FOR EDEXCEL

GCE Examinations

Advanced Subsidiary

Core Mathematics C1

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.

Written by Shaun Armstrong

C1 Paper A – Marking Guide

1. *(a)* $= \frac{21}{\sqrt{7}} \times \frac{\sqrt{7}}{\sqrt{7}} = 3\sqrt{7}$ — M1 A1

(b) $= \frac{1}{\sqrt[3]{8}} = \frac{1}{2}$ — M1 A1 **(4)**

---

2. AP: $a = 27$, $l = 67$ — B1

$n = 30 - 9 = 21$ — B1

$S_{21} = \frac{21}{2}(27 + 67)$ — M1

$= \frac{21}{2} \times 94 = 987$ — A1 **(4)**

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3. $\frac{6x^2 - 1}{2\sqrt{x}} = 3x^{\frac{3}{2}} - \frac{1}{2}x^{-\frac{1}{2}}$ — M1 A1

$\frac{d}{dx}(3x^{\frac{3}{2}} - \frac{1}{2}x^{-\frac{1}{2}}) = \frac{9}{2}x^{\frac{1}{2}} + \frac{1}{4}x^{-\frac{3}{2}}$ — M1 A2 **(5)**

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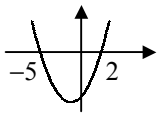
4. *(a)* $x^2 + 3x - 10 > 0$

$(x + 5)(x - 2) > 0$ — M1



M1

$x < -5$ or $x > 2$ — A1

(b) $3x - 2 < x + 3 \Rightarrow 2x < 5$ — M1

$x < \frac{5}{2}$ — A1

both satisfied when $x < -5$ or $2 < x < \frac{5}{2}$ — A1 **(6)**

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5. *(a)* $u_2 = k^2 - 1$ — B1

$u_3 = (k^2 - 1)^2 - 1 = k^4 - 2k^2$ — M1 A1

(b) $k^4 - 2k^2 + k^2 - 1 = 11$

$k^4 - k^2 - 12 = 0$ — M1

$(k^2 + 3)(k^2 - 4) = 0$ — M1

$k^2 = -3$ (no solutions) or 4 — A1

$k = \pm 2$ — A1 **(7)**

---

6. *(a)* $(x + 2k)^2 - (2k)^2 - k = 0$ — M1

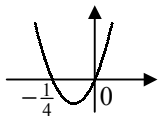
$(x + 2k)^2 = 4k^2 + k$ — A1

$x + 2k = \pm\sqrt{4k^2 + k}$ — M1

$x = -2k \pm \sqrt{4k^2 + k}$ — A1

(b) no real roots if $4k^2 + k < 0$ — M1

$k(4k + 1) < 0$, critical values: $-\frac{1}{4}, 0$ — A1



M1

$\therefore\ -\frac{1}{4} < k < 0$ — A1 **(8)**

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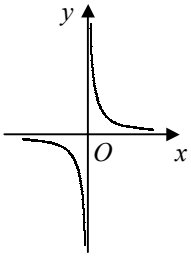
7. *(a)* stretch by factor of 3 in y-direction about x-axis
or stretch by factor of 3 in x-direction about y-axis — B2

(b) 

B2

asymptotes: $x = 0$ and $y = 0$ — B1

(c) $\frac{3}{x} = c - 3x$

$3 = cx - 3x^2$ — M1

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

tangent $\therefore$ equal roots, $b^2 - 4ac = 0$

$(-c)^2 - (4 \times 3 \times 3) = 0$ — M1 A1

$c^2 = 36, \quad c = \pm 6$ — A1 **(9)**

---

8. *(a)* grad $= \frac{7-4}{9-7} = \frac{3}{2}$ — M1 A1

$\therefore \ y - 4 = \frac{3}{2}(x - 7)$ — M1

$2y - 8 = 3x - 21$

$3x - 2y - 13 = 0$ — A1

(b) $y = 8x$ — B1

(c) at R, $3x - 2(8x) - 13 = 0$

$x = -1 \quad \therefore R\ (-1, -8)$ — M1 A1

$OP = \sqrt{7^2 + 4^2} = \sqrt{49 + 16} = \sqrt{65}$ — M1 A1

$OR = \sqrt{(-1)^2 + (-8)^2} = \sqrt{1 + 64} = \sqrt{65} \quad \therefore OP = OR$ — A1 **(10)**

---

9. *(a)* $y = \int (6 - 4x - 3x^2)\ dx, \quad y = 6x - 2x^2 - x^3 + c$ — M1 A2

$(0, 0) \ \therefore c = 0$ — M1

$y = 6x - 2x^2 - x^3$ — A1

(b) $6x - 2x^2 - x^3 = 0, \quad x(6 - 2x - x^2) = 0$ — M1

$x = 0$ (at O) or $6 - 2x - x^2 = 0$

at A, B: $x = \frac{2 \pm \sqrt{4 + 24}}{-2} = \frac{2 \pm 2\sqrt{7}}{-2} = -1 \pm \sqrt{7}$ — M2 A1

$A\ (-1 - \sqrt{7}, 0), B\ (-1 + \sqrt{7}, 0)$

$\therefore \ AB = (-1 + \sqrt{7}) - (-1 - \sqrt{7}) = 2\sqrt{7} \qquad [\ k = 2\ ]$ — M1 A1 **(11)**

---

10. *(a)* $\frac{dy}{dx} = 1 - 3x^{-2}$ — M1 A1

grad $= 1 - 3(1)^{-2} = 1 - 3 = -2$ — A1

(b) $x = 1 \ \therefore y = 4$

grad $= \frac{-1}{-2} = \frac{1}{2}$ — M1 A1

$\therefore \ y - 4 = \frac{1}{2}(x - 1)$ — M1

$y = \frac{1}{2}x + \frac{7}{2}$ — A1

(c) $x + \frac{3}{x} = \frac{1}{2}x + \frac{7}{2}$

$2x^2 + 6 = x^2 + 7x$ — M1

$x^2 - 7x + 6 = 0, \quad (x - 1)(x - 6) = 0$ — M1

$x = 1$ (at P), 6 — A1

$\therefore \ (6, 6\frac{1}{2})$ — A1 **(11)**

Total **(75)**

Performance Record – C1 Paper A

Question no.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	Total
Topic(s)	surds, indices	AP	diff.	inequals	recur. relation	compl. square	transform., rep. root	straight lines	integr.	diff., normal	
Marks	4	4	5	6	7	8	9	10	11	11	75
Student											

FOR EDEXCEL

GCE Examinations

Advanced Subsidiary

Core Mathematics C1

Paper B

MARKING GUIDE

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Written by Shaun Armstrong

C1 Paper B – Marking Guide

1. $f(x) = x + 6\sqrt{x} + 9 + 1 - 6\sqrt{x} + 9x$ — M1 A1
$= 10x + 10, \quad a = 10, b = 10$ — A1 **(3)**

---

2. quadratic, coeff of $x^2 = 1$, minimum $(-2, 5)$
$\therefore\ y = (x + 2)^2 + 5$ — M1 A1
$= x^2 + 4x + 9, \quad a = 4, b = 9$ — M1 A1 **(4)**

---

3. *(a)* $u_1 = 2 + k$
$u_3 = 8 + 3k$ — B1
$u_1 = u_3 \ \therefore 2 + k = 8 + 3k$ — M1
$k = -3$ — A1

(b) $u_5 = 2^5 - 3(5) = 32 - 15 = 17$ — M1 A1 **(5)**

---

4. $y = \int (2x^3 + 1)\ dx$
$y = \frac{1}{2}x^4 + x + c$ — M1 A2
$x = 0, y = 3 \ \therefore\ c = 3$ — B1
$y = \frac{1}{2}x^4 + x + 3$
when $x = 2, \quad y = 8 + 2 + 3 = 13$ — M1 A1 **(6)**

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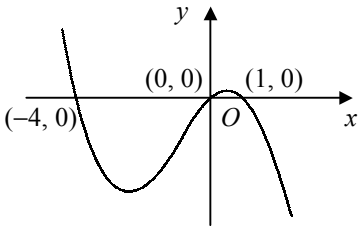
5. *(a)* $= x(4 - 3x - x^2)$ — M1
$= x(1 - x)(4 + x)$ — M1 A1

(b)



B3 **(6)**

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6. $x = 0 \Rightarrow y = -6 \quad \therefore (0, -6)$
$y = 0 \Rightarrow x = 12 \quad \therefore (12, 0)$ — B1
mid-point $= \left(\frac{0+12}{2}, \frac{-6+0}{2}\right) = (6, -3)$ — M1 A1
dist. from $O = \sqrt{6^2 + (-3)^2} = \sqrt{36+9} = \sqrt{45}$ — M1
$= \sqrt{9 \times 5} = 3\sqrt{5}$ — M1 A1 **(6)**

---

7. *(a)* *(i)* $2^{x+2} = 2^2 \times 2^x = 4y$ — M1 A1
(ii) $2^{3-x} = \frac{2^3}{2^x} = \frac{8}{y}$ — M1 A1

