FOR EDEXCEL

GCE Examinations
Advanced Subsidiary

Core Mathematics C3

Paper A

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.

Solomon Press

Written by Shaun Armstrong

C3 Paper A – Marking Guide

1. $\frac{dx}{dy} = 2\sec y \times \sec y \tan y + \sec^2 y = \sec^2 y(2\tan y + 1) = \frac{2\tan y+1}{\cos^2 y}$ M1 A1

$\frac{dy}{dx} = 1 \div \frac{dx}{dy} = \frac{\cos^2 y}{2\tan y+1}$ M1 A1 **(4)**

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2. *(a)* $= f(\frac{1}{2}) = -\frac{5}{2}$ M1 A1

(b) $gf(x) = \frac{2}{(3x-4)+3} = \frac{2}{3x-1}$ M1 A1

$\therefore \frac{2}{3x-1} = 6$

$2 = 6(3x - 1)$ M1

$x = \frac{4}{9}$ A1 **(6)**

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3. $e^{2y} - x + 2 = 0 \Rightarrow e^{2y} = x - 2$

$2y = \ln(x - 2)$ M1

sub. $\Rightarrow \ln(x + 3) - \ln(x - 2) - 1 = 0$ A1

$\ln\frac{x+3}{x-2} = 1$ M1

$\frac{x+3}{x-2} = e$ A1

$x + 3 = e(x - 2)$ M1

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

$x = \frac{2e+3}{e-1} = 4.91$ (2dp), $y = \frac{1}{2}\ln(\frac{2e+3}{e-1} - 2) = 0.53$ (2dp) A2 **(8)**

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4. *(a)* $\frac{d}{dx}(\tan x) = \frac{d}{dx}\left(\frac{\sin x}{\cos x}\right)$

$= \frac{\cos x \times \cos x - \sin x \times (-\sin x)}{\cos^2 x}$ M1 A1

$= \frac{\cos^2 x + \sin^2 x}{\cos^2 x} = \frac{1}{\cos^2 x} = \sec^2 x$ M1 A1

(b) $\frac{dy}{dx} = 2 \times \tan x + 2x \times \sec^2 x = 2\tan x + 2x\sec^2 x$ M1 A1

$x = \frac{\pi}{4}$, $y = \frac{\pi}{2}$, grad $= 2 + \pi$ B1

$\therefore y - \frac{\pi}{2} = (2 + \pi)(x - \frac{\pi}{4})$ M1

at P, $x = 0$

$\therefore y = \frac{\pi}{2} - \frac{\pi}{4}(2 + \pi) = -\frac{1}{4}\pi^2$ M1 A1 **(10)**

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

$R\cos\alpha = 3$, $R\sin\alpha = 1$

$\therefore R = \sqrt{3^2 + 1^2} = \sqrt{10}$ M1 A1

$\tan\alpha = \frac{1}{3}$, $\alpha = 18.4$ (3sf) M1 A1

$\therefore 3\cos x° + \sin x° = \sqrt{10}\cos(x - 18.4)°$

(b) $6\cos^2 x + 2\sin x\cos x = 0$ M1

$2\cos x(3\cos x + \sin x) = 0$ M1

$\cos x = 0$ or $3\cos x + \sin x = \sqrt{10}\cos(x - 18.4) = 0$ A1

$x = 90, 270$ or $x - 18.4 = 90, 270$ B1 M1

$x = 90, 108.4$ (1dp), $270, 288.4$ (1dp) A1 **(10)**

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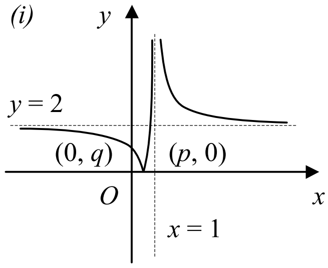
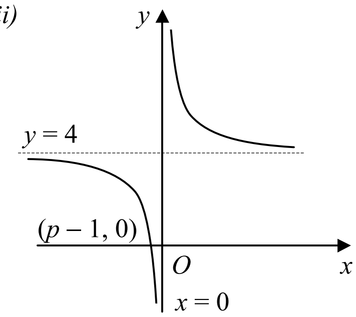
6. *(a)* *(i)*



