

**Solomon Press**  
**Core Mathematics C3**  
**Paper C**  
**(Mark Scheme)**

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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)	$= \frac{x+4}{(2x+1)(x+1)} - \frac{2}{2x+1}$	M1	
		$= \frac{(x+4)-2(x+1)}{(2x+1)(x+1)}$	M1	
		$= \frac{2-x}{(2x+1)(x+1)}$	A1	
	(b)	$\frac{2-x}{(2x+1)(x+1)} = \frac{1}{2}$		
		$2(2-x) = 2x^2 + 3x + 1$	M1	
		$2x^2 + 5x - 3 = 0$		
		$(2x-1)(x+3) = 0$	M1	
		$x = -3, \frac{1}{2}$	A1	<b>(6)</b>

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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	
		$\sin^2 \theta + 2 \sin \theta - 1 = 0$		
		$\sin \theta = \frac{-2 \pm \sqrt{4+4}}{2} = -1 - \sqrt{2} \text{ (no solutions) or } -1 + \sqrt{2}$	M1 A1	
		$\theta = 0.4271, \pi - 0.4271$	M1	
		$\theta = 0.43, 2.71 \text{ (2dp)}$	A1	<b>(7)</b>

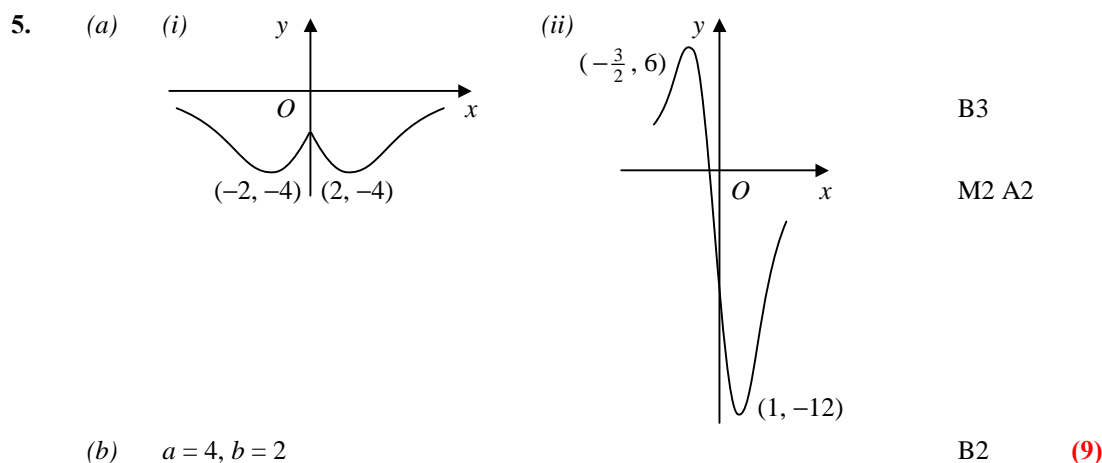
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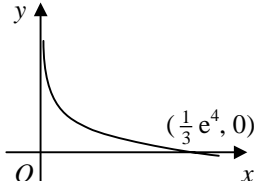
3.	(a)	$2x - 3 = e$ $x = \frac{1}{2}(e + 3)$	M1	
			M1 A1	
	(b)	$3e^{2y} - 16e^y + 5 = 0$ $(3e^y - 1)(e^y - 5) = 0$ $e^y = \frac{1}{3}, 5$ $y = \ln \frac{1}{3}, \ln 5$	M1	
			M1	
			A1	
			M1 A1	<b>(8)</b>

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4.	(a)	$= \frac{1}{3x-2} \times 3 = \frac{3}{3x-2}$	M1 A1	
	(b)	$= \frac{2 \times (1-x) - (2x+1) \times (-1)}{(1-x)^2} = \frac{3}{(1-x)^2}$	M1 A2	
	(c)	$= \frac{3}{2}x^{\frac{1}{2}} \times e^{2x} + x^{\frac{3}{2}} \times 2e^{2x} = \frac{1}{2}x^{\frac{1}{2}} e^{2x}(3 + 4x)$	M1 A2	<b>(8)</b>

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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)  $y = 4 - \ln 3x$   
 $\ln 3x = 4 - y$   
 $x = \frac{1}{3}e^{4-y}$   
 $\therefore f^{-1}(x) = \frac{1}{3}e^{4-x}$  M1  
M1  
A1
- (d)  $fg(x) = 4 - \ln 3e^{2-x}$   
 $= 4 - (\ln 3 + \ln e^{2-x})$   
 $= 4 - \ln 3 - (2 - x)$   
 $= x + 2 - \ln 3 \quad [a = 2, b = 3]$  M1  
M1  
A1 (10)

7. (a)  $4 \sin x + 3 \cos x = R \sin x \cos \alpha + R \cos x \sin \alpha$   
 $R \cos \alpha = 4, \quad R \sin \alpha = 3$   
 $\therefore R = \sqrt{4^2 + 3^2} = 5$  M1 A1  
 $\tan \alpha = \frac{3}{4}, \quad \alpha = 0.644 \text{ (3sf)}$  M1 A1  
 $\therefore 4 \sin x + 3 \cos x = 5 \sin(x + 0.644)$
- (b) minimum = -5 B1  
occurs when  $x + 0.6435 = \frac{3\pi}{2}, \quad x = 4.07 \text{ (3sf)}$  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  
 $\theta = 1.04, 3.03 \text{ (2dp)}$  A2 (13)

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  
 $\therefore y - \frac{3}{2} = \frac{1}{3}(x - \frac{1}{4}) \quad [4x - 12y + 17 = 0]$  M1 A1
- (b) SP:  $\frac{1}{2}x^{-\frac{1}{2}} - 4e^{1-4x} = 0, \quad \frac{1}{2\sqrt{x}} = 4e^{1-4x}$   
 $\frac{1}{8\sqrt{x}} = e^{1-4x}$  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)  $x_1 = 0.7699, x_2 = 0.7372, x_3 = 0.7317, x_4 = 0.7308 = 0.731 \text{ (3dp)}$  M1 A2
- (d) let  $f(x) = \frac{1}{2}x^{-\frac{1}{2}} - 4e^{1-4x}$   
 $f(0.7305) = -0.00025, \quad f(0.7315) = 0.0017$  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)