C2 Paper I – Marking Guide
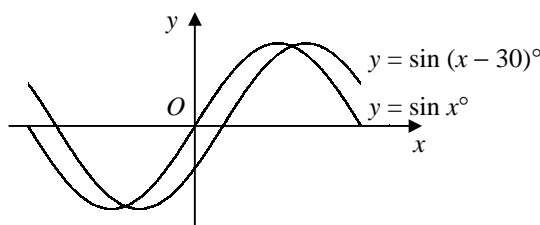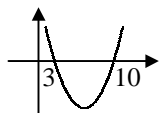
1. (i) $u_1 = 2 + k$
$u_3 = 8 + 3k$ B1
$u_1 = u_3$ ∴ $2 + k = 8 + 3k$ M1
$k = -3$ A1

(ii) $u_5 = 2^5 - 3(5) = 32 - 15 = 17$ M1 A1   **(5)**

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2. $= \int (2x^{\frac{3}{2}} - 1)^2 \ dx$

$= \int (4x^3 - 4x^{\frac{3}{2}} + 1) \ dx$ M1 A1

$= x^4 - \frac{8}{5}x^{\frac{5}{2}} + x + c$ M1 A3   **(6)**

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3. (i), (ii)

$y = \sin(x - 30)°$ B2
$y = \sin x°$ B2

(iii) $x = -75, 105$ B2   **(6)**

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4. (i) $(x - 3)(x - 10) < 0$ M1

                                                                    M1
$3 < x < 10$ A1

(ii) let $x = 2^y$
⇒ $3 < 2^y < 10$
$\lg 3 < y \lg 2 < \lg 10$ M1
$\frac{\lg 3}{\lg 2} < y < \frac{\lg 10}{\lg 2}$ M1
$1.58 < y < 3.32$ (3sf)   A1   **(6)**

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5. (i) $(-4, 0)$ ∴ $0 = 4 - 20 + 16k + 128$ M1
$16k = -112, \ k = -7$ A1

(ii) $4 + 5x - 7x^2 - 2x^3 = 0$
$x = -4$ is a solution ∴ $(x + 4)$ is a factor   B1

$$
\begin{array}{r}
-2x^2 + x + 1 \\
x+4\overline{)-2x^3 - 7x^2 + 5x + 4} \\
\underline{-2x^3 - 8x^2} \\
x^2 + 5x \\
\underline{x^2 + 4x} \\
x + 4 \\
\underline{x + 4}
\end{array}
$$
                                                                    M1 A1

∴ $(x + 4)(1 + x - 2x^2) = 0$
$(x + 4)(1 + 2x)(1 - x) = 0$ M1
$x = -4$ (at A), $-\frac{1}{2}$, 1

∴ $(-\frac{1}{2}, 0), (1, 0)$ A1   **(7)**

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6. (i) $f(x) = \int (5 + \frac{4}{x^2})\ dx$

$f(x) = 5x - 4x^{-1} + c$ M1 A2

(ii) $f(1) = 5 - 4 + c = 1 + c$ M1

$f(2) = 10 - 2 + c = 8 + c$

$f(2) = 2f(1)$ $\therefore$ $8 + c = 2(1 + c)$ M1

$\qquad\qquad c = 6$ A1

$f(x) = 5x - 4x^{-1} + 6$

$f(4) = 20 - 1 + 6 = 25$ M1 A1   **(8)**

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7. (i) $\dfrac{\sin B}{3} = \dfrac{\sin 2.2}{7}$ M1

$\sin B = \frac{3}{7} \sin 2.2$

$\angle ABC = 0.354$ (3sf)   A1

(ii) $\angle BAC = \pi - (2.2 + 0.3538) = 0.588$ (3sf)   M1 A1

(iii) $= \frac{1}{2} \times 3 \times 7 \times \sin 0.5878 = 5.82\ \text{m}^2$ (3sf)   M1 A1

(iv) $= 5.822 + [\frac{1}{2} \times 2^2 \times (2\pi - 0.5878)] + [\frac{1}{2} \times 1^2 \times (2\pi - 0.3538)]$ M3

$= 20.2\ \text{m}^2$ (3sf)   A1   **(10)**

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8. (i)

x	2	4	6	8
$1 + 3\sqrt{x}$	5.243	7	8.348	9.485

     M1 A1

$\text{area} \approx \frac{1}{2} \times 2 \times [5.243 + 9.485 + 2(7 + 8.348)]$ B1 M1

$= 45.4$ (3sf)   A1

(ii) $= \int_2^8 (1 + 3\sqrt{x})\ dx$

$= [x + 2x^{\frac{3}{2}}]_2^8$ M1 A1

$= [8 + 2(2\sqrt{2})^3] - [2 + 2(2\sqrt{2})]$ M1

$= (8 + 32\sqrt{2}) - (2 + 4\sqrt{2})$ M1

$= 6 + 28\sqrt{2}$ A1

(iii) $= \dfrac{(6 + 28\sqrt{2}) - 45.4}{6 + 28\sqrt{2}} \times 100\% = 0.43\%$ M1 A1   **(12)**

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9. (i) $r = \dfrac{x}{2}$ M1

$\therefore\ u_3 = x \times \dfrac{x}{2} = \frac{1}{2}x^2$ M1 A1

(ii) $a = 2,\ a + 2d = x$

$\therefore\ d = \frac{1}{2}(x - 2)$ M1

$u_{11} = 2 + [10 \times \frac{1}{2}(x - 2)] = 5x - 8$ M1 A1

(iii) $\frac{1}{2}x^2 = 5x - 8$

$x^2 - 10x + 16 = 0$ M1

$(x - 2)(x - 8) = 0$ M1

$x \neq 2\ \therefore\ x = 8$ A1

(iv) $d = \frac{1}{2}(8 - 2) = 3$ B1

$S_{50} = \dfrac{50}{2}[4 + (49 \times 3)] = 3775$ M1 A1   **(12)**

Total   **(72)**

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