(b) $2^{x+2} + 2^{3-x} = 33 \Rightarrow 4y + \frac{8}{y} = 33$
$4y^2 + 8 = 33y$ — M1
$4y^2 - 33y + 8 = 0$ — A1

(c) $(4y - 1)(y - 8) = 0$ — M1
$y = \frac{1}{4}, 8$ — A1
$2^x = \frac{1}{4}, 8$
$x = -2, 3$ — A2 **(10)**

---

8. *(a)* $\frac{dy}{dx} = 3x^{\frac{1}{2}}$ M1 A1

$\frac{d^2y}{dx^2} = \frac{3}{2}x^{-\frac{1}{2}}$ A1

(b) LHS $= 4x^2(\frac{3}{2}x^{-\frac{1}{2}}) - 3(2x^{\frac{3}{2}} - 1)$

$= 6x^{\frac{3}{2}} - 6x^{\frac{3}{2}} + 3$ M1

$= 3 \quad [k = 3]$ A1

(c) $= \int (2x^{\frac{3}{2}} - 1)^2 \, dx$

$= \int (4x^3 - 4x^{\frac{3}{2}} + 1) \, dx$ M1 A1

$= x^4 - \frac{8}{5}x^{\frac{5}{2}} + x + c$ M1 A3 **(11)**

---

9. *(a)* $a + d = 26$

$a + 4d = 41$ A1

subtracting, $3d = 15$ M1

$d = 5$ A1

(b) $a = 21$ B1

$u_{12} = 21 + (11 \times 5) = 76$ M1 A1

(c) $\frac{n}{2}[42 + 5(n - 1)] = \frac{n}{2}[-24 + 7(n - 1)]$ M1 A1

$n(5n + 37) = n(7n - 31)$

$2n(n - 34) = 0$ M1

$n > 0 \ \therefore n = 34$ A1 **(11)**

---

10. *(a)* $x^2 - 3x + 5 = 2x + 1$

$x^2 - 5x + 4 = 0$ M1

$(x - 1)(x - 4) = 0$ M1

$x = 1, 4$ A1

when $x = 1, \ y = 2(1) + 1 = 3$

$\therefore \ P(1, 3), Q(4, 9)$ A1

(b) $\frac{dy}{dx} = 2x - 3$ M1

grad $= -1$ A1

$\therefore \ y - 3 = -(x - 1) \quad [y = 4 - x]$ M1 A1

(c) grad $= 5$

$\therefore \ y - 9 = 5(x - 4)$ M1

$y - 9 = 5x - 20$

$y = 5x - 11$ A1

(d) $4 - x = 5x - 11$ M1

$x = \frac{5}{2}$ A1

$\therefore \ (\frac{5}{2}, \frac{3}{2})$ A1 **(13)**

Total **(75)**

Performance Record – C1 Paper B

Question no.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	Total
Topic(s)	algebra	compl. square	sequence	integr.	curve sketch	straight line	indices	diff., integr.	AP	diff., tangents	
Marks	3	4	5	6	6	6	10	11	11	13	75
Student											

FOR EDEXCEL

GCE Examinations

Advanced Subsidiary

Core Mathematics C1

Paper C

MARKING GUIDE

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C1 Paper C – Marking Guide

1. $x = \frac{4 \pm \sqrt{16+32}}{2}$ M1

$= \frac{4 \pm 4\sqrt{3}}{2} = 2 \pm 2\sqrt{3}$ M1 A1 **(3)**

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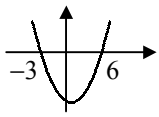
2. $x^2 - 3x + 2 < 20$

$x^2 - 3x - 18 < 0$ M1

$(x + 3)(x - 6) < 0$ M1



M1

$-3 < x < 6$ A1 **(4)**

---

3. $f(x) = \int (4x^{\frac{1}{3}} - 5)\ dx$

$f(x) = 3x^{\frac{4}{3}} - 5x + c$ M1 A2

$(8, 7)\ \therefore\ 7 = 3(\sqrt[3]{8})^4 - 40 + c$ M1

$7 = 48 - 40 + c$

$c = -1$ M1

$f(x) = 3x^{\frac{4}{3}} - 5x - 1$ A1 **(6)**

---

4. *(a)* $= (\frac{49}{9})^{-\frac{1}{2}} = \sqrt{\frac{9}{49}} = \frac{3}{7}$ M1 A1

(b) $1 + x = \sqrt{3}\,x$

$1 = x(\sqrt{3} - 1)$ M1

$x = \frac{1}{\sqrt{3}-1}$ A1

$x = \frac{1}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1} = \frac{\sqrt{3}+1}{3-1} = \frac{1}{2} + \frac{1}{2}\sqrt{3}$ M1 A1 **(6)**

---

5. *(a)* $= 1 - \frac{3}{2}x^{-\frac{3}{2}}$ M1 A2

(b) $= \frac{1}{2}x^2 + 5x + 6x^{\frac{1}{2}} + c$ M1 A3 **(7)**

---

6. *(a)* $= 3\sqrt{3} - \frac{8}{\sqrt{3}} = 3\sqrt{3} - \frac{8}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$ B1 M1

$= 3\sqrt{3} - \frac{8}{3}\sqrt{3} = \frac{1}{3}\sqrt{3}$ A1

(b) $x^{\frac{3}{2}} = 8x^{-\frac{1}{2}}$

$x^2 = 8$ M1 A1

$x = \pm\sqrt{8} = \pm 2\sqrt{2}$ M1 A1 **(7)**

---

7. *(a)* $y + 5 = 2(x - 4)$ M1

$y = 2x - 13$ A1

(b) $3x - y = 4 \Rightarrow y = 3x - 4\ \therefore$ grad $= 3$

grad $l_2 = \frac{-1}{3} = -\frac{1}{3}$ M1 A1

$\therefore\ y - 0 = -\frac{1}{3}(x - 3) \qquad [\, y = -\frac{1}{3}x + 1\,]$ A1

(c) $2x - 13 = -\frac{1}{3}x + 1$

$x = 6$ M1 A1

$\therefore\ (6, -1)$ A1 **(8)**

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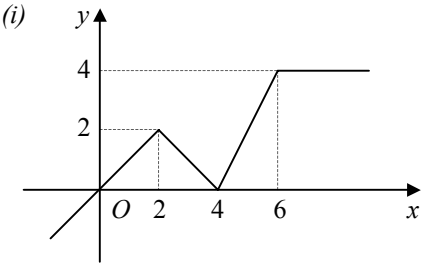
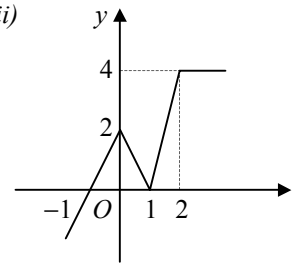
8. *(a)* *(i)* 3 B1

(ii) 1 B1

(b) *(i)*



(ii)



B3 B3

(8)

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9. *(a)* $S_n = a + (a + d) + (a + 2d) + \ldots + [a + (n - 1)d]$ B1

$S_n = [a + (n - 1)d] + [a + (n - 2)d] + [a + (n - 3)d] + \ldots + a$ M1

adding, $2S_n = n[2a + (n - 1)d]$ M1

$S_n = \frac{1}{2}n[2a + (n - 1)d]$ A1

(b) $= 16 + (4 \times 2) = 24$ M1 A1

(c) $= \frac{5}{2}[32 + (4 \times 2)] = \frac{5}{2} \times 40 = 100$ M1 A1

(d) $\frac{n}{2}[32 + 2(n - 1)] = 250$ M1

$n^2 + 15n - 250 = 0$ A1

$(n + 25)(n - 10) = 0$ M1

$n > 0 \ \therefore n = 10$ A1 **(12)**

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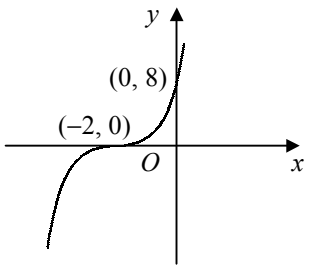
10. *(a)*



B3

(b) $f(x) = (x + 2)(x^2 + 4x + 4)$

$f(x) = x^3 + 4x^2 + 4x + 2x^2 + 8x + 8$ M1

$f(x) = x^3 + 6x^2 + 12x + 8$ A1

$f'(x) = 3x^2 + 12x + 12$ M1 A1

(c) grad $= 3 - 12 + 12 = 3$ B1

$\therefore \ y - 1 = 3(x + 1)$ $[\ y = 3x + 4\ ]$ M1 A1

(d) grad $m = 3$

$\therefore \ 3x^2 + 12x + 12 = 3$

$x^2 + 4x + 3 = 0$

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

$x = -1$ (at P), -3 A1

$x = -3 \ \therefore y = -1$

$\therefore \ y + 1 = 3(x + 3)$ M1

$y = 3x + 8$ A1 **(14)**

Total **(75)**

Performance Record – C1 Paper C

Question no.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	Total
Topic(s)	quad. formula	inequal.	integr.	indices, surds	diff., integr.	surds, indices	straight lines	transform.	AP	curve sketch, diff., tangents	
Marks	3	4	6	6	7	7	8	8	12	14	75
Student											

