GCE Examinations

Advanced / Advanced Subsidiary

Core Mathematics C2

Paper E

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 using a valid method.

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

(B) marks are independent of method marks.

C2 Paper E – Marking Guide

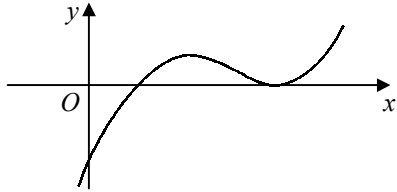**1.** *(i)*   1, 7, 25, 79   B1

     (ii) $7 = a + b$ M1
           $25 = 7a + b$ A1
           subtracting, $6a = 18$ M1
                        $a = 3, b = 4$ A1   **(5)**

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2. *(i)*

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

     (ii)   use more trapezia, each with smaller width   B1   **(5)**

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3. *(i)* $= 2^6 + 6(2^5)(y) + \binom{6}{2}(2^4)(y^2) + \binom{6}{3}(2^3)(y^3) + ...$ M2
          $= 64 + 192y + 240y^2 + 160y^3 + ...$ A2

     (ii)   let $y = x - x^2$
          $(2 + x - x^2)^6 = 64 + 192(x - x^2) + 240(x - x^2)^2 + 160(x - x^2)^3 + ...$ M1
                    $= 64 + 192(x - x^2) + 240(x^2 - 2x^3 + ...) + 160(x^3 + ...) + ...$ M1
                    $= 64 + 192x + 48x^2 - 320x^3 + ...$ A1   **(7)**

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4. *(i)*   max. value $= 4$ B1
          when $x = 270$ B1

     (ii) $\dfrac{4}{2 + \sin x} = 3$
          $2 + \sin x = \frac{4}{3}$ M1
          $\sin x = -\frac{2}{3}$ A1
          $x = 180 + 41.8, 360 - 41.8$ B1 M1
          $x = 221.8, 318.2$ (1dp)   A1   **(7)**

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5. *(a)*   *(i)* $= 2t$ B1
        (ii) $t = \log_3 x \implies x = 3^t$ M1
                  $x = (9^{\frac{1}{2}})^t = 9^{\frac{1}{2}t}$ M1 A1
                  $\therefore \log_9 x = \frac{1}{2}t$ A1

     (b) $2t - \frac{1}{2}t = 4$
          $t = \frac{8}{3}$ M1
          $\log_3 x = \frac{8}{3}$, $x = 3^{\frac{8}{3}} = 18.7$ (3sf)   M1 A1   **(8)**

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6. $y = \int (1 - 4x^{-3})\ dx$ M1
     $y = x + 2x^{-2} + c$ M1 A2
     $x = -1, y = 0 \ \therefore \ 0 = -1 + 2 + c$ M1
                 $c = -1$ A1
     $y = x + 2x^{-2} - 1$
     when $x = 2$, $y = 2 + \frac{1}{2} - 1 = \frac{3}{2}$ M1 A1   **(8)**

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7. (i) $r = \frac{114}{120} = 0.95$ M1

$u_5 = 120 \times (0.95)^4 = 97.74$ M1

∴ 1 hour 38 minutes A1

(ii) $S_8 = \frac{120[1-(0.95)^8]}{1-0.95}$ M1

$= 807.79...$ minutes $\approx$ 13 hours 28 minutes A1

(iii) $120 \times (0.95)^{n-1} < 60$ M1

$(n-1) \lg 0.95 < \lg 0.5$ M1

$n > \frac{\lg 0.5}{\lg 0.95} + 1$ A1

$n > 14.51$ ∴ 15 papers A1 **(9)**

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8. (i) $= 12 \times (2\pi - \frac{2\pi}{3}) = 16\pi$ cm M1 A1

(ii) chord $= 2 \times 12 \sin \frac{\pi}{3} = 24 \times \frac{\sqrt{3}}{2} = 12\sqrt{3}$ M1 A1

$P = (12 \times \frac{2\pi}{3}) + 12\sqrt{3}$ M1

$= 8\pi + 12\sqrt{3} = 4(2\pi + 3\sqrt{3})$ cm   [$k = 4$] A1

(iii) area of segment $= (\frac{1}{2} \times 12^2 \times \frac{2\pi}{3}) - (\frac{1}{2} \times 12^2 \times \sin \frac{2\pi}{3})$ M2

$= 72(\frac{2\pi}{3} - \frac{\sqrt{3}}{2}) = 88.443$

as % of area of circle $= \frac{88.443}{\pi \times 12^2} \times 100\% = 19.6\%$ (1dp) M1 A1 **(10)**

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9. (i) f(1) $= 1 - 9 + 24 - 16 = 0$ B1

∴ $(x - 1)$ is a factor of f(x) B1

(ii)

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              x²  −  8x  +  16
      x − 1 ) x³  −  9x² + 24x  − 16
              x³  −   x²
                  − 8x² + 24x
                  − 8x² +  8x
                          16x  − 16
                          16x  − 16
```
M1 A1

f$(x) = (x - 1)(x^2 - 8x + 16)$

f$(x) = (x - 1)(x - 4)^2$ [$p = -1, q = -4$] M1 A1

(iii)

B2

(iv) $= \int_1^4 (x^3 - 9x^2 + 24x - 16) \, dx$

$= [\frac{1}{4}x^4 - 3x^3 + 12x^2 - 16x]_1^4$ M1 A2

$= [(64 - 192 + 192 - 64) - (\frac{1}{4} - 3 + 12 - 16)]$ M1

$= 6\frac{3}{4}$ A1 **(13)**

Total **(72)**

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Performance Record – C2 Paper E

Question no.	1	2	3	4	5	6	7	8	9	Total
Topic(s)	sequence	trapezium rule	binomial	trig. eqn	logs	integr.	GP, logs	sector of a circle	factor theorem, alg. div., area by integr.	
Marks	5	5	7	7	8	8	9	10	13	72
Student										

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