\frac{-\cos 2x}{2} \right] = 0 - \left(-\frac{1}{2} \right) = \frac{1}{2}$ $\int_0^{\frac{\pi}{4}} \cos^2 x dx = \int \frac{\cos 2x}{2} + \frac{1}{2} dx$ $= \left[\frac{\sin 2x}{4} + \frac{x}{2} \right]$ $= \frac{1}{8} (2 + \pi)$	M1 A1 M1 A1 DM1 A1	Needs “–” and cos 2x. Co Using double angles + attempt at integration Co Use of limits 0 to $\pi/4$ Co beware of fortuitous answers.
	(ii)	$\int (2s + 3c)^2 dx = \int (4s^2 + 9c^2 + 12sc) dx$ $12sc = 6\sin 2x \text{ Integral} = 6 \times \frac{1}{2} = 3$ $9c^2 \text{ Integral} = 9 \times \frac{1}{8} \times (\pi + 2)$ $4s^2 = 4 - 4c^2$ $\text{Integral} = 4x \text{ between } 0 \text{ and } \frac{1}{4}\pi$ $4 \times \text{integral of } c^2 \text{ from } 0 \text{ to } \frac{1}{4}\pi$ $= 9.36 \text{ or } 13\pi/8 + 17/4$	B1 B1 B1 M1 A1	Correct squaring – needs all terms There could be alternatives to these marks. They could also be implied. Dealing correctly with $\int 4s^2$ Correct in either form.
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