(ii)



M1 A1

M2 A2

(b) $y = 0 \Rightarrow 2x - 1 = 0 \Rightarrow x = \frac{1}{2} \quad \therefore p = \frac{1}{2}$ — M1 A1

$x = 0 \Rightarrow y = 1 \quad \therefore q = 1$ — B1

(c) $y = \frac{2x-1}{x-1}, \quad y(x-1) = 2x - 1$ — M1

$x(y-2) = y - 1, \quad x = \frac{y-1}{y-2}$ — M1

$\therefore \ f^{-1}(x) = \frac{x-1}{x-2}$ — A1 **(12)**

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7. *(a)* *(i)* LHS = sin x cos 30 + cos x sin 30 + sin x cos 30 – cos x sin 30 — M1 A1

$= 2 \sin x \cos 30 = \sqrt{3} \sin x \qquad [a = \sqrt{3}\,]$ — A1

(ii) let $x = 45$, $\sin 75 + \sin 15 = \sqrt{3} \sin 45 = \sqrt{3} \times \frac{1}{\sqrt{2}} = \frac{1}{2}\sqrt{6}$ — M2 A1

(b) $2(\text{cosec}^2 y - 1) + 5 \text{ cosec } y + \text{cosec}^2 y = 0$ — M1

$3 \text{ cosec}^2 y + 5 \text{ cosec } y - 2 = 0, \qquad (3 \text{ cosec } y - 1)(\text{cosec } y + 2) = 0$ — M1

cosec $y = -2$ or $\frac{1}{3}$ (no solutions) — A1

$\sin y = -\frac{1}{2}$

$y = 180 + 30, 360 - 30$ — B1 M1

$y = 210, 330$ — A1 **(12)**

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8. *(a)*

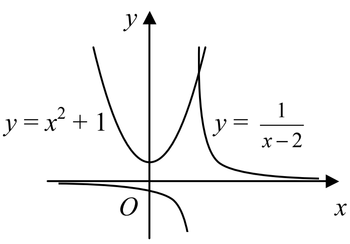
$$\begin{array}{r|l} & x^2 + 0x + 1 \\ \hline x^2 + x - 6 & x^4 + x^3 - 5x^2 + 0x - 9 \\ & x^4 + x^3 - 6x^2 \\ \hline & \qquad\qquad x^2 + 0x - 9 \\ & \qquad\qquad x^2 + x - 6 \\ \hline & \qquad\qquad\quad -x - 3 \end{array}$$

M1 A1

$\therefore \ f(x) = x^2 + 1 + \frac{-x-3}{x^2+x-6}$ — A1

$= x^2 + 1 - \frac{x+3}{(x-2)(x+3)} = x^2 + 1 - \frac{1}{x-2} \quad [A = 1, B = -1, C = -2]$ — M1 A1

(b)



B2

$f(x) = 0 \Rightarrow x^2 + 1 = \frac{1}{x-2}$, graphs intersect once ∴ exactly one real root — B1

(c) e.g. $x_0 = 3$, $\quad x_1 = 2.1, x_2 = 2.1848, x_3 = 2.1732, x_4 = 2.1747$ — M1 A1

∴ root = 2.17 (3sf) — A1

f(2.165) = –0.37, f(2.175) = 0.016 — M1

sign change, f(x) continuous ∴ root — A1 **(13)**

Total **(75)**

Performance Record – C3 Paper A

Question no.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	Total
Topic(s)	differentiation	functions	exponentials and logarithms	differentiation	trigonometry	functions	trigonometry	rational expressions, numerical methods	
Marks	4	6	8	10	10	12	12	13	75
Student									