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Core Mathematics C1

Paper D

MARKING GUIDE

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C1 Paper D – Marking Guide

1. $= \sqrt{25\times 2} + 3\sqrt{4\times 2} = 5\sqrt{2} + (3\times 2\sqrt{2})$ M1 A1

$= 11\sqrt{2}$ A1 **(3)**

---

2. $= 6x - \frac{1}{2}x^{-\frac{1}{2}} - \frac{1}{2}x^{-2}$ M1 A3 **(4)**

---

3. *(a)* 50, 48, 46, 44 B1

(b) AP: $a = 50$, $d = -2$ B1

$S_{20} = \frac{20}{2}[100 + (19\times -2)]$ M1

$= 10 \times 62 = 620$ A1 **(4)**

---

4. *(a)* equal roots $\therefore b^2 - 4ac = 0$

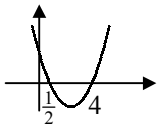
$(-6)^2 - (4\times 1\times k) = 0$ M1

$36 - 4k = 0$

$k = 9$ A1

(b) $(2x-1)(x-4) < 0$ M1

critical values: $\frac{1}{2}$, 4 A1



M1

$\frac{1}{2} < x < 4$ A1 **(6)**

---

5. $x + y = 2 \Rightarrow \quad y = 2 - x$ M1

sub. into $3x^2 - 2x + y^2 = 2$

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

$2x^2 - 3x + 1 = 0$ A1

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

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

$\therefore\ x = \frac{1}{2},\ y = \frac{3}{2}$ or $x = 1,\ y = 1$ M1 A1 **(7)**

---

6. $y = \int (3\sqrt{x} - x^2)\ dx$

$y = 2x^{\frac{3}{2}} - \frac{1}{3}x^3 + c$ M1 A2

$x = 1, y = \frac{2}{3} \quad \therefore \quad \frac{2}{3} = 2 - \frac{1}{3} + c$

$c = -1$ M1

$y = 2x^{\frac{3}{2}} - \frac{1}{3}x^3 - 1$ A1

when $x = 4$, $y = 2(\sqrt{4})^3 - \frac{1}{3}(4^3) - 1$ M1

$y = 16 - 21\frac{1}{3} - 1 = -6\frac{1}{3}$ A1 **(7)**

---

7. *(a)* $2p - (12 - p) = (4p - 5) - 2p$ M1

$p = 7$ A1

(b) $a = 12 - 7 = 5$, $a + d = 2\times 7 = 14 \quad \therefore d = 9$ B1

$u_6 = 5 + (5\times 9) = 5 + 45 = 50$ M1 A1

(c) $= \frac{15}{2}[10 + (14\times 9)] = \frac{15}{2}\times 136 = 1020$ M1 A1

(d) $5 + 9(n-1) < 400$ M1

$n < \frac{395}{9} + 1$ M1

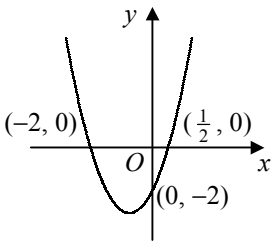
$n < 44\frac{8}{9} \quad \therefore$ 44 terms A1 **(10)**

---

8. *(a)* $(2x - 1)(x + 2) = 0$ M1

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

(b)



B2

(c) (0, –2), B1

(–4, 0), (1, 0) M1 A1

(d) $f(x - 1) = 2(x - 1)^2 + 3(x - 1) - 2$ M1 A1

$= 2x^2 - x - 3$

$\therefore\ a = 2,\ b = -1,\ c = -3$ A1 **(10)**

---

9. *(a)* $x(x^2 + 3x - 4) = 0$ M1

$x(x + 4)(x - 1) = 0$ M1

$x = 0$ (at O), -4, 1

$\therefore$ (–4, 0), (1, 0) A1

(b) $\frac{dy}{dx} = 3x^2 + 6x - 4$ M1 A1

grad $= -4$ M1

$\therefore\ y = -4x$ A1

(c) $x^3 + 3x^2 - 4x = -4x$ M1

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

$x^2(x + 3) = 0$ M1

$x = 0$ (at O), -3 A1

$\therefore$ (–3, 12) A1 **(11)**

---

10. *(a)* $y = 0\ \therefore x = 7 \quad \Rightarrow \quad A\ (7, 0)$ M1 A1

(b) l_1: $y = 14 - 2x\ \therefore$ grad $= -2$ B1

l_2: $y - 6 = -2(x + 6)$ M1

$y = -2x - 6$ A1

(c) $y = 0\ \therefore x = -3 \quad \Rightarrow \quad C\ (-3, 0)$ B1

(d) grad $CD = \frac{-1}{-2} = \frac{1}{2}$ M1

eqn CD: $y - 0 = \frac{1}{2}(x + 3)$ M1 A1

intersection with l_1: $\frac{1}{2}(x + 3) = 14 - 2x$

$x = 5$ M1

$y = 14 - (2 \times 5) = 4$

$\therefore D\ (5, 4)$ A1

(e) $AC = 7 - (-3) = 10$

area $= \frac{1}{2} \times 10 \times 4 = 20$ M1 A1 **(13)**

Total **(75)**

Performance Record – C1 Paper D

Question no.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	Total
Topic(s)	surds	diff.	recur. relation	rep. root, inequal.	simul. eqn	integr.	AP	transform.	diff., tangent	straight lines	
Marks	3	4	4	6	7	7	10	10	11	13	75
Student											

FOR EDEXCEL

GCE Examinations

Advanced Subsidiary

Core Mathematics C1

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.

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(B) marks are independent of method marks.

Written by Shaun Armstrong

C1 Paper E – Marking Guide

1. *(a)* $= \frac{18}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = 6\sqrt{3}$ M1 A1

(b) $= 4 - 2\sqrt{3} - 4\sqrt{3} + 6 = 10 - 6\sqrt{3}$ M1 A1 **(4)**

---

2. $3x^2 - 5 = 2x$ M1

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

$(3x - 5)(x + 1) = 0$ M1

$x = -1, \frac{5}{3}$ A2 **(4)**

---

3. $x - 5y = 7 \Rightarrow y = \frac{1}{5}x - \frac{7}{5} \therefore$ grad $= \frac{1}{5}$ B1

grad $m = \frac{-1}{\frac{1}{5}} = -5$ M1 A1

$\therefore\ y - 1 = -5(x + 4)$ M1

$y = -5x - 19$ A1 **(5)**

---

4. *(a)* 1, 7, 25, 79 B2

(b) $7 = a + b$ M1

$25 = 7a + b$ A1

subtracting, $6a = 18$ M1

$a = 3, b = 4$ A1 **(6)**

---

5. *(a)* $8x - x^{\frac{5}{2}} = 0$

$x(8 - x^{\frac{3}{2}}) = 0$

$x = 0$ (at O) or $x^{\frac{3}{2}} = 8$ M1

$\therefore\ x = (\sqrt[3]{8})^2 = 4$ M1 A1

(b) $\frac{dy}{dx} = 8 - \frac{5}{2}x^{\frac{3}{2}}$ M1 A1

grad $= 8 - (\frac{5}{2} \times 8) = -12$ M1 A1 **(7)**

---

6. *(a)* $f(x) = 2[x^2 - 2x] + 1$ M1

$= 2[(x - 1)^2 - 1] + 1$ M1

$= 2(x - 1)^2 - 1, \quad a = 2, b = -1, c = -1$ A2

(b) $x = 1$ B1

(c) $2(x - 1)^2 - 1 = 3$

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

$x = 1 \pm \sqrt{2}$ M1 A1 **(8)**

---

7. *(a)* $f(x) = \frac{x^2 - 8x + 16}{2x^{\frac{1}{2}}}$ M1

$f(x) = \frac{1}{2}x^{\frac{3}{2}} - 4x^{\frac{1}{2}} + 8x^{-\frac{1}{2}}, \quad A = \frac{1}{2}, B = -4, C = 8$ A2

(b) $f'(x) = \frac{3}{4}x^{\frac{1}{2}} - 2x^{-\frac{1}{2}} - 4x^{-\frac{3}{2}}$ M1 A2

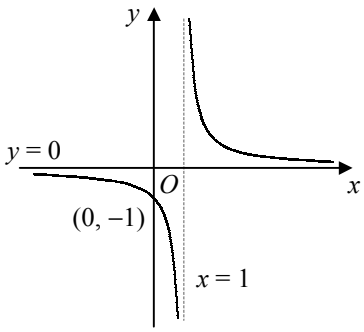
$f'(x) = \frac{1}{4}x^{-\frac{3}{2}}(3x^2 - 8x - 16)$ M1

