C2 Paper K – Marking Guide

1. $\log_5 \frac{4x+3}{x-1} = 2$ M1

$\frac{4x+3}{x-1} = 5^2 = 25$ M1

$4x + 3 = 25(x - 1)$ M1

$21x = 28$

$x = \frac{4}{3}$ A1 **(4)**

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2. $(1 - x)^6 = 1 + 6(-x) + \binom{6}{2}(-x)^2 + \ldots = 1 - 6x + 15x^2$ M1 A2

$(1 + x)(1 - x)^6 = (1 + x)(1 - 6x + 15x^2 + \ldots)$

coeff. of $x^2 = 15 - 6 = 9$ M1 A1 **(5)**

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3. *(i)* AP: $a = 77, l = -70$ B1

$S_{50} = \frac{50}{2}[77 + (-70)] = 25 \times 7 = 175$ M1 A1

(ii) AP: $a = 2, d = \frac{1}{2}$ B2

$S_n = \frac{n}{2}[4 + \frac{1}{2}(n - 1)]$ M1

$= \frac{1}{4}n[8 + (n - 1)] = \frac{1}{4}n(n + 7)$ $[\, k = \frac{1}{4} \,]$ A1 **(7)**

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4. *(i)* $\cos^2 P = 1 - (\frac{2}{3})^2 = \frac{5}{9}$ M1

acute $\therefore \cos \angle QPR = \sqrt{\frac{5}{9}} = \frac{1}{3}\sqrt{5}$ A1

(ii) $QR^2 = 7^2 + (3\sqrt{5})^2 - (2 \times 7 \times 3\sqrt{5} \times \frac{1}{3}\sqrt{5})$ M1

$QR^2 = 49 + 45 - 70 = 24$

$QR = \sqrt{24} = \sqrt{4 \times 6} = 2\sqrt{6}$ M1 A1

(iii) $\frac{\sin Q}{3\sqrt{5}} = \frac{\frac{2}{3}}{2\sqrt{6}}$ M1

$\sin Q = \frac{\sqrt{5}}{\sqrt{6}}$

$\angle PQR = 65.9°$ (1dp) A1 **(7)**

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5. *(i)* $= 4x^2 + x^{-2} + c$ M1 A2

(ii) $(1, 1) \quad \therefore \quad 1 = 4 + 1 + c$ M1

$c = -4$ A1

$y = 4x^2 + x^{-2} - 4$

$y = (2x - \frac{1}{x})^2$ $[\, a = 2, b = -1 \,]$ M1 A1 **(7)**

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6. *(i)* $-27 + 63 - 3p - 6 = 0$ M1
$p = 10$ A1

(ii) remainder = f(2) = 8 + 28 + 20 − 6 = 50 M1 A1

(iii) $x = -3$ is a solution $\therefore$ $(x + 3)$ is a factor B1

$$\begin{array}{r|l} x+3 & x^2 + 4x - 2 \\ \hline & x^3 + 7x^2 + 10x - 6 \\ & x^3 + 3x^2 \\ \hline & 4x^2 + 10x \\ & 4x^2 + 12x \\ \hline & -2x - 6 \\ & -2x - 6 \\ \hline \end{array}$$

M1 A1

$\therefore$ $(x + 3)(x^2 + 4x - 2) = 0$
$x = -3$ or $x^2 + 4x - 2 = 0$
other solutions: $x = \frac{-4 \pm \sqrt{16+8}}{2} = -4.45, 0.45$ M1 A1 **(9)**

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7. *(i)* $r = \frac{\log_3 16}{\log_3 4} = \frac{\log_3 4^2}{\log_3 4} = \frac{2\log_3 4}{\log_3 4} = 2$ M2 A1

(ii) $ar = \log_3 4$
$a = \frac{\log_3 4}{2} = \frac{\log_3 2^2}{2} = \frac{2\log_3 2}{2} = \log_3 2$ M1 A1

(iii) $S_6 = \frac{(2^6 - 1)\log_3 2}{2 - 1} = 63 \log_3 2$ M1 A1
let $y = \log_3 2$ $\therefore$ $3^y = 2$ M1
$y = \frac{\lg 2}{\lg 3}$ A1
$\therefore$ $S_6 = 63 \times \frac{\lg 2}{\lg 3} = 39.7$ (3sf) A1 **(10)**

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8. *(i)* $2x = 1.2490, \pi + 1.2490 = 1.2490, 4.3906$ B1 M1
$x = 0.62, 2.20$ (2dp) M1 A1

(ii) $2 \sin y \cos y = \sin y$ M1
$\sin y (2 \cos y - 1) = 0$ M1
$\sin y = 0$ or $\cos y = \frac{1}{2}$ A1
$y = 0, \pi$ or $\frac{\pi}{3}, 2\pi - \frac{\pi}{3}$ B2 M1
$y = 0, \frac{\pi}{3}, \pi, \frac{5\pi}{3}$ A1 **(11)**

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9. *(i)* $x = 4$ $\therefore$ $y = 12 - 8 + 2 = 6$ B1
$\frac{dy}{dx} = 3 - 2x^{-\frac{1}{2}}$ M1 A1
grad = 3 − 1 = 2 M1
$\therefore$ $y - 6 = 2(x - 4)$ M1
$y - 6 = 2x - 8$
$y = 2x - 2$ A1

(ii) area $= \int_0^4 [(3x - 4\sqrt{x} + 2) - (2x - 2)]\ dx$ M1
$= \int_0^4 (x - 4\sqrt{x} + 4)\ dx$
$= [\frac{1}{2}x^2 - \frac{8}{3}x^{\frac{3}{2}} + 4x]_0^4$ M1 A2
$= (8 - \frac{64}{3} + 16) - (0) = \frac{8}{3}$ M1 A1 **(12)**

Total **(72)**