C1 Paper C – Marking Guide

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

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

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

$\therefore\ y - 1 = -5(x + 4)$ M1
$y = -5x - 19$ A1 **(4)**

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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

$\therefore EH = \sqrt{5}(2 + \sqrt{5}) = 5 + 2\sqrt{5}$ A1 **(5)**

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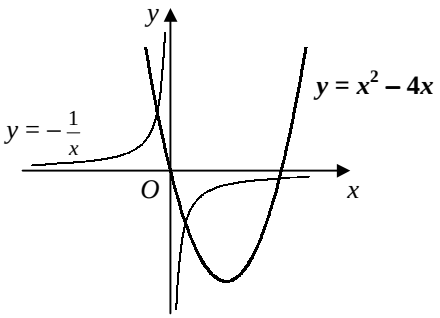
4. *(i)*



B2
B2

(ii) 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)**

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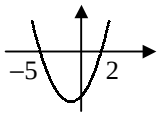
5. *(i)* $x^2 + 3x - 10 > 0$

$(x + 5)(x - 2) > 0$ M1



M1

$x < -5$ or $x > 2$ A1

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

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

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

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6. *(i)* $b^2 - 4ac = 12^2 - (4 \times 4 \times 9) = 0$ M1

$\therefore$ 1 real root A1

(ii) $4x^2 + 12x + 9 = 8$

$4x^2 + 12x + 1 = 0$

$x = \frac{-12 \pm \sqrt{144 - 16}}{8}$ M1

$= \frac{-12 \pm 8\sqrt{2}}{8}$ M1

$= -\frac{3}{2} \pm \sqrt{2}$ A2 **(6)**

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7. *(i)* $(x+1)^2 + (y-6)^2 = (2\sqrt{5})^2$ M1
$(x+1)^2 + (y-6)^2 = 20$ A1

(ii) sub. $y = 3x - 1$ into eqn of C:
$(x+1)^2 + [(3x-1)-6]^2 = 20$ M1
$(x+1)^2 + (3x-7)^2 = 20$
$x^2 - 4x + 3 = 0$ A1
$(x-1)(x-3) = 0$ M1
$x = 1, 3$ A1

(iii) $x = 1 \Rightarrow y = 2 \quad \therefore (1, 2), \qquad x = 3 \Rightarrow y = 8 \quad \therefore (3, 8)$ B1
$AB = \sqrt{(3-1)^2 + (8-2)^2} = \sqrt{4+36} = \sqrt{40} = \sqrt{4\times10} = 2\sqrt{10}$ M1 A1 **(9)**

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

(ii) for TP, $-1 + 2x^{-\frac{1}{3}} = 0$ M1
$x^{\frac{1}{3}} = 2$ M1
$x = 8 \qquad \therefore \ (8, 6)$ A2

(iii) $f''(8) = -\frac{1}{24}$, $f''(x) < 0 \ \therefore$ maximum M1 A1 **(9)**

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9. *(i)* $\frac{dy}{dx} = 2x$ M1
grad = 2 A1
$\therefore \ y - 3 = 2(x-1)$ M1
$y = 2x + 1$ A1

(ii) $= (x-3)^2 - 9 + 11 = (x-3)^2 + 2$ M1 A1

(iii) translation by 3 units in the positive x-direction B2

(iv) $y = 2(x-3) + 1 \qquad [\, y = 2x - 5 \,]$ M1 A1 **(10)**

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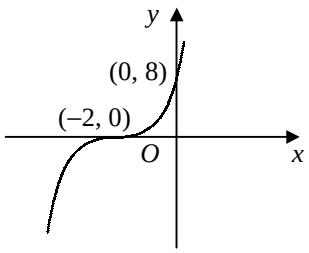
10. *(i)*



B3

(ii) $f(x) = (x+2)(x^2 + 4x + 4)$
$f(x) = x^3 + 4x^2 + 4x + 2x^2 + 8x + 8$ M1
$f(x) = x^3 + 6x^2 + 12x + 8$ A1
$f'(x) = 3x^2 + 12x + 12$ M1 A1

(iii) grad $= 3 - 12 + 12 = 3$ B1
$\therefore \ y - 1 = 3(x+1) \qquad [\, y = 3x + 4 \,]$ M1 A1

(iv) 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 **(72)**