$f'(x) = \frac{1}{4}x^{-\frac{3}{2}}(3x + 4)(x - 4) = \frac{(3x + 4)(x - 4)}{4x^{\frac{3}{2}}}$ M1 A1 **(9)**

---

8. *(a)* translation by 1 unit in the positive x-direction — B2

(b)



B3

(c) $\frac{1}{x-1} = 2 + \frac{1}{x}$

$x = 2x(x-1) + (x-1)$ — M1

$2x^2 - 2x - 1 = 0$ — A1

$x = \frac{2 \pm \sqrt{4+8}}{4}$ — M1

$x = \frac{2 \pm 2\sqrt{3}}{4}$ — M1

$x = \frac{1}{2} \pm \frac{1}{2}\sqrt{3}$ — A1 **(10)**

---

9. *(a)* $S_6 = \frac{6}{2}[3000 + (5 \times -x)] = 8100$ — M1 A1

$3000 - 5x = 2700, \quad x = 60$ — M1 A1

(b) $= 1500 - (7 \times 60) = 1500 - 420 = £1080$ — M1 A1

(c) $S_n = \frac{n}{2}[3000 - 60(n-1)]$ — M1

$= n[1500 - 30(n-1)]$

$= 30n[50 - (n-1)] = 30n(51 - n) \qquad [\, k = 30 \,]$ — M1 A1

(d) the value of sales in a month would become negative which is not possible — B1 **(10)**

---

10. *(a)* $y = \int (3x^2 + 4x + k)\ dx$

$y = x^3 + 2x^2 + kx + c$ — M1 A2

$(0, -2) \ \therefore c = -2$ — B1

$(2, 18) \ \therefore 18 = 8 + 8 + 2k - 2$ — M1

$k = 2$ — A1

$y = x^3 + 2x^2 + 2x - 2$ — A1

(b) $x^3 + 2x^2 + 2x - 2 = x - 2$

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

$x(x^2 + 2x + 1) = 0$ — M1

$x(x+1)^2 = 0$ — M1

repeated root $\therefore$ tangent — A1

point of contact where $x = -1$ — M1

$\therefore \ (-1, -3)$ — A1 **(12)**

Total **(75)**

Performance Record – C1 Paper E

Question no.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	Total
Topic(s)	surds	quad.	straight lines	sequence, recur. relation	indices, diff.	compl. square	diff.	transform., quad. formula	AP	integr., rep. root	
Marks	4	4	5	6	7	8	9	10	10	12	75
Student											

FOR EDEXCEL

GCE Examinations

Advanced Subsidiary

Core Mathematics C1

Paper F

MARKING GUIDE

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Written by Shaun Armstrong

C1 Paper F – Marking Guide

1. $x^4 - 5x^2 - 14 = 0, \quad (x^2 + 2)(x^2 - 7) = 0$ — M1
$x^2 = -2$ (no solutions) or 7 — A1
$x = \pm\sqrt{7}$ — A1 **(3)**

---

2. $= \frac{2}{3\sqrt{5}+7} \times \frac{3\sqrt{5}-7}{3\sqrt{5}-7} = \frac{6\sqrt{5}-14}{45-49} = \frac{7}{2} - \frac{3}{2}\sqrt{5}$ — M2 A1 **(3)**

---

3. *(a)* $x = (\sqrt[3]{27})^2 = 3^2 = 9$ — M1 A1

(b) $= (\frac{9}{4})^{-\frac{1}{2}} = \sqrt{\frac{4}{9}} = \frac{2}{3}$ — M1 A1 **(4)**

---

4. cubic, coeff of $x^3 = 1$, crosses x-axis at $(-1, 0)$, touches at $(3, 0)$
$\therefore \ y = (x + 1)(x - 3)^2$ — M1 A1
$= (x + 1)(x^2 - 6x + 9)$
$= x^3 - 6x^2 + 9x + x^2 - 6x + 9$ — M1
$= x^3 - 5x^2 + 3x + 9$
$\therefore \ a = -5, b = 3, c = 9$ — A2 **(5)**

---

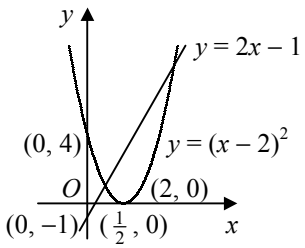
5. *(a)* $y = \frac{1}{2}x^2 - \frac{3}{2}x^{-2}$ — M1 A1

$\frac{dy}{dx} = x + 3x^{-3}$ — M1 A1

(b) $\frac{d^2y}{dx^2} = 1 - 9x^{-4} = \frac{x^4 - 9}{x^4}$ — M1 A1 **(6)**

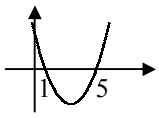
---

6. *(a)*



B2
B3

(b) $x^2 - 4x + 4 > 2x - 1$
$x^2 - 6x + 5 > 0$
$(x - 1)(x - 5) > 0$ — M1



M1
$x < 1$ or $x > 5$ — A1 **(8)**

---

7. *(a)* $\frac{dy}{dx} = \frac{1}{2} + x^{-2}$ — M1 A1

grad $= \frac{1}{2} + 2^{-2} = \frac{3}{4}$ — M1 A1

(b) $x = 2 \ \therefore \ y = \frac{7}{2}$ — B1

$y - \frac{7}{2} = \frac{3}{4}(x - 2)$ — M1
$4y - 14 = 3x - 6$
$3x - 4y + 8 = 0$ — A1

(c) at B, grad $= \frac{3}{4}$
$\therefore \ \frac{1}{2} + x^{-2} = \frac{3}{4}$ — M1
$x^2 = 4, \quad x = 2$ (at A), -2 — A1
$\therefore \ B\ (-2, \frac{5}{2})$ — A1 **(10)**

---

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

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

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

$x = 7$ A1

$\therefore B\ (7, 6)$ A1

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

(d) l_2: $y = \frac{3}{4}x + \frac{3}{4}$ $\therefore$ 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)**

---

9. *(a)* $a + 2d = 5\frac{1}{2}$ (1) B1

$\frac{4}{2}(2a + 3d) = 22\frac{3}{4}$ (2) M1 A1

(2) $\Rightarrow$ $4a + 6d = 22\frac{3}{4}$

(1) $\Rightarrow$ $3a + 6d = 16\frac{1}{2}$

subtracting, $a = 22\frac{3}{4} - 16\frac{1}{2} = 6\frac{1}{4}$ M1 A1

$d = \frac{1}{2}(5\frac{1}{2} - 6\frac{1}{4}) = -\frac{3}{8}$ M1 A1

(b) $6\frac{1}{4} - \frac{3}{8}(n - 1) > 0$ M1

$50 - 3(n - 1) > 0$

$n < 17\frac{2}{3}$ $\therefore$ 17 positive terms M1 A1

(c) $= S_{17} = \frac{17}{2}[12\frac{1}{2} + (16 \times -\frac{3}{8})]$ M1

$= \frac{17}{2}(12\frac{1}{2} - 6) = \frac{17}{2} \times \frac{13}{2} = \frac{221}{4} = 55\frac{1}{4}$ A1 **(12)**

---

10. *(a)* grad $= 8 - 2 = 6$ B1

$\therefore\ y - 1 = 6(x - 1)$ M1

$y = 6x - 5$ A1

(b) $y = \int (8x - \frac{2}{x^3})\ dx$

$y = 4x^2 + x^{-2} + c$ M1 A2

$(1, 1)$ $\therefore\ 1 = 4 + 1 + c$

$c = -4$ M1

$y = 4x^2 + x^{-2} - 4$ A1

(c) $4x^2 + x^{-2} - 4 = 0$

$4x^4 - 4x^2 + 1 = 0$ M1

$(2x^2 - 1)^2 = 0$ M1

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

$x = \pm\frac{1}{\sqrt{2}}$ A1

$x = \pm\frac{1}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \pm\frac{1}{2}\sqrt{2}$ M1 A1 **(13)**

Total **(75)**

Performance Record – C1 Paper F

Question no.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	Total
Topic(s)	quad.	surds	indices	cubic	diff.	curve sketch, inequal.	diff., tangents	straight lines	AP	integr., tangent	
Marks	3	3	4	5	6	8	10	11	12	13	75
Student											

FOR EDEXCEL

GCE Examinations

Advanced Subsidiary

Core Mathematics C1

Paper G

MARKING GUIDE

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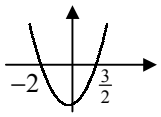
Written by Shaun Armstrong

C1 Paper G – Marking Guide

1. $(3^2)^x = 3^{x+2}$ M1
$2x = x + 2, \quad x = 2$ M1 A1 **(3)**

---

2. $2x^2 + x - 6 \leq 0$
$(2x - 3)(x + 2) \leq 0$ M1
critical values: $-2, \frac{3}{2}$ A1



