



**MEI**

Mathematics in Education and Industry

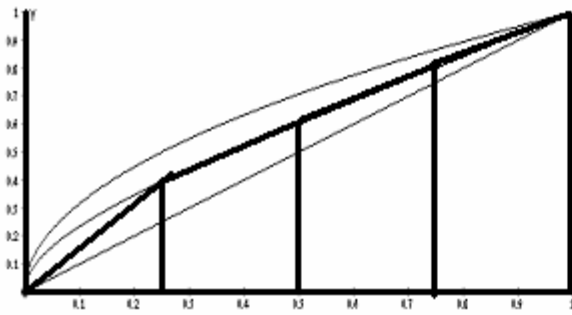
**MEI STRUCTURED MATHEMATICS**

**CONCEPTS OF ADVANCED MATHEMATICS, C2**

**Practice Paper C2-C**

**MARK SHEME**

Qu	Answer	Mark	Comment
<b>Section A</b>			
<b>1</b>	$\frac{a(1-(-0.5)^3)}{1-(-0.5)} = 15$ $\Rightarrow \frac{3a}{4} = 15 \Rightarrow a = 20$ <p>Substitute numerical values into <math>\frac{a}{1-r}</math></p> $13\frac{1}{3}$	M1 A1 A1 M1 A1 <b>5</b>	Use of G.P. sum formula or attempt to sum three terms Forming an equation for $a$ $a - \frac{a}{2} + \frac{a}{4} = 15$
<b>2</b>	<b>(i)</b> Sketch showing reflection in the $x$ axis (0, -2)	B1 <b>1</b>	
	<b>(ii)</b> Sketch showing stretch parallel to the $x$ axis, s.f. $\frac{1}{3}$ (0, 2)	B1 B1 <b>2</b>	
<b>3</b>	Use of $\sin^2 x + \cos^2 x = 1$ $\cos^2 x = \frac{24}{25}$ selecting the negative value $\cos x = -\frac{\sqrt{24}}{5}$	M1 A1 M1 A1 <b>4</b>	
<b>4</b>	<b>(i)</b> $\frac{dy}{dx} = 3x^2 - 12$	M1 A1 <b>2</b>	
	<b>(ii)</b> $3x^2 - 12 = 0$ when $x = \pm 2$ $\Rightarrow (2, -16)$ and $(-2, 16)$	M1 B1 B1 <b>3</b>	
<b>5</b>	<b>(i)</b> Values calculated 6, 11, 16, .....	B1 <b>1</b>	
	<b>(ii)</b> Identify $a = 6, d = 5$ $S_{100} = \frac{100}{2}(2(6) + 99(5))$ $= 25350$	M1 A1 M1 A1 <b>4</b>	Both
<b>6</b>	use of index law $2^{2x+1} = 10$ use of logarithms $(2x+1)\log 2 = \log 10$ $x = 1.16$	M1 A1 M1 A1 A1 <b>5</b>	

<b>7</b>		Integrating each term $x^3 - 5x^2 + 6x + c$ Substituting (2,3) $c = 3$ $y = x^3 - 5x^2 + 6x + 3$	M1 A1 A1 M1  A1  <b>5</b>	1 for integration, 1 for $c$
<b>8</b>		$\frac{\sin 82^\circ}{12} = \frac{\sin \theta}{8}$ $\Rightarrow \sin \theta = 8 \times \frac{\sin 82^\circ}{12}$ $\Rightarrow \theta = 41.3^\circ$	M1 A1  M1  A1  <b>4</b>	Use of sine rule  Correct solution process to extract $\theta$ c.a.o
<b>Section B</b>				
<b>9</b>	<b>(i)</b>	$\frac{1}{2}$	B1  <b>1</b>	
	<b>(ii)</b>	$\int_0^1 x^{\frac{1}{2}} dx = \left[ \frac{2}{3} x^{\frac{3}{2}} \right]_0^1$ $= \frac{2}{3}$	M1 A1  E1  <b>3</b>	
	<b>(iii)</b>	$\frac{1}{2} < A < \frac{2}{3}$	B1  <b>1</b>	
	<b>(iv)</b>	Values of $y_0, y_1, y_2, y_3, y_4$ are 0, 0.39528, 0.61237, 0.81009, 1  $\text{Area} \approx \frac{1}{2} \times 0.25 \times \left( \begin{array}{c} 0+ \\ 2 \times (0.39528 + 0.61237 + 0.81009) \\ +1 \end{array} \right)$ $= 0.57874$	B1  M1  A1 A1  <b>4</b>	
	<b>(v)</b>	 The region lies between the triangle and the upper curve. The region is below the middle curve.	B1  B1  B1  <b>3</b>	

<b>10</b>	<b>(i)</b>	5 points plotted accurately Smooth curve drawn	B1 B1 <b>2</b>	
	<b>(ii)</b>	exponential shape or increasing curve	B1 <b>1</b>	
	<b>(iii)</b>	$\log N = t \log b + \log a$ slope = $\log b$ intercept = $\log a$	B1 B1 B1 <b>3</b>	
	<b>(iv)</b>	$\log N$ values = 2.08, 2.23, 2.40, 2.57, 2.72 5 points plotted and single best fit line drawn $\log b = 0.16$ approximately $b = 1.45$ $\log a = 1.92$ approximately $a = 83$	B1 B1 M1 A1 M1 A1 <b>6</b>	
<b>11</b>	<b>(i)</b>	$\frac{1}{2}, -1, 2$ Periodic	B1 B1 B1 <b>3</b>	$a_2, a_3$ $a_4$
	<b>(ii)</b>	$a_2 = 1 - \frac{1}{k} = \frac{k-1}{k}$ $a_3 = 1 - \frac{k}{k-1} = \frac{-1}{k-1}$ $a_4 = 1 - \frac{k-1}{-1} = k$	M1 A1 A1 A1 <b>4</b>	attempt correct process  attempt simplification in terms of $k$
	<b>(iii)</b>	$\frac{k-1}{k} \times \frac{-1}{k-1} \times k = -1$	M1 A1 <b>2</b>	
	<b>(iv)</b>	$\sum_{i=1}^{99} a_i = \left(2 + \frac{1}{2} - 1\right) + \left(2 + \frac{1}{2} - 1\right) + \dots$ $= \frac{3}{2} \times 33$ $= 49.5$	M1 A1 A1 <b>3</b>	Awareness to take in groups of 3  For 33  c.a.o