FOR OCR

GCE Examinations

Advanced / Advanced Subsidiary

Core Mathematics C1

Paper J

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.

Written by Shaun Armstrong

C1 Paper J – Marking Guide

1. $= \sqrt{49} + (\sqrt[3]{8})^2 = 7 + 2^2$ B1 M1
$= 11$ A1 **(3)**

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2. $3x^2 - 5 = 2x$ M1
$3x^2 - 2x - 5 = 0$ A1
$(3x - 5)(x + 1) = 0$ M1
$x = -1, \frac{5}{3}$ A1 **(4)**

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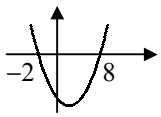
3. *(i)* $5x > 15$ M1
$x > 3$ A1

(ii) $(x + 2)(x - 8) < 0$ M1



M1
$-2 < x < 8$ A1 **(5)**

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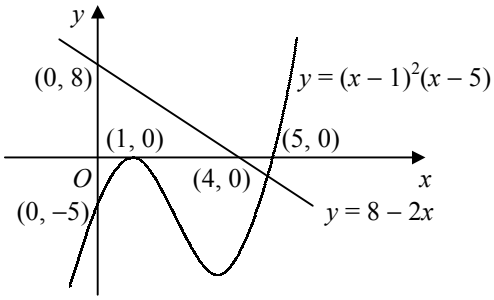
4. *(i)*



B3

B2

(ii) the graphs intersect at exactly one point ∴ one solution B1

(iii) $n = 4$ B1 **(7)**

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5. *(a)* $f(x) = (x - 5)^2 - 25 + 17$ M1
$f(x) = (x - 5)^2 - 8$ A2

(b) $(5, -8)$ B1

(c) *(i)* $(5, -4)$ B2

(ii) $(\frac{5}{2}, -8)$ B2 **(8)**

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6. *(i)* grad $PQ = \frac{8-2}{-3-(-5)} = 3$, grad $QR = \frac{4-8}{9-(-3)} = -\frac{1}{3}$ M1 A1

grad $PQ \times$ grad $QR = 3 \times (-\frac{1}{3}) = -1$ M1

∴ PQ perp. to QR, ∴ $\angle PQR = 90°$ A1

(ii) $\angle PQR = 90°$ ∴ PR is a diameter M1

∴ centre = mid-point of $PR = (\frac{-5+9}{2}, \frac{2+4}{2}) = (2, 3)$ M1 A1

(iii) radius = dist. $(-5, 2)$ to $(2, 3) = \sqrt{49+1} = \sqrt{50}$ B1

∴ $(x - 2)^2 + (y - 3)^2 = (\sqrt{50})^2$ M1

$x^2 - 4x + 4 + y^2 - 6y + 9 = 50$

$x^2 + y^2 - 4x - 6y = 37$ $[k = 37]$ A1 **(10)**

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7. *(i)* $y - 3 = \frac{3}{2}(x - 5)$ M1

$y = \frac{3}{2}x - \frac{9}{2}$ A1

(ii) $3x - 4(\frac{3}{2}x - \frac{9}{2}) + 3 = 0$ M1

$x = 7 \quad \therefore B\ (7, 6)$ A2

(iii) $= (\frac{5+7}{2}, \frac{3+6}{2}) = (6, \frac{9}{2})$ M1 A1

(iv) l_2: $y = \frac{3}{4}x + \frac{3}{4} \quad \therefore$ grad $= \frac{3}{4}$ B1

$\therefore \ y - \frac{9}{2} = \frac{3}{4}(x - 6)$ M1

$y = \frac{3}{4}x$ A1

when $x = 0, y = 0 \ \therefore$ passes through origin A1 **(11)**

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8. *(i)* $A\ (0, 2)$ B1

$\frac{dy}{dx} = 3 - 2x$ M1 A1

grad $= 3$ M1

$\therefore \ y = 3x + 2$ A1

(ii) grad of $m = 3$

grad of curve at $B = \frac{-1}{3} = -\frac{1}{3}$ M1 A1

at B: $3 - 2x = -\frac{1}{3}$

$x = \frac{5}{3}$ M1 A1

$y = 2 + 3(\frac{5}{3}) - (\frac{5}{3})^2 = 4\frac{2}{9} \quad \therefore B\ (1\frac{2}{3}, 4\frac{2}{9})$ M1 A1 **(11)**

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9. *(i)* $3 - x^{\frac{1}{2}} - 2x^{-\frac{1}{2}} = 0$

$3x^{\frac{1}{2}} - x - 2 = 0$ M1

$x - 3x^{\frac{1}{2}} + 2 = 0, \qquad (x^{\frac{1}{2}} - 1)(x^{\frac{1}{2}} - 2) = 0$ M1

$x^{\frac{1}{2}} = 1, 2$ A1

$x = 1, 4 \ \therefore (1, 0), (4, 0)$ A1

(ii) $\frac{dy}{dx} = -\frac{1}{2}x^{-\frac{1}{2}} + x^{-\frac{3}{2}}$ M1 A1

for minimum, $-\frac{1}{2}x^{-\frac{1}{2}} + x^{-\frac{3}{2}} = 0$ M1

$-\frac{1}{2}x^{-\frac{3}{2}}(x - 2) = 0$

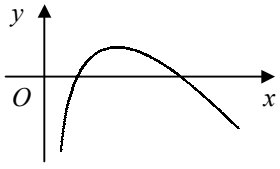
$x = 2$ A1

$y = 3 - \sqrt{2} - \frac{2}{\sqrt{2}} \quad \therefore (2, 3 - 2\sqrt{2})$ A1

(iii) $\frac{d^2y}{dx^2} = \frac{1}{4}x^{-\frac{3}{2}} - \frac{3}{2}x^{-\frac{5}{2}}$ M1

when $x = 2, \ \frac{d^2y}{dx^2} = \frac{1}{8\sqrt{2}} - \frac{3}{8\sqrt{2}} = -\frac{1}{4\sqrt{2}}, \ \frac{d^2y}{dx^2} < 0 \ \therefore$ maximum A1

(iv)



B2

(13)

Total **(72)**

Performance Record – C1 Paper J

Question no.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	Total
Topic(s)	indices	quad.	inequals.	cubic	compl. square, transform.	circle	straight lines	diff., tangent, normal	SP	
Marks	3	4	5	7	8	10	11	11	13	72
Student										