M1
$-2 \leq x \leq \frac{3}{2}$ A1 **(4)**

---

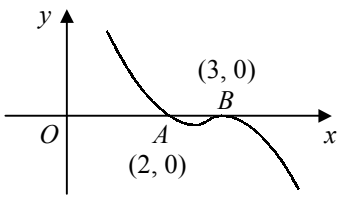
3. *(a)* $y = x^2 - 2ax + a^2$ B1
$\frac{dy}{dx} = 2x - 2a = 2x - 6$ M1 A1
$\therefore \ a = 3$ A1
(b) translation by 3 units in the negative x-direction B2 **(6)**

---

4. *(a)* $x^2 - 4x + 2 = 0$
$x = \frac{4 \pm \sqrt{16-8}}{2} = \frac{4 \pm 2\sqrt{2}}{2}$ M2
$x = 2 \pm \sqrt{2}, \quad \therefore \ (2 - \sqrt{2}, 0), (2 + \sqrt{2}, 0)$ A2
(b) $x^2 - 4x + 2 = 2x + k, \quad x^2 - 6x + 2 - k = 0$
tangent $\therefore$ equal roots, $b^2 - 4ac = 0$
$(-6)^2 - [4 \times 1 \times (2 - k)] = 0$ M1 A1
$36 - 4(2 - k) = 0, \quad k = -7$ A1 **(7)**

---

5. *(a)*

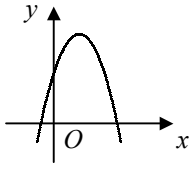


B3

(b) $y = (2 - x)(9 - 6x + x^2)$ M1
$y = 18 - 12x + 2x^2 - 9x + 6x^2 - x^3$ M1
$y = 18 - 21x + 8x^2 - x^3$ A1
$\frac{dy}{dx} = -21 + 16x - 3x^2$ M1 A1
grad $= -21 + 32 - 12 = -1$
$\therefore \ y - 0 = -(x - 2)$ M1
$x + y = 2$ A1 **(10)**

---

6. *(a)* $f(x) = 9 - [x^2 - 6x]$ M1
$= 9 - [(x - 3)^2 - 9]$ M1
$= 18 - (x - 3)^2, \quad A = 18, B = -3$ A2
(b) 18 B1
(c) $18 - (x - 3)^2 = 0, \quad x - 3 = \pm\sqrt{18}$ M1
$x = 3 \pm 3\sqrt{2}$ M1 A1
(d)



B2 **(10)**

---

7. *(a)* *(i)* $\frac{20}{2}[2a + (19 \times 7)] = 530$ M1

$2a + 133 = 53,\ a = -40$ M1 A1

(ii) $= -40 + 7k = -40 + 42 = 2$ M1 A1

(b) *(i)* $u_1 = (1 + k)^2,\ u_2 = (2 + k)^2$ B1

$(2 + k)^2 = 2(1 + k)^2$ M1

$4 + 4k + k^2 = 2 + 4k + 2k^2$

$k^2 = 2$ M1

$k > 0\ \therefore k = \sqrt{2}$ A1

(ii) $u_3 = (3 + \sqrt{2})^2 = 9 + 6\sqrt{2} + 2 = 11 + 6\sqrt{2}$ M1 A1 **(11)**

---

8. *(a)* grad $= \frac{1-5}{4-(-2)} = -\frac{2}{3}$ M1 A1

$\therefore\ y - 5 = -\frac{2}{3}(x + 2)$ M1

$3y - 15 = -2x - 4$

$2x + 3y = 11$ A1

(b) grad $l_2 = \frac{-1}{-\frac{2}{3}} = \frac{3}{2}$ M1 A1

$\therefore\ y - 1 = \frac{3}{2}(x - 4)$ $[\ 3x - 2y = 10\ ]$ A1

(c) at C, $x = 0\ \therefore y = -5\ \Rightarrow\ C\,(0, -5)$ B1

$AB = \sqrt{(4+2)^2 + (1-5)^2} = \sqrt{36+16} = \sqrt{52}$ M1 A1

$BC = \sqrt{(0-4)^2 + (-5-1)^2} = \sqrt{16+36} = \sqrt{52}$

$AB = BC\ \therefore$ triangle ABC is isosceles A1 **(11)**

---

9. *(a)* 2 B1

(b) $1 + \frac{2}{\sqrt{x}} = 2$ M1

$\sqrt{x} = 2$ M1

$x = 4$ A1

(c) $x = 4\ \therefore y = 2(4) - 1 = 7$ B1

$y = \int (1 + \frac{2}{\sqrt{x}})\ \mathrm{d}x$

$y = x + 4x^{\frac{1}{2}} + c$ M1 A2

$(4, 7)\ \therefore\ 7 = 4 + 8 + c$

$c = -5$ M1

$y = x + 4x^{\frac{1}{2}} - 5$ A1

(d) $x + 4x^{\frac{1}{2}} - 5 = 0$

$(x^{\frac{1}{2}} + 5)(x^{\frac{1}{2}} - 1) = 0$ M1

$x^{\frac{1}{2}} = -5$ (no real solutions), 1 A1

$x = 1\ \therefore (1, 0)$ and no other point A1 **(13)**

Total **(75)**

Performance Record – C1 Paper G

Question no.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	Total
Topic(s)	indices	inequal.	diff., transform.	quad. formula, rep. root	curve sketch, diff., tangent	compl. square	AP, sequence	straight lines	integr.	
Marks	3	4	6	7	10	10	11	11	13	75
Student										

FOR EDEXCEL

GCE Examinations

Advanced Subsidiary

Core Mathematics C1

Paper H

MARKING GUIDE

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Written by Shaun Armstrong

C1 Paper H – Marking Guide

1. AP: $a = 7, l = 94$ — B1

$S_{30} = \frac{30}{2}(7 + 94) = 15 \times 101 = 1515$ — M1 A1 **(3)**

---

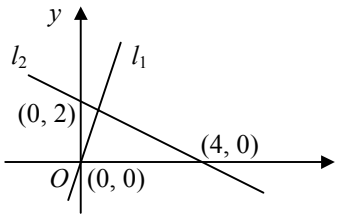
2. *(a)* $= (x + 3)^2 - 9 + 7$ — M1

$= (x + 3)^2 - 2$ — A2

(b) $(-3, -2)$ — B1 **(4)**

---

3. *(a)*



B2 B1

(b) $l_1 \quad \Rightarrow \quad 6x - 2y = 0$

$l_2: \quad x + 2y - 4 = 0$

adding $\quad 7x - 4 = 0, \quad x = \frac{4}{7}$ — M1 A1

$\therefore$ intersect at $(\frac{4}{7}, \frac{12}{7})$ — A1 **(6)**

---

4. $5x + y = 7 \quad \Rightarrow \quad y = 7 - 5x$ — M1

sub. into $3x^2 + y^2 = 21$

$3x^2 + (7 - 5x)^2 = 21$ — M1

$2x^2 - 5x + 2 = 0$ — A1

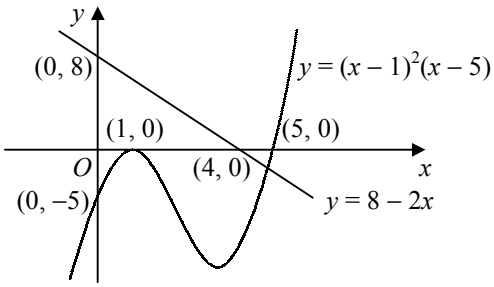
$(2x - 1)(x - 2) = 0$ — M1

$x = \frac{1}{2}, 2$ — A1

$\therefore \ (\frac{1}{2}, \frac{9}{2})$ and $(2, -3)$ — M1 A1 **(7)**

---

5. *(a)*



B3

B2

(b) the graphs intersect at exactly one point $\therefore$ one solution — B1

(c) $n = 4$ — B1 **(7)**

---

6. *(a)* $\frac{dy}{dx} = 2x + 2$ — M1 A1

grad of tangent $= 2$ — A1

grad of normal $= \frac{-1}{2} = -\frac{1}{2}$ — M1

$\therefore \ y = -\frac{1}{2}x$ — A1

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

$2x^2 + 5x = 0, \quad x(2x + 5) = 0$ — M1

$x = 0$ (at O), $-\frac{5}{2}$ — A1

$\therefore \ (-\frac{5}{2}, \frac{5}{4})$ — A1 **(8)**

---

7. *(a)* $\frac{dy}{dx} = \frac{1}{2}x^{-\frac{1}{2}} + 2x^{-\frac{3}{2}}$ — M1 A2

(b) $\frac{d^2y}{dx^2} = -\frac{1}{4}x^{-\frac{3}{2}} - 3x^{-\frac{5}{2}}$ — M1 A1

(c) LHS $= 4x^2(-\frac{1}{4}x^{-\frac{3}{2}} - 3x^{-\frac{5}{2}}) + 4x(\frac{1}{2}x^{-\frac{1}{2}} + 2x^{-\frac{3}{2}}) - (x^{\frac{1}{2}} - 4x^{-\frac{1}{2}})$

