FOR EDEXCEL

GCE Examinations

Advanced Subsidiary

Core Mathematics C3

Paper C

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.



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C3 Paper C – Marking Guide

1. *(a)* $= \dfrac{x+4}{(2x+1)(x+1)} - \dfrac{2}{2x+1}$ M1

$= \dfrac{(x+4)-2(x+1)}{(2x+1)(x+1)}$ M1

$= \dfrac{2-x}{(2x+1)(x+1)}$ A1

(b) $\dfrac{2-x}{(2x+1)(x+1)} = \dfrac{1}{2}$

$2(2-x) = 2x^2 + 3x + 1$ M1

$2x^2 + 5x - 3 = 0$

$(2x-1)(x+3) = 0$ M1

$x = -3,\ \frac{1}{2}$ A1 **(6)**

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2. *(a)* if $\theta = \frac{\pi}{2}$, $\sin\theta = 1$, $\operatorname{cosec}\theta = 1$ M1

$\therefore$ $\operatorname{cosec}\theta - \sin\theta = 1 - 1 = 0$

$\therefore$ statement is false A1

(b) $1 - \sin^2\theta = 2\sin\theta$ M1

$\sin^2\theta + 2\sin\theta - 1 = 0$

$\sin\theta = \dfrac{-2 \pm \sqrt{4+4}}{2} = -1 - \sqrt{2}$ (no solutions) or $-1 + \sqrt{2}$ M1 A1

$\theta = 0.4271, \pi - 0.4271$ M1

$\theta = 0.43, 2.71$ (2dp) A1 **(7)**

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3. *(a)* $2x - 3 = \mathrm{e}$ M1

$x = \frac{1}{2}(\mathrm{e} + 3)$ M1 A1

(b) $3\mathrm{e}^{2y} - 16\mathrm{e}^{y} + 5 = 0$ M1

$(3\mathrm{e}^{y} - 1)(\mathrm{e}^{y} - 5) = 0$ M1

$\mathrm{e}^{y} = \frac{1}{3}, 5$ A1

$y = \ln\frac{1}{3}, \ln 5$ M1 A1 **(8)**

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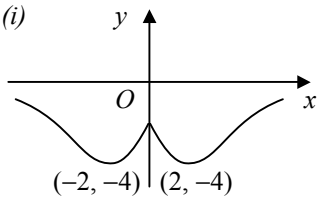
4. *(a)* $= \dfrac{1}{3x-2} \times 3 = \dfrac{3}{3x-2}$ M1 A1

(b) $= \dfrac{2\times(1-x)-(2x+1)\times(-1)}{(1-x)^2} = \dfrac{3}{(1-x)^2}$ M1 A2

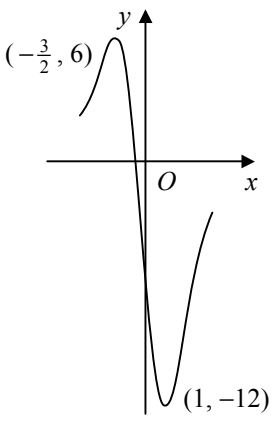
(c) $= \frac{3}{2}x^{\frac{1}{2}} \times \mathrm{e}^{2x} + x^{\frac{3}{2}} \times 2\mathrm{e}^{2x} = \frac{1}{2}x^{\frac{1}{2}}\,\mathrm{e}^{2x}(3 + 4x)$ M1 A2 **(8)**

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5. *(a)* *(i)*



(ii)



B3

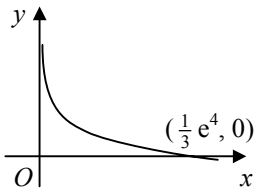
M2 A2

(b) $a = 4,\ b = 2$ B2 **(9)**

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6. *(a)* $4 - \ln 3x = 0, \quad \ln 3x = 4, \quad x = \frac{1}{3}e^4$ M1 A1

(b)



B2

(c) $y = 4 - \ln 3x$

$\ln 3x = 4 - y$ M1

$x = \frac{1}{3}e^{4-y}$ M1

$\therefore \ f^{-1}(x) = \frac{1}{3}e^{4-x}$ A1

(d) $fg(x) = 4 - \ln 3e^{2-x}$

$= 4 - (\ln 3 + \ln e^{2-x})$ M1

$= 4 - \ln 3 - (2 - x)$ M1

$= x + 2 - \ln 3 \qquad [a = 2, b = 3]$ A1 **(10)**

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7. *(a)* $4 \sin x + 3 \cos x = R \sin x \cos \alpha + R \cos x \sin \alpha$

$R \cos \alpha = 4, \ R \sin \alpha = 3$

$\therefore \ R = \sqrt{4^2 + 3^2} = 5$ M1 A1

$\tan \alpha = \frac{3}{4}, \ \alpha = 0.644$ (3sf) M1 A1

$\therefore \ 4 \sin x + 3 \cos x = 5 \sin (x + 0.644)$

(b) minimum $= -5$ B1

occurs when $x + 0.6435 = \frac{3\pi}{2}, \ x = 4.07$ (3sf) M1 A1

(c) $5 \sin (2\theta + 0.6435) = 2$

$\sin (2\theta + 0.6435) = 0.4$ M1

$2\theta + 0.6435 = \pi - 0.4115, 2\pi + 0.4115$ B1 M1

$2\theta = 2.087, 6.051$ M1

$\theta = 1.04, 3.03$ (2dp) A2 **(13)**

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8. *(a)* $\frac{dy}{dx} = \frac{1}{2}x^{-\frac{1}{2}} - 4e^{1-4x}$ M1

grad $= -3$, grad of normal $= \frac{1}{3}$ A1

$\therefore \ y - \frac{3}{2} = \frac{1}{3}(x - \frac{1}{4}) \qquad [\ 4x - 12y + 17 = 0\ ]$ M1 A1

(b) SP: $\frac{1}{2}x^{-\frac{1}{2}} - 4e^{1-4x} = 0, \qquad \frac{1}{2\sqrt{x}} = 4e^{1-4x}$

$\frac{1}{8\sqrt{x}} = e^{1-4x}$ M1

$8\sqrt{x} = e^{4x-1}$

$4x - 1 = \ln 8\sqrt{x}$ M1

$x = \frac{1}{4}(1 + \ln 8\sqrt{x})$ A1

(c) $x_1 = 0.7699, x_2 = 0.7372, x_3 = 0.7317, x_4 = 0.7308 = 0.731$ (3dp) M1 A2

(d) let $f(x) = \frac{1}{2}x^{-\frac{1}{2}} - 4e^{1-4x}$

$f(0.7305) = -0.00025, \ f(0.7315) = 0.0017$ M1

sign change, $f(x)$ continuous $\therefore$ root A1

(e) $x_1 = 6.304, x_2 = 1.683 \times 10^{19}$

diverges rapidly away from root B2 **(14)**

Total **(75)**

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Performance Record – C3 Paper C

Question no.	1	2	3	4	5	6	7	8	Total
Topic(s)	rational expressions	trigonometry	exponentials and logarithms	differentiation	functions	functions	trigonometry	differentiation, numerical methods	
Marks	6	7	8	8	9	10	13	14	75
Student									

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