C1 Paper K – 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)**

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2. $\frac{dy}{dx} = 1 - 8x^{-3}$ M1 A1

for SP, $1 - 8x^{-3} = 0$ M1

$x^3 = 8$

$x = 2 \ \therefore (2, 3)$ A2 **(5)**

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3. 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)**

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4. *(i)* $y = x^2 - 2ax + a^2$ B1

$\frac{dy}{dx} = 2x - 2a = 2x - 6$ M1 A1

$\therefore \ a = 3$ A1

(ii) translation by 3 units in the negative x-direction B2 **(6)**

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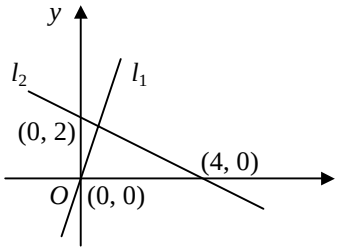
5. *(i)*



B2 B2

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

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

adding $7x - 4 = 0$

$x = \frac{4}{7}$ M1 A1

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

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6. *(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)**

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7. *(i)* centre = (2, 3) — B1

radius = $\sqrt{4+9} = \sqrt{13}$ — M1

$\therefore\ (x-2)^2 + (y-3)^2 = (\sqrt{13})^2$ — M1

$(x-2)^2 + (y-3)^2 = 13$ — A1

(ii) $y = 0\ \therefore\ (x-2)^2 + 9 = 13$ — M1

$x = 2 \pm \sqrt{4} = 0$ (at O) or $4\ \therefore\ B\ (4, 0)$ — A1

(iii) grad of radius = $\frac{0-3}{4-2} = -\frac{3}{2}$ — M1

$\therefore$ grad of tangent = $\frac{-1}{-\frac{3}{2}} = \frac{2}{3}$ — M1 A1

$\therefore\ y - 0 = \frac{2}{3}(x-4)$ — M1

$3y = 2x - 8$

$2x - 3y = 8$ — A1 **(11)**

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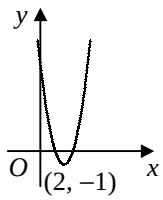
8. *(i)* $= 3[x^2 - 4x] + 11$ — M1

$= 3[(x-2)^2 - 4] + 11$ — M1

$= 3(x-2)^2 - 1$ — A2

(ii)



B3

(iii) $3(x-2)^2 - 1 = 0$

$(x-2)^2 = \frac{1}{3}$ — M1

$x = 2 \pm \frac{1}{\sqrt{3}} = 2 \pm \frac{1}{3}\sqrt{3}$ — M1 A1

$AB = (2 + \frac{1}{3}\sqrt{3}) - (2 - \frac{1}{3}\sqrt{3}) = \frac{2}{3}\sqrt{3}$ — M1 A1 **(12)**

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

$x(x^2 - 5x + 7) = 0$ — 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

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

grad of tangent = $27 - 30 + 7 = 4$ — M1

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

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

$4y - 12 = -x + 3$

$x + 4y = 15$ — A1

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

$y = 0 \Rightarrow x = 15$ — M1

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

Total **(72)**