$= -x^{\frac{1}{2}} - 12x^{-\frac{1}{2}} + 2x^{\frac{1}{2}} + 8x^{-\frac{1}{2}} - x^{\frac{1}{2}} + 4x^{-\frac{1}{2}}$ — M1 A1

$= 0$ — A1 **(8)**

---

8. *(a)* $S_n = 1 + 2 + 3 + \ldots + n$ — B1

$S_n = n + (n-1) + (n-2) + \ldots + 1$ — M1

adding, $2S_n = n(n+1)$ — M1

$S_n = \frac{1}{2}n(n+1)$ — A1

(b) *(i)* $= S_{200} - S_{99}$ — M1

$= \frac{1}{2} \times 200 \times 201 - \frac{1}{2} \times 99 \times 100$ — M1

$= 20\,100 - 4950 = 15\,150$ — A1

(ii) $= 3 \times 15\,150 = 45\,450$ — M1 A1 **(9)**

---

9. *(a)* *(i)* $= 16 - 24\sqrt{2} + 18 = 34 - 24\sqrt{2}$ — M1 A1

(ii) $= \frac{1}{2+\sqrt{2}} \times \frac{2-\sqrt{2}}{2-\sqrt{2}}$ — M1

$= \frac{2-\sqrt{2}}{4-2} = 1 - \frac{1}{2}\sqrt{2}$ — M1 A1

(b) *(i)* $y^2 - 9y + 8 = 0$

$(y-1)(y-8) = 0$ — M1

$y = 1, 8$ — A1

(ii) let $y = x^{\frac{3}{2}} \Rightarrow y^2 + 8 = 9y$

$\therefore\ x^{\frac{3}{2}} = 1, 8$ — B1

$x = 1$ or $(\sqrt[3]{8})^2$ — M1

$x = 1$ or 4 — A1 **(10)**

---

10. *(a)* $f(x) = \int (3x^{\frac{1}{2}} - 4x^{-\frac{1}{2}})\ dx$

$f(x) = 2x^{\frac{3}{2}} - 8x^{\frac{1}{2}} + c$ — M1 A2

$(0, 0)\ \therefore c = 0$ — M1

$f(x) = 2x^{\frac{3}{2}} - 8x^{\frac{1}{2}}$ — A1

(b) $2x^{\frac{3}{2}} - 8x^{\frac{1}{2}} = 0$

$2x^{\frac{1}{2}}(x-4) = 0$ — M1

$x = 0$ (at O), $4\ \therefore A\ (4, 0)$ — A1

(c) $x = 2\ \therefore y = 2(2\sqrt{2}) - 8(\sqrt{2}) = -4\sqrt{2}$ — M1 A1

grad $= 3\sqrt{2} - \frac{4}{\sqrt{2}} = 3\sqrt{2} - 2\sqrt{2} = \sqrt{2}$ — M1 A1

$\therefore\ y + 4\sqrt{2} = \sqrt{2}(x-2)$ — M1

$y = \sqrt{2}x - 6\sqrt{2}$ — A1 **(13)**

Total **(75)**

Performance Record – C1 Paper H

Question no.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	Total
Topic(s)	AP	compl. square	straight lines	simul. eqn	curve sketch	diff., normal	diff.	AP	surds, quad.	integr., tangent	
Marks	3	4	6	7	7	8	8	9	10	13	75
Student											

FOR EDEXCEL

GCE Examinations

Advanced Subsidiary

Core Mathematics C1

Paper I

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.

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(B) marks are independent of method marks.

Written by Shaun Armstrong

C1 Paper I – Marking Guide

1. $u_k = k^2 - 6k + 11 = 38$

$\therefore\ k^2 - 6k - 27 = 0$ M1

$(k + 3)(k - 9) = 0$ M1

$k \geq 1\ \ \therefore\ k = 9$ A1 **(3)**

---

2. $= \frac{4}{3}x^3 - \frac{2}{3}x^{\frac{3}{2}} + c$ M1 A2 **(3)**

---

3. $4\sqrt{12} - \sqrt{75} = 4(2\sqrt{3}) - 5\sqrt{3} = 3\sqrt{3}$ M1 A1

$= \sqrt{9\times 3} = \sqrt{27}, \qquad n = 27$ M1 A1 **(4)**

---

4. *(a)* $= (6 + \sqrt[4]{16})^{\frac{1}{3}}$ B1 M1

$= (6 + 2)^{\frac{1}{3}} = \sqrt[3]{8} = 2$ A1

(b) $\frac{3}{\sqrt{x}} = 4$ M1

$\sqrt{x} = \frac{3}{4}$ M1

$x = \frac{9}{16}$ A1 **(6)**

---

5. *(a)* $f(x) = \int (-\frac{1}{x^2})\ dx$

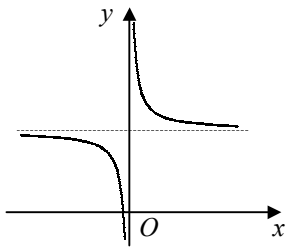
$f(x) = x^{-1} + c$ M1 A1

$(-1, 3)\ \ \therefore\ 3 = -1 + c$

$c = 4$ M1

$f(x) = x^{-1} + 4$ A1

(b)



B2

asymptotes: $x = 0$ and $y = 4$ B1 **(7)**

---

6. *(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)**

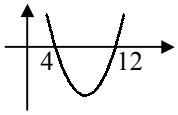
---

7. *(a)* real roots $\therefore\ b^2 - 4ac \geq 0$

$(-k)^2 - [4 \times 4 \times (k - 3)] \geq 0$ M1

$k^2 - 16k + 48 \geq 0$ A1

(b) $(k - 4)(k - 12) \geq 0$



M1

M1

$k \leq 4$ or $k \geq 12$ A1

(c) $k = 4$ B1

$4x^2 - 4x + 1 = 0$

$(2x - 1)^2 = 0$ M1

$x = \frac{1}{2}$ A1 **(8)**

---

8. *(a)* *(i)* $a = 3,\ a + 2d = 27$ B1

$2d = 24,\ d = 12$ M1 A1

(ii) $= \frac{11}{2}[6 + (10 \times 12)]$ M1

$= \frac{11}{2} \times 126 = 693$ A1

(b) $a = 56,\ l = 144$ B1

$56 + 8(n - 1) = 144,\ n = 12$ M1 A1

$S_{12} = \frac{12}{2}(56 + 144) = 6 \times 200 = 1200$ M1 A1 **(10)**

---

9. *(a)* $x^3 - 5x^2 + 7x = 0$

$x(x^2 - 5x + 7) = 0$ M1

$x = 0$ or $x^2 - 5x + 7 = 0$

$b^2 - 4ac = (-5)^2 - (4 \times 1 \times 7) = -3$ M1

$b^2 - 4ac < 0$ $\therefore$ no real roots A1

$\therefore$ only crosses x-axis at one point A1

(b) $\frac{dy}{dx} = 3x^2 - 10x + 7$ M1 A1

grad of tangent $= 27 - 30 + 7 = 4$

grad of normal $= \frac{-1}{4} = -\frac{1}{4}$ M1 A1

$\therefore\ y - 3 = -\frac{1}{4}(x - 3)$ M1

$4y - 12 = -x + 3$

$x + 4y = 15$ A1

(c) $x = 0 \Rightarrow y = \frac{15}{4}$

$y = 0 \Rightarrow x = 15$ M1

area $= \frac{1}{2} \times \frac{15}{4} \times 15 = \frac{225}{8} = 28\frac{1}{8}$ M1 A1 **(13)**

---

10. *(a)* grad $= \frac{4-3}{3-(-1)} = \frac{1}{4}$ M1 A1

$\therefore\ y - 3 = \frac{1}{4}(x + 1)$ M1

$4y - 12 = x + 1$

$x - 4y + 13 = 0$ A1

(b) perp grad $= \frac{-1}{\frac{1}{4}} = -4$ M1

line through A, perp l_1: $y - 3 = -4(x + 1)$ M1

$y = -4x - 1$ A1

intersection with l_2: $x - 4(-4x - 1) - 21 = 0$

$x = 1,\ \therefore (1, -5)$ M1 A1

dist. A to $(1, -5) = \sqrt{(1+1)^2 + (-5-3)^2} = \sqrt{4+64} = \sqrt{68}$ M1

$\therefore$ dist. between lines $= \sqrt{68} = \sqrt{4 \times 17} = 2\sqrt{17}$ $[\ k = 2\ ]$ A1

(c) $AB = \sqrt{(3+1)^2 + (4-3)^2} = \sqrt{16+1} = \sqrt{17}$ M1

area $= \sqrt{17} \times 2\sqrt{17} = 34$ A1 **(13)**

Total **(75)**

Performance Record – C1 Paper I

Question no.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	Total
Topic(s)	sequence	integr.	surds	indices	integr.	compl. square, transform.	roots, inequal.	AP	diff., normal	straight lines	
Marks	3	3	4	6	7	8	8	10	13	13	75
Student											

