C2 Paper G – Marking Guide

1. $= 3^4 + 4(3^3)(-2x) + 6(3^2)(-2x)^2 + 4(3)(-2x)^3 + (-2x)^4$ M2
$= 81 - 216x + 216x^2 - 96x^3 + 16x^4$ A2 **(4)**

2.

x	-2	-1	0	1	2	
2^x	$\frac{1}{4}$	$\frac{1}{2}$	1	2	4	M1

area $\approx \frac{1}{2} \times 1 \times [\frac{1}{4} + 4 + 2(\frac{1}{2} + 1 + 2)]$ B1 M1

$= 5\frac{5}{8}$ or 5.63 (3sf) A1 **(4)**

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3. *(i)* $5\cos\theta = 2\sin\theta$

$\frac{5}{2} = \frac{\sin\theta}{\cos\theta}$ M1

$\tan\theta = 2.5$ A1

(ii) $\tan 2x = 2.5$

$2x = 68.199, 180 + 68.199$ B1 M1

$2x = 68.199, 248.199$

$x = 34.1, 124.1$ (1dp) M1 A1 **(6)**

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4. *(a)* *(i)* $= \log_2 x - \log_2 2 = y - 1$ M1 A1

(ii) $= \log_2 x^{\frac{1}{2}} = \frac{1}{2}\log_2 x = \frac{1}{2}y$ M1 A1

(b) $2(y - 1) + \frac{1}{2}y = 8$

$y = 4$ M1

$\log_2 x = 4, \quad x = 2^4 = 16$ M1 A1 **(7)**

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5. *(i)* $P = 2r + (r \times 2.5) = \frac{9}{2}r = 36$ M1

$OA = r = 8$ cm A1

(ii) perimeter $= (2 \times 8 \sin 1.25) + (8 \times 2.5) = 35.2$ cm (3sf) M2 A1

area $= (\frac{1}{2} \times 8^2 \times 2.5) - (\frac{1}{2} \times 8^2 \times \sin 2.5) = 60.8$ cm^2 (3sf) M2 A1 **(8)**

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6. *(i)* $4x^{\frac{1}{3}} - x = 0$

$x^{\frac{1}{3}}(4 - x^{\frac{2}{3}}) = 0$ M1

$x^{\frac{1}{3}} = 0$ (at O) or $x^{\frac{2}{3}} = 4$ M1

$x \geq 0 \quad \therefore x = (\sqrt{4})^3 = 8, \ a = 8$ A1

(ii) $= \int_0^8 (4x^{\frac{1}{3}} - x)\ dx$

$= [3x^{\frac{4}{3}} - \frac{1}{2}x^2]_0^8$ M1 A2

$= (48 - 32) - (0) = 16$ M1 A1 **(8)**

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7. *(a)* AP: $a = 27, l = 67$ — B1
$n = 30 - 9 = 21$ — B1
$S_{21} = \frac{21}{2}(27 + 67)$ — M1
$= \frac{21}{2} \times 94 = 987$ — A1

(b) *(i)* $\frac{1}{2}n(n + 1)$ — B1
(ii) $= S_{200} - S_{99}$ — M1
$= \frac{1}{2} \times 200 \times 201 - \frac{1}{2} \times 99 \times 100$ — M1
$= 20\,100 - 4950 = 15\,150$ — A1
(iii) $= 3 \times 15\,150 = 45\,450$ — M1 A1 **(10)**

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8. *(i)* $r = \frac{x+6}{x-2} = \frac{x^2}{x+6}$ — M1
$(x + 6)^2 = x^2(x - 2)$ — M1
$x^2 + 12x + 36 = x^3 - 2x^2, \quad x^3 - 3x^2 - 12x - 36 = 0$ — A1

(ii) when $x = 6$, LHS $= 216 - 108 - 72 - 36 = 0$ $\therefore$ $x = 6$ is a solution — B1

$$\begin{array}{r|l} & x^2 + 3x + 6 \\ \hline x - 6 & x^3 - 3x^2 - 12x - 36 \\ & x^3 - 6x^2 \\ \hline & 3x^2 - 12x \\ & 3x^2 - 18x \\ \hline & 6x - 36 \\ & 6x - 36 \\ \hline \end{array}$$

M1 A1

$\therefore$ $(x - 6)(x^2 + 3x + 6) = 0$
$x = 6$ or $x^2 + 3x + 6 = 0$
$b^2 - 4ac = 3^2 - (4 \times 1 \times 6) = -15$ — M1 A1
$b^2 - 4ac < 0$ $\therefore$ no real solutions to quadratic
$\therefore$ no other solutions — A1

(iii) $r = \frac{6+6}{6-2} = 3$ — B1

(iv) $a = 6 - 2 = 4$
$S_8 = \frac{4(3^8 - 1)}{3 - 1} = 13\,120$ — M1 A1 **(12)**

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9. *(i)* $= \int_1^3 (9 - 6\sqrt{x} + x)\ dx$ — M1
$= [9x - 4x^{\frac{3}{2}} + \frac{1}{2}x^2]_1^3$ — M1 A2
$= (27 - 12\sqrt{3} + \frac{9}{2}) - (9 - 4 + \frac{1}{2})$ — M1
$= 26 - 12\sqrt{3}$ — A1

(ii) $y = \int (3x^2 + 4x + k)\ dx$
$y = x^3 + 2x^2 + kx + c$ — M1 A2
$(0, -2)$ $\therefore$ $c = -2$ — B1
$(2, 18)$ $\therefore$ $18 = 8 + 8 + 2k - 2$ — M1
$k = 2$ — A1
$\therefore$ $y = x^3 + 2x^2 + 2x - 2$ — A1 **(13)**

Total **(72)**