

**NOVEMBER 2001**

**ADVANCED SUBSIDIARY LEVEL**

<b>MARK SCHEME</b>
<b>MAXIMUM MARK : 50</b>
<b>SYLLABUS/COMPONENT : 8709/2</b> <b>MATHEMATICS</b>



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4	<p>Attempt at <math>Y = mX + c</math>  <math>Y = -0.6X + c</math>                  Puts <math>Y = \ln y</math> and <math>X = \ln x</math>  <math>\ln y = -0.6 \ln x + 3</math>  <math>y = e^3 x^{-0.6}</math>  <math>n = -0.6</math> and <math>A = e^3 = 20.1</math></p>	<p><b>M1</b>  <b>A1</b>  <b>M1</b>  <b>M1</b>  <b>A1A1</b></p>	<p>Attempt at any <math>y = mx + c</math> eqn  <math>m</math> and <math>c</math> correct                  Putting <math>Y = \ln y</math> and <math>X = \ln x</math>                  Correct elimination of logs</p>
6			
5	<p>(a) <math>y = \frac{e^{2x}}{2x+3}</math>      <math>dy/dx = \frac{(2x+3)2e^{2x} - e^{2x} \cdot 2}{(2x+3)^2}</math>                  If <math>x = 0</math>, <math>dy/dx = 4/9</math></p> <p>(b) Implicit differentiation.  <math>2x + 2ydy/dx = y + xdy/dx</math>                  At <math>(3,2)</math>, <math>dy/dx = -4</math>                  Eqn of tangent <math>y - 2 = -4(x - 3)</math>                  or <math>y + 4x = 14</math></p>	<p><b>M1</b>  <b>A1</b>  <b>A1</b>  <b>M1</b>  <b>A1A1</b>  <b>M1</b>  <b>A1</b></p>	<p>Correct u/v formula – or uv                  with <math>e^{2x}(2x+3)^{-1}</math>                  Correct unsimplified                  Co                  Some evidence of implicit                  needed                  A1 LHS, A1 RHS                  Must have used calculus, not                  for normal                  Any form ok.</p>
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6	<p>(i) <math>y = x^2 \cos x</math>      <math>dy/dx = 2x \cos x - x^2 \sin x</math>  <math>= 0</math> when <math>x = 0</math> or <math>2 \cos x = x \sin x</math>  <math>\rightarrow x \tan x = 2.</math></p> <p>(ii) <math>u_2 = 1.107</math>      <math>u_3 = 1.065</math>      <math>u_4 = 1.081</math>  <math>u_5 = 1.075</math>      <math>u_6 = 1.078</math>      <math>u_7 = 1.077</math>  <math>\rightarrow</math> Limit of 1.08</p> <p>(iii) Since a limit is reached (<math>=L</math>)  <math>u_{n+1} = u_n = L</math>  <math>L = \tan^{-1}(2/L)</math>  <math>L \tan L = 2.</math></p>	<p><b>M1</b>  <b>A1</b>  <b>M1</b>  <b>A1</b>  <b>M1</b>  <b>A1</b>  <b>A1</b>  <b>M1</b>  <b>A1</b></p>	<p>Correct uv formula                  Unsimplified ok                  Putting his <math>dy/dx = 0</math>                  Co                  Correct manipulation of <math>u_{n+1}</math>                  from <math>u_n</math>                  First two correct                  Correct limit                  Putting <math>u_{n+1} = u_n = L</math>                  Co</p>
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7	(i)	$\int_0^{\frac{\pi}{4}} \sin 2x dx = \left[ \frac{-\cos 2x}{2} \right] = 0 - \left(-\frac{1}{2}\right) = \frac{1}{2}$	M1	Needs “-“ and cos 2x.
		$\int_0^{\frac{\pi}{4}} \cos^2 x dx = \int \frac{\cos 2x}{2} + \frac{1}{2} dx$ $= \left[ \frac{\sin 2x}{4} + \frac{x}{2} \right]$ $= \frac{1}{8} (2 + \pi)$	A1 M1 A1 DM1 A1	Co Using double angles + attempt at integration Co Use of limits 0 to $\pi/4$ Co beware of fortuitous answers.
	(ii)	$\int (2s + 3c)^2 dx = \int (4s^2 + 9c^2 + 12sc) dx$	B1	Correct squaring – needs all terms
		$12sc = 6\sin 2x \text{ Integral} = 6 \times \frac{1}{2} = 3$	B1	There could be alternatives to these marks.
		$9c^2 \text{ Integral} = 9 \times \frac{1}{8} \times (\pi + 2)$	B1	They could also be implied.
		$4s^2 = 4 - 4c^2$		
		$\text{Integral} = 4x \text{ between } 0 \text{ and } \frac{1}{4}\pi$	M1	Dealing correctly with $\int 4s^2$
		$4 \times \text{integral of } c^2 \text{ from } 0 \text{ to } \frac{1}{4}\pi$ $= 9.36 \text{ or } 13\pi/8 + 17/4$	A1	Correct in either form.
			11	