C2 Paper H – Marking Guide

1. *(i)* $f(-2) = -35 \quad \therefore \quad -24 - 8 - 2k + 9 = -35$ M1
$k = 6$ A1

(ii) $= f(\frac{2}{3})$ M1

$= 3(\frac{8}{27}) - 2(\frac{4}{9}) + 6(\frac{2}{3}) + 9 = \frac{8}{9} - \frac{8}{9} + 4 + 9 = 13$ A1 **(4)**

2.

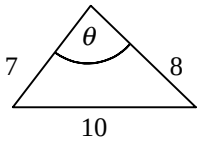
x	1	2	3	4
$4x + x^{-1}$	5	$8\frac{1}{2}$	$12\frac{1}{3}$	$16\frac{1}{4}$

M1

area $\approx \frac{1}{2} \times 1 \times [5 + 16\frac{1}{4} + 2(8\frac{1}{2} + 12\frac{1}{3})]$ B1 M1

$= 31.5$ (3sf) A1 **(4)**

3.



$10^2 = 7^2 + 8^2 - (2 \times 7 \times 8 \times \cos\theta)$ M1

$\cos\theta = \frac{49 + 64 - 100}{112} = \frac{13}{112}$ M1

$\theta = 83.335$ A1

area $= \frac{1}{2} \times 7 \times 8 \times \sin 83.335$ M1

$= 27.8 \text{ cm}^2$ (3sf) A1 **(5)**

---

4. $2(1 - \cos^2 x) - 2\cos x - \cos^2 x = 1$ M1

$3\cos^2 x + 2\cos x - 1 = 0$ A1

$(3\cos x - 1)(\cos x + 1) = 0$ M1

$\cos x = -1$ or $\frac{1}{3}$ A1

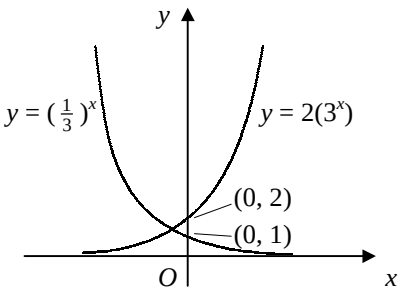
$x = 180$ or $70.5, 360 - 70.5$ B2 M1

$x = 70.5°$ (1dp), 180°, 289.5° (1dp) A1 **(8)**

---

5. *(i)* reflection in the y-axis B1

(ii)



B3

(iii) $(\frac{1}{3})^x = 2(3^x)$

$1 = 2 \times (3^x)^2$ M1

$3^{2x} = \frac{1}{2}, \quad 2x = \frac{\lg\frac{1}{2}}{\lg 3}$ M1

$x = \frac{\lg\frac{1}{2}}{2\lg 3} = -0.32$ A1

$3^x = \sqrt{\frac{1}{2}} = \frac{1}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{1}{2}\sqrt{2}$ M1

$y = 2(3^x) = 2 \times \frac{1}{2}\sqrt{2} = \sqrt{2}$ A1 **(9)**

---

6. *(i)* $= [\frac{1}{3}x^3 - \frac{5}{2}x^2 + 4x]_1^4$ M1 A2

$= (\frac{64}{3} - 40 + 16) - (\frac{1}{3} - \frac{5}{2} + 4) = -\frac{9}{2}$ M1 A1

(ii) $= \lim_{k\to-\infty} [-\frac{1}{3}x^{-3}]_k^{-1}$ M2 A1

$= \lim_{k\to-\infty} \{\frac{1}{3} - (-\frac{1}{3k^3})\}$ M1

$= \lim_{k\to-\infty} (\frac{1}{3} + \frac{1}{3k^3}) = \frac{1}{3}$ A1 **(10)**

---

7. *(i)* $r = 1.5$

$u_4 = 1 \times (1.5)^3 = 3.375$ mm M1 A1

(ii) $w = 2 \times S_8$; GP, $a = 1$, $r = 1.5$ M1

$= 2 \times \frac{1[(1.5)^8 - 1]}{1.5 - 1}$ M1

$= 98.516 = 98.5$ mm (3sf) A1

(iii) areas form GP, $a = \pi \times 1^2 = \pi$, $r = (1.5)^2 = 2.25$ B2

total area $= \frac{\pi[(2.25)^{10} - 1]}{2.25 - 1} = 8354.8$ mm^2 M1 A1

$= \frac{8354.8}{10^2}$ cm^2 $= 83.5$ cm^2 (3sf) A1 **(10)**

---

8. *(i)* $(1 + ax)^n = 1 + n(ax) + \frac{n(n-1)}{2}(ax)^2 + \ldots$ B2

$\therefore\ an = -24$ (1) and $\frac{1}{2}a^2n(n-1) = 270$ (2) M1

(1) $\Rightarrow$ $a = \frac{-24}{n}$

sub. (2) $\frac{288}{n}(n-1) = 270$ M1

$288n - 288 = 270n$ M1

$18n = 288$

$n = \frac{288}{18} = 16$, $a = -\frac{3}{2}$ A2

(ii) $1 - \frac{3}{2}x = 0.9985$ $\therefore\ x = 0.001$ B1

$\therefore\ (0.9985)^{16} \approx 1 - 0.024 + 0.000\,270$ M1

$= 0.976\,27$ (5dp) A1 **(10)**

---

9. *(i)* $y = \int (4 - 6x - 3x^2)\ dx$

$y = 4x - 3x^2 - x^3 + c$ M1 A2

$(0, 0)$ $\therefore\ c = 0$ M1

$y = 4x - 3x^2 - x^3$ A1

(ii) $4x - 3x^2 - x^3 = 0$

$-x(x + 4)(x - 1) = 0$ M1

$x = 0$ (at O), -4, 1

$\therefore\ A\ (-4, 0)$, $B\ (1, 0)$ A1

(iii) $= -\int_{-4}^{0} (4x - 3x^2 - x^3)\ dx + \int_0^1 (4x - 3x^2 - x^3)\ dx$ M1

$= -[2x^2 - x^3 - \frac{1}{4}x^4]_{-4}^{0} + [2x^2 - x^3 - \frac{1}{4}x^4]_0^1$ M1 A1

$= -[(0) - (32 + 64 - 64)] + [(2 - 1 - \frac{1}{4}) - (0)]$ M1

$= 32 + \frac{3}{4} = 32\frac{3}{4}$ A1 **(12)**

Total **(72)**