Solomon Press
Core Mathematics C2
Paper K

(Mark Scheme)

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FOR EDEXCEL

GCE Examinations

Advanced Subsidiary

Core Mathematics C2

Paper K

MARKING GUIDE

This guide is intended to be as helpful as possible to teachers by providing concise solutions and indicating how marks could be awarded. There are obviously alternative methods that would also gain full marks.

Method marks (M) are awarded for knowing and using a method.

Accuracy marks (A) can only be awarded when a correct method has been used.

(B) marks are independent of method marks.

Written by Shaun Armstrong

C2 Paper K – Marking Guide

1. $= [\frac{1}{3}x^3 - \frac{5}{2}x^2 + 4x]_1^4$ M1 A1

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

2.

x	1	1.5	2	2.5	3
$\sqrt{4x-1}$	$\sqrt{3}$	$\sqrt{5}$	$\sqrt{7}$	3	$\sqrt{11}$

M1

area $\approx \frac{1}{2} \times 0.5 \times [\sqrt{3} + \sqrt{11} + 2(\sqrt{5} + \sqrt{7} + 3)]$ B1 M1

$= 5.20$ (3sf) A1 **(4)**

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3. *(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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4. *(a)* $f'(x) = -1 - 3x^2$ M1 A1

$x^2 \geq 0$ for all real $x \Rightarrow -1 - 3x^2 \leq -1$ M1

$\therefore$ $f'(x) < 0 \Rightarrow f(x)$ is decreasing for all values of x A1

(b) $f(1) = 2 - 1 - 1 = 0 \quad \therefore (1, 0)$ on curve B1

(c) $= \int_0^1 (2 - x - x^3)\ dx$

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

$= (2 - \frac{1}{2} - \frac{1}{4}) - (0) = \frac{5}{4}$ M1 A1 **(9)**

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

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

(b) $QR^2 = 7^2 + (3\sqrt{5})^2 - (2 \times 7 \times 3\sqrt{5} \times \frac{1}{3}\sqrt{5})$ M1 A1

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

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

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

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

$\angle PQR = 65.9°$ (1dp) M1 A1 **(9)**

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6. *(a)* p(−2) = 20 ∴ −16 + 4 − 2*a* + *b* = 20 — M1
b = 2*a* + 32 — A1

(b) p(−3) = 0 ∴ −54 + 9 − 3*a* + *b* = 0 — M1
sub. −45 − 3*a* + (2*a* + 32) = 0 — M1
a = −13, *b* = 6 — A2

(c)

$$x+3\overline{)\,2x^3+x^2-13x+6}\quad 2x^2-5x+2$$
$$2x^3+6x^2$$
$$-5x^2-13x$$
$$-5x^2-15x$$
$$2x+6$$
$$2x+6$$

M1 A1

p(*x*) = (*x* + 3)(2*x*² − 5*x* + 2)
p(*x*) = (*x* + 3)(2*x* − 1)(*x* − 2) — M1 A1 **(10)**

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7. *(a)* $x+\frac{\pi}{4} = 1.2490, \pi + 1.2490 = 1.2490, 4.3906$ — B1 M1
x = 0.46, 3.61 (2dp) — M1 A1

(b) 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, π or $\frac{\pi}{3}, 2\pi - \frac{\pi}{3}$ — B1 M1
y = 0, $\frac{\pi}{3}$, π, $\frac{5\pi}{3}$ — A1 **(10)**

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8. *(a)* centre = (2, 3) — B1
radius = $\sqrt{4+9} = \sqrt{13}$ — M1
∴ $(x-2)^2 + (y-3)^2 = (\sqrt{13})^2$ — M1
$(x-2)^2 + (y-3)^2 = 13$ — A1

(b) *y* = 0 ∴ $(x-2)^2 + 9 = 13$ — M1
$x = 2 \pm \sqrt{4} = 0$ (at *O*) or 4 ∴ *B* (4, 0) — A1

(c) grad of radius = $\frac{0-3}{4-2} = -\frac{3}{2}$ — M1
∴ grad of tangent = $\frac{-1}{-\frac{3}{2}} = \frac{2}{3}$ — M1 A1
∴ $y - 0 = \frac{2}{3}(x-4)$ — M1
3*y* = 2*x* − 8
2*x* − 3*y* = 8 — A1 **(11)**

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9. *(a)* *r* = 1.5
$u_4 = 1 \times (1.5)^3 = 3.375$ mm — M1 A1

(b) *w* = 2 × S_8; GP, *a* = 1, *r* = 1.5 — M1
$= 2 \times \frac{1[(1.5)^8 - 1]}{1.5 - 1}$ — M1 A1
= 98.516 = 98.5 mm (3sf) — A1

(c) areas form GP, $a = \pi \times 1^2 = \pi$, $r = (1.5)^2 = 2.25$ — B2
total area = $\frac{\pi[(2.25)^{10} - 1]}{2.25 - 1} = 8354.8$ mm² — M1 A1
$= \frac{8354.8}{10^2}$ cm² = 83.5 cm² (3sf) — A1 **(11)**

Total **(75)**