FOR EDEXCEL

GCE Examinations

Advanced Subsidiary

Core Mathematics C1

Paper J

MARKING GUIDE

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Written by Shaun Armstrong

C1 Paper J – Marking Guide

1. grad $AB = \frac{-2-0}{5-(-3)} = -\frac{1}{4}$ — M1 A1

$\therefore\ y - 1 = -\frac{1}{4}(x - 4)$ — M1

$4y - 4 = -x + 4$

$x + 4y = 8$ — A1 **(4)**

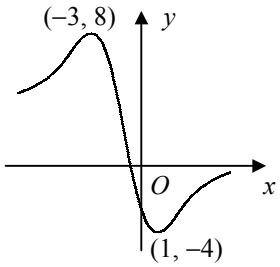
---

2. $= \sqrt{\frac{45}{2}} = \frac{3\sqrt{5}}{\sqrt{2}}$ — M1 A1

$= \frac{3\sqrt{5}}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{3}{2}\sqrt{10}$ — M1 A1 **(4)**

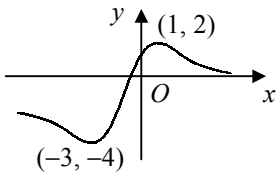
---

3. *(a)*



B3

(b)



B3 **(6)**

---

4. *(a)* $4x - 8 < 2x + 5$

$2x < 13$ — M1

$x < 6\frac{1}{2}$ — A1

(b) $(2^2)^{y+1} = (2^3)^{2y-1}$ — M1

$2^{2y+2} = 2^{6y-3}$ — A1

$2y + 2 = 6y - 3$ — M1

$y = \frac{5}{4}$ — A1 **(6)**

---

5. *(a)* $t_2 = 3k - 7$ — B1

$t_3 = k(3k - 7) - 7 = 3k^2 - 7k - 7$ — M1 A1

(b) $3k^2 - 7k - 7 = 13$

$3k^2 - 7k - 20 = 0$

$(3k + 5)(k - 4) = 0$ — M1

$k = -\frac{5}{3}, 4$ — A2 **(6)**

---

6. $x = 2\ \ \therefore y = \sqrt{16} = 4$ — B1

$y = \sqrt{8}\sqrt{x} = 2\sqrt{2}\,x^{\frac{1}{2}}$ — B1

$\frac{dy}{dx} = \sqrt{2}\,x^{-\frac{1}{2}}$ — M1 A1

grad $= \frac{\sqrt{2}}{\sqrt{2}} = 1$ — M1

$\therefore\ y - 4 = 1(x - 2)$ $\quad [\, y = x + 2\,]$ — M1 A1 **(7)**

---

7. *(a)* $a = 20 \times 7 = 140$, $d = 2 \times 7 = 14$ — B1
$u_5 = 140 + (4 \times 14) = 196$ — M1 A1

(b) $S_8 = \frac{8}{2}[280 + (7 \times 14)] = 4 \times 378 = 1512$ — M1 A1

(c) $140 + 14(n - 1) > 300$ — M1
$n > \frac{160}{14} + 1$ — M1
$n > 12\frac{3}{7}$ $\therefore n = 13$ — A1 **(8)**

---

8. *(a)* $t = 0, A = 4 \Rightarrow 4 = p^2$ — M1
$p > 0$ $\therefore p = 2$ — A1
$t = 5, A = 9 \Rightarrow 9 = (2 + 5q)^2$ — M1
$2 + 5q = \pm 3$
$q = \frac{1}{5}(-2 \pm 3)$ — M1
$q > 0$ $\therefore q = \frac{1}{5}$ — A1

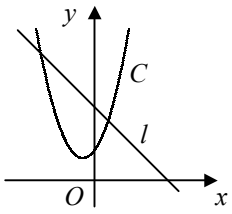
(b) $A = (2 + \frac{1}{5}t)^2 = 4 + \frac{4}{5}t + \frac{1}{25}t^2$ — M1 A1
$\frac{dA}{dt} = \frac{4}{5} + \frac{2}{25}t$ — M1 A1

(c) $t = 15$ $\therefore \frac{dA}{dt} = \frac{4}{5} + \frac{2}{25}(15) = 2$ cm^2 s^{-1} — M1 A1 **(11)**

---

9. *(a)* $x^2 + 2x + 4 = (x + 1)^2 - 1 + 4$ — M1
$= (x + 1)^2 + 3$ — A1
minimum: $(-1, 3)$ — A2

(b)



B2
B1

(c) $x^2 + 2x + 4 = 8 - x$
$x^2 + 3x - 4 = 0$
$(x + 4)(x - 1) = 0$ — M1
$x = -4, 1$ — A1
$\therefore (-4, 12)$ and $(1, 7)$ — M1 A1 **(11)**

---

10. *(a)* $y = \int (3 - \frac{2}{x^2})\, dx$
$y = 3x + 2x^{-1} + c$ — M1 A2
$(2, 6)$ $\therefore$ $6 = 6 + 1 + c$
$c = -1$ — M1
$y = 3x + 2x^{-1} - 1$ — A1

(b) grad $= 3 - \frac{1}{2} = \frac{5}{2}$ — M1 A1
$y - 6 = \frac{5}{2}(x - 2)$ — M1
$2y - 12 = 5x - 10$
$5x - 2y + 2 = 0$ — A1

(c) $3x + 2x^{-1} - 1 = x + 3$
$3x^2 + 2 - x = x^2 + 3x$ — M1
$x^2 - 2x + 1 = 0$
$(x - 1)^2 = 0$, repeated root $\therefore$ tangent — M1 A1 **(12)**

Total **(75)**

Performance Record – C1 Paper J

Question no.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	Total
Topic(s)	straight line	surds	transform.	inequal., indices	recur. relation	diff., tangent	AP	diff., rate of change	compl. square, curve sketch	integr., tangents	
Marks	4	4	6	6	6	7	8	11	11	12	75
Student											

FOR EDEXCEL

GCE Examinations

Advanced Subsidiary

Core Mathematics C1

Paper K

MARKING GUIDE

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Written by Shaun Armstrong

C1 Paper K – Marking Guide

1. $(2^2)^{y+3} = 2^3$ M1
$2y + 6 = 3$ M1
$y = -\frac{3}{2}$ A1 **(3)**

---

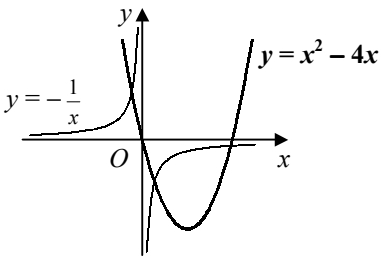
2. $= \int (3x^2 + \frac{1}{2}x^{-2})\ dx$ B1
$= x^3 - \frac{1}{2}x^{-1} + c$ M1 A2 **(4)**

---

3. $\frac{EH}{AD} = \frac{EF}{AB} \ \therefore\ \frac{EH}{\sqrt{5}} = \frac{1+\sqrt{5}}{3-\sqrt{5}}$ M1
$\frac{1+\sqrt{5}}{3-\sqrt{5}} = \frac{1+\sqrt{5}}{3-\sqrt{5}} \times \frac{3+\sqrt{5}}{3+\sqrt{5}} = \frac{3+\sqrt{5}+3\sqrt{5}+5}{9-5} = 2 + \sqrt{5}$ M2 A1
$\therefore EH = \sqrt{5}\,(2 + \sqrt{5}\,) = 5 + 2\sqrt{5}$ M1 A1 **(6)**

---

4. *(a)*



B2
B2

(b) 3 solutions B1
$x^2 - 4x + \frac{1}{x} = 0 \ \Rightarrow\ x^2 - 4x = -\frac{1}{x}$
and the graphs of $y = x^2 - 4x$ and $y = -\frac{1}{x}$ intersect at 3 points B1 **(6)**

---

5. *(a)* $(x + k)^2 - k^2 + 4 = 0$ M1
$(x + k)^2 = k^2 - 4$ A1
$x + k = \pm\sqrt{k^2 - 4}$ M1
$x = -k \pm \sqrt{k^2 - 4}$ A1

(b) $k = 3 \ \ \therefore x = -3 \pm \sqrt{3^2 - 4}$ M1
$= -3 \pm \sqrt{5}$ A1 **(6)**

---

6. *(a)* AP: $a = 77, l = -70$ B1
$S_{50} = \frac{50}{2}[77 + (-70)] = 25 \times 7 = 175$ M1 A1

(b) AP: $a = 2, d = \frac{1}{2}$ B2
$S_n = \frac{n}{2}[4 + \frac{1}{2}(n - 1)]$ M1
$= \frac{1}{4}n[8 + (n - 1)] = \frac{1}{4}n(n + 7) \qquad [\ k = \frac{1}{4}\ ]$ A1 **(7)**

