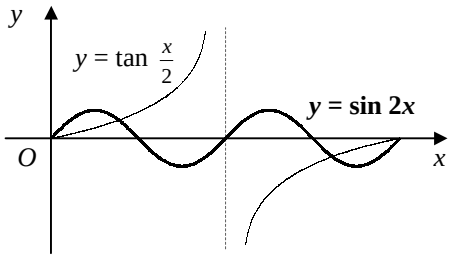
C2 Paper L – Marking Guide

1. *(i)*



B2

B2

(ii) 4 solutions — B1

the graphs intersect at 4 points — B1 **(6)**

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2. area of segment = $(\frac{1}{2} \times r^2 \times \frac{\pi}{3}) - (\frac{1}{2} \times r^2 \times \sin \frac{\pi}{3})$ — B1 M2

$= \frac{1}{6} r^2\pi - \frac{1}{4} r^2\sqrt{3}$ — A1

shaded area $= \frac{1}{6} r^2\pi - 2(\frac{1}{6} r^2\pi - \frac{1}{4} r^2\sqrt{3})$ — M1

$= \frac{1}{6} r^2\pi - \frac{1}{3} r^2\pi + \frac{1}{2} r^2\sqrt{3}$

$= \frac{1}{2} r^2\sqrt{3} - \frac{1}{6} r^2\pi = \frac{1}{6} r^2(3\sqrt{3} - \pi)$ — A1 **(6)**

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3. *(i)* $u_2 = k^2 - 1$ — B1

$u_3 = (k^2 - 1)^2 - 1 = k^4 - 2k^2$ — M1 A1

(ii) $k^4 - 2k^2 + k^2 - 1 = 11$

$k^4 - k^2 - 12 = 0$ — M1

$(k^2 + 3)(k^2 - 4) = 0$ — M1

$k^2 = -3$ (no solutions) or 4 — A1

$k = \pm 2$ — A1 **(7)**

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4. *(i)*

x	0	0.5	1	1.5	2
$\frac{1}{x^2+1}$	1	0.8	0.5	0.3077	0.2

M1 A1

area $\approx \frac{1}{2} \times 0.5 \times [1 + 0.2 + 2(0.8 + 0.5 + 0.3077)]$ — B1 M1

$= 1.10$ (3sf) — A1

(ii) area $= 8^2 \times 1.10385 = 70.6464$ — M1

volume $= 2 \times 70.6464 = 141$ cm^3 (3sf) — A1 **(7)**

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5. *(i)* $\log_a 27 - \log_a 8 = 3$

$\log_a \frac{27}{8} = 3$ — M1

$a^3 = \frac{27}{8}$, $a = \sqrt[3]{\frac{27}{8}} = \frac{3}{2}$ — M1 A1

(ii) $(x + 3) \lg 2 = (x - 1) \lg 6$ — M1

$x(\lg 6 - \lg 2) = 3 \lg 2 + \lg 6$ — M1

$x = \frac{3\lg 2 + \lg 6}{\lg 6 - \lg 2} = 3.52$ — M1 A1 **(7)**

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6. *(i)* $= [2x + x^{-1}]_2^4$ M1 A1

$= (8 + \frac{1}{4}) - (4 + \frac{1}{2}) = 3\frac{3}{4}$ M1 A1

(ii) $y = \int (2x^3 + 1)\ dx$

$y = \frac{1}{2}x^4 + x + c$ M1 A1

$x = 0, y = 3 \ \therefore \ c = 3$ B1

$y = \frac{1}{2}x^4 + x + 3$

when $x = 2$, $y = 8 + 2 + 3 = 13$ M1 A1 **(9)**

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7. *(i)* $\frac{1-8x^3}{x^2} = 0 \ \Rightarrow \ 1 - 8x^3 = 0$ M1

$x^3 = \frac{1}{8}$ M1

$x = \frac{1}{2}$ A1

(ii) $f(x) = x^{-2} - 8x$

$\int f(x)\ dx = \int (x^{-2} - 8x)\ dx$

$= -x^{-1} - 4x^2 + c$ M1 A2

(iii) $= -[-x^{-1} - 4x^2]_{\frac{1}{2}}^2$ M1

$= -\{(-\frac{1}{2} - 16) - (-2 - 1)\} = 13\frac{1}{2}$ M1 A1 **(9)**

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8. *(i)* $S_6 = \frac{6}{2}[3000 + (5 \times -x)] = 8100$ M1 A1

$3000 - 5x = 2700, \quad x = 60$ M1 A1

(ii) $= 1500 - (7 \times 60) = 1500 - 420 = £1080$ M1 A1

(iii) $S_n = \frac{n}{2}[3000 - 60(n - 1)]$ M1

$= n[1500 - 30(n - 1)]$

$= 30n[50 - (n - 1)] = 30n(51 - n) \qquad [\ k = 30\ ]$ M1 A1

(iv) the value of sales in a month would become negative which is not possible B1 **(10)**

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9. *(i)* $f(2) = 16 - 20 + 2 + 2 = 0 \ \therefore \ (x - 2)$ is a factor M1 A1

(ii)

$$
\begin{array}{r|l}
x - 2 & 2x^2 - x - 1 \\
\hline
 & 2x^3 - 5x^2 + x + 2 \\
 & 2x^3 - 4x^2 \\
\hline
 & \quad -x^2 + x \\
 & \quad -x^2 + 2x \\
\hline
 & \qquad -x + 2 \\
 & \qquad -x + 2 \\
\hline
\end{array}
$$

M1 A1

$f(x) = (x - 2)(2x^2 - x - 1)$

$f(x) = (x - 2)(2x + 1)(x - 1)$ M1 A1

(iii) $x = -\frac{1}{2}, 1, 2$ B1

(iv) $\sin\theta = 2$ (no solutions), $-\frac{1}{2}$ or 1

$\theta = \pi + \frac{\pi}{6}, 2\pi - \frac{\pi}{6}$ or $\frac{\pi}{2}$ M1 B1

$\theta = \frac{\pi}{2}, \frac{7\pi}{6}, \frac{11\pi}{6}$ A2 **(11)**

Total **(72)**