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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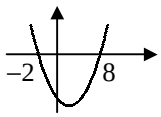
3. *(i)* $5x > 15$ — M1
$x > 3$ — A1

(ii) $(x + 2)(x - 8) < 0$ — M1



M1

$-2 < x < 8$ — A1 **(5)**

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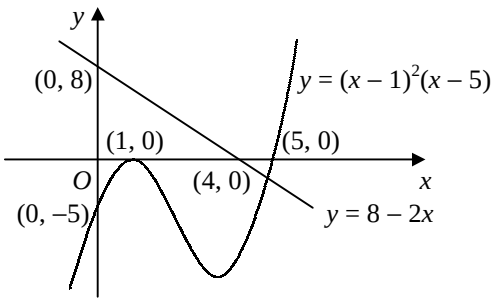
4. *(i)*



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 $x = 0, y = 0 \quad \therefore$ 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

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

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

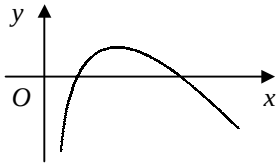
$x = 2$ A1

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

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

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

(iv)



B2

(13)

Total **(72)**