---

7. $x - 3y + 7 = 0 \ \Rightarrow \quad x = 3y - 7$ M1
sub. into $x^2 + 2xy - y^2 = 7$
$(3y - 7)^2 + 2y(3y - 7) - y^2 = 7$ M1
$y^2 - 4y + 3 = 0$ A1
$(y - 1)(y - 3) = 0$ M1
$y = 1, 3$ A1
$\therefore\ x = -4,\ y = 1$ or $x = 2,\ y = 3$ M1 A1 **(7)**

---

8. *(a)* $\frac{dy}{dx} = 1 - 4x^{-3}$ B1

$\frac{d^2y}{dx^2} = 12x^{-4}$ M1 A1

(b) $y = \int (1 - 4x^{-3})\ dx$

$y = x + 2x^{-2} + c$ M1 A2

$x = -1, y = 0 \ \therefore \ 0 = -1 + 2 + c$

$c = -1$ M1

$y = x + 2x^{-2} - 1$

when $x = 2$, $y = 2 + \frac{1}{2} - 1 = \frac{3}{2}$ M1 A1 **(9)**

---

9. *(a)* $y = x - 6\sqrt{x} + 9$ M1 A1

$\frac{dy}{dx} = 1 - 3x^{-\frac{1}{2}} = 1 - \frac{3}{\sqrt{x}}$ M1 A1

(b) $x = 4 \ \therefore y = 1$

grad of tangent $= 1 - \frac{3}{2} = -\frac{1}{2}$ M1

grad of normal $= \frac{-1}{-\frac{1}{2}} = 2$ M1 A1

$\therefore \ y - 1 = 2(x - 4)$ M1

$y = 2x - 7$ A1

(c) at intersect: $x - 6\sqrt{x} + 9 = 2x - 7$

$x + 6\sqrt{x} - 16 = 0$ M1

$(\sqrt{x} + 8)(\sqrt{x} - 2) = 0$ M1

$\sqrt{x} = -8, 2$ A1

$\sqrt{x} = 2 \Rightarrow x = 4$ (at P)

$\sqrt{x} = -8 \Rightarrow$ no real solutions $\therefore$ normal does not intersect again A1 **(13)**

---

10. *(a)* $y - 4 = 3(x + 6)$ M1

$y = 3x + 22$ A1

(b) at B, $x = 0 \ \therefore y = 2 \quad \Rightarrow \quad B\ (0, 2)$ B1

at C, $x - 7(3x + 22) + 14 = 0$ M1

$x = -7$ A1

$\therefore \ C\ (-7, 1)$ A1

(c) grad $AB = \frac{2-4}{0-(-6)} = -\frac{1}{3}$ M1 A1

grad $AC = \frac{1-4}{-7-(-6)} = 3$

grad $AB \times$ grad $AC = -\frac{1}{3} \times 3 = -1$ M1

$\therefore$ AB perp to $AC \ \therefore \angle BAC = 90°$ A1

(d) $AB = \sqrt{(0+6)^2 + (2-4)^2} = \sqrt{36+4} = \sqrt{40} = 2\sqrt{10}$ M1 A1

$AC = \sqrt{(-7+6)^2 + (1-4)^2} = \sqrt{1+9} = \sqrt{10}$

area $= \frac{1}{2} \times 2\sqrt{10} \times \sqrt{10} = 10$ M1 A1 **(14)**

Total **(75)**

Performance Record – C1 Paper K

Question no.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	Total
Topic(s)	indices	integr.	surds	curve sketch	compl. square	AP	simul. eqn	diff., integr.	diff., normal	straight lines	
Marks	3	4	6	6	6	7	7	9	13	14	75
Student											

FOR EDEXCEL

GCE Examinations

Advanced Subsidiary

Core Mathematics C1

Paper L

MARKING GUIDE

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Written by Shaun Armstrong

C1 Paper L – Marking Guide

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

---

2. *(a)* $u_4 = \frac{5+1}{3} = 2$ — B1

(b) $5 = \frac{u_2+1}{3}$, $u_2 = 14$ — M1 A1

$14 = \frac{u_1+1}{3}$, $u_1 = 41$ — A1 **(4)**

---

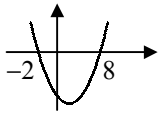
3. *(a)* $b^2 - 4ac = 12^2 - (4 \times 4 \times 9) = 0$ — M1
$\therefore$ 1 real root — A1

(b) $4x^2 + 12x + 9 = 8$
$4x^2 + 12x + 1 = 0$
$x = \frac{-12 \pm \sqrt{144-16}}{8}$ — M1
$= \frac{-12 \pm 8\sqrt{2}}{8}$ — M1
$= -\frac{3}{2} \pm \sqrt{2}$ — A2 **(6)**

---

4. *(a)* $5x > 15$ — M1
$x > 3$ — A1

(b) $(x + 2)(x - 8) < 0$ — M1



M1
$-2 < x < 8$ — A1

(c) $3 < x < 8$ — B1 **(6)**

---

5. *(a)* $(2 - \sqrt{x})^2 = 0$
$\sqrt{x} = 2$ — M1
$x = 4$ — A1

(b) $= (2 - \sqrt{3})^2 = 4 - 4\sqrt{3} + 3 = 7 - 4\sqrt{3}$ — M1 A1

(c) $= \int (2 - \sqrt{x})^2 \, dx$
$= \int (4 - 4\sqrt{x} + x) \, dx$ — B1
$= 4x - \frac{8}{3}x^{\frac{3}{2}} + \frac{1}{2}x^2 + c$ — M1 A2 **(8)**

---

6. *(a)* grad $= \frac{-4-6}{1-(-3)} = -\frac{5}{2}$ — M1 A1
$\therefore\ y - 6 = -\frac{5}{2}(x + 3)$ — M1
$2y - 12 = -5x - 15$
$5x + 2y + 3 = 0$ — A1

(b) m: $y = -\frac{2}{k}x - \frac{7}{k}$ $\therefore$ grad $= -\frac{2}{k}$ — M1 A1
l and m perp. $\therefore\ -\frac{5}{2} \times -\frac{2}{k} = -1$ — M1
$k = -5$ — A1 **(8)**

---

7. *(a)* $f(x) = \int (5 + \frac{4}{x^2})\ dx$

$f(x) = 5x - 4x^{-1} + c$ M1 A2

(b) $f(1) = 5 - 4 + c = 1 + c$ M1

$f(2) = 10 - 2 + c = 8 + c$

$f(2) = 2f(1) \quad \therefore \quad 8 + c = 2(1 + c)$ M1

$c = 6$ A1

$f(x) = 5x - 4x^{-1} + 6$

$f(4) = 20 - 1 + 6 = 25$ M1 A1 **(8)**

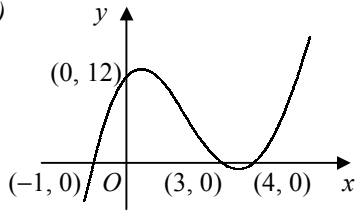
---

8. *(a)* $\text{LHS} = (x + 1)(x^2 - 7x + 12)$ M1

$= x^3 - 7x^2 + 12x + x^2 - 7x + 12$ M1

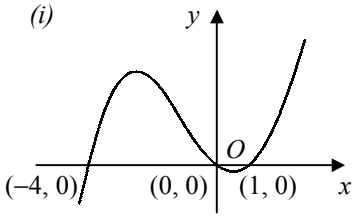
$= x^3 - 6x^2 + 5x + 12 = \text{RHS}$ A1

(b)

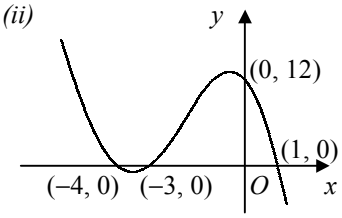


B3

(c) *(i)*



(ii)



B2 B2 **(10)**

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9. *(a)* *(i)* $= (t^2 - 5) - (t - 1) = t^2 - t - 4$ M1 A1

(ii) $= (t^2 - 5) + (t^2 - t - 4) = 2t^2 - t - 9$ M1 A1

(b) $2t^2 - t - 9 = 19$

$2t^2 - t - 28 = 0$

$(2t + 7)(t - 4) = 0$ M1

$t > 0 \quad \therefore \ t = 4$ A1

(c) $a = 4 - 1 = 3, \ d = 16 - 4 - 4 = 8$ B1

$u_{10} = 3 + (9 \times 8) = 3 + 72 = 75$ M1 A1

(d) $= \frac{40}{2}[6 + (39 \times 8)] = 20 \times 318 = 6360$ M1 A1 **(11)**

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10. *(a)* $A\ (0, 2)$ B1

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

$\text{grad} = 3$ M1

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

(b) 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)**

Total **(75)**

Performance Record – C1 Paper L

Question no.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	Total
Topic(s)	indices	recur. relation	quad. formula	inequals	surds, integr.	straight lines	integr.	curve sketch, transform.	AP	diff., tangent	
Marks	3	4	6	6	8	8	8	10	11	11	75
Student											