

GCE Examinations
Advanced / Advanced Subsidiary

Core Mathematics C1

Paper D

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.



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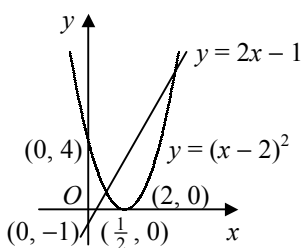
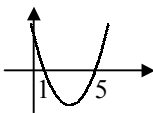
C1 Paper D – Marking Guide

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)

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

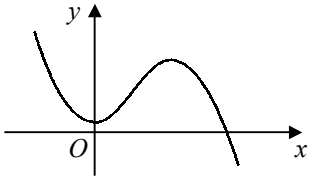
3. (i) $x^2 - 6x + 7 = 2x - 9$ M1
 $x^2 - 8x + 16 = 0$ M1
 $(x-4)^2 = 0$ A2
 $x = 4, y = -1$
(ii) the line is a tangent to the curve at the point $(4, -1)$ B1 (5)

4. (i) $= (6 + \sqrt[4]{16})^{\frac{1}{3}}$ B1 M1
 $= (6 + 2)^{\frac{1}{3}} = \sqrt[3]{8} = 2$ A1
(ii) $\frac{3}{\sqrt{x}} = 4$ M1
 $\sqrt{x} = \frac{3}{4}$ M1
 $x = \frac{9}{16}$ A1 (6)

5. (i)  B2
B2
(ii) $x^2 - 4x + 4 > 2x - 1$ M1
 $x^2 - 6x + 5 > 0$ M1
 $(x-1)(x-5) > 0$  A1 (7)
 $x < 1$ or $x > 5$

6. (i) $2y + \frac{3}{y} = 7$ M1
 $2y^2 + 3 = 7y$ M1
 $2y^2 - 7y + 3 = 0$ A1
(ii) $(2y-1)(y-3) = 0$ M1
 $y = \frac{1}{2}, 3$ A1
 $x^{\frac{1}{3}} = \frac{1}{2}, 3$
 $x = (\frac{1}{2})^3, 3^3 = \frac{1}{8}, 27$ M1 A1 (7)

7. (i) $\frac{dy}{dx} = \frac{1}{2}x^{-\frac{1}{2}} + 2x^{-\frac{3}{2}}$ M1 A2
- (ii) $\frac{d^2y}{dx^2} = -\frac{1}{4}x^{-\frac{3}{2}} - 3x^{-\frac{5}{2}}$ M1 A1
- (iii) 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. (i) $f'(x) = 12x - 3x^2$ M1 A1
for SP, $12x - 3x^2 = 0$
 $3x(4 - x) = 0$ M1
 $x = 0, 4$
 $\therefore (0, 2), (4, 34)$ A1
- (ii) $f''(x) = 12 - 6x$ M1
 $f''(0) = 12, f''(x) > 0 \therefore (0, 2)$ minimum A1
 $f''(4) = -12, f''(x) < 0 \therefore (4, 34)$ maximum A1
- (iii)  B2
- (iv) $2 < k < 34$ B1 (10)

9. (i) $\text{grad} = \frac{7-4}{9-7} = \frac{3}{2}$ M1 A1
 $\therefore y - 4 = \frac{3}{2}(x - 7)$ M1
 $2y - 8 = 3x - 21$
 $3x - 2y - 13 = 0$ A1
- (ii) $y = 8x$ B1
- (iii) at R, $3x - 2(8x) - 13 = 0$
 $x = -1$ M1
 $\therefore R(-1, -8)$ A1
 $OP = \sqrt{7^2 + 4^2} = \sqrt{49+16} = \sqrt{65}$ M1 A1
 $OR = \sqrt{(-1)^2 + (-8)^2} = \sqrt{1+64} = \sqrt{65}$
 $\therefore OP = OR$ A1 (10)

10. (i) $= \frac{-8-4}{8-2} = -2$ M1 A1
- (ii) $= (\frac{2+8}{2}, \frac{4-8}{2}) = (5, -2)$ M1 A1
- (iii) perp. grad = $\frac{-1}{-2} = \frac{1}{2}$ M1
perp. bisector: $y + 2 = \frac{1}{2}(x - 5)$ M1 A1
centre where $y = 0 \therefore x = 9 \Rightarrow (9, 0)$ M1 A1
- (iv) radius = dist. $(2, 4)$ to $(9, 0) = \sqrt{49+16} = \sqrt{65}$ B1
 $\therefore (x - 9)^2 + (y - 0)^2 = (\sqrt{65})^2$ M1
 $x^2 - 18x + 81 + y^2 = 65$
 $x^2 + y^2 - 18x + 16 = 0$ A1 (12)

Total (72)

