1. a) $\dfrac{(3-\sqrt{3})(3-\sqrt{3})}{(3+\sqrt{3})(3-\sqrt{3})}$ M1

$\dfrac{9-3\sqrt{3}-3\sqrt{3}+3}{9-3\sqrt{3}+3\sqrt{3}-3}$ (o.e) M1

$2-\sqrt{3}$ A1 c.u.o

b) $\dfrac{1}{x}=\dfrac{x}{16}$ OR $x^2=16$ M1

$x=\pm 4$ A1 c.a.o

2. $2x^3 \boxed{+x^{\frac{1}{2}}}+\boxed{1+2x^{-1}}$ (o.e)   B1 B1

$\boxed{6x^2}+\boxed{\frac{1}{2}x^{-\frac{1}{2}}}\boxed{-2x^{-2}}$ (o.e) $-$A3 -1 eeoo

3. $\int (3x-1)^2\, dx$ or $\int \cdots$ M1

$9x^2-6x+1$ B1

$f(x)=\boxed{3x^3}\boxed{-3x^2}\boxed{+x}\boxed{+C}$ A2 -1eeoo

$x=3$ $y=56$ USED   M1

$c=-1$ OR $\boxed{f(x)=}3x^3-3x^2+x-1$ A1

4. a) I DRAWS OR MENTIONS NO OF INTERSECTIONS WITH $y = 2$ M1

3 (ROOTS)   A1 dep

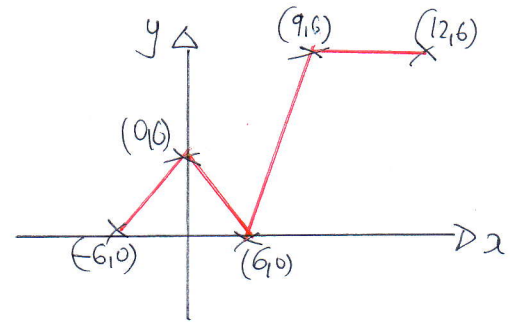**(II)** DRAWS OR MENTIONS THE NUMBER OF INTERSECTIONS WITH $y = x$ M1

3 (ROOTS) A_1 dep

b) (I)

$(-12,12)$ $(-9,12)$ $(0,6)$ $(-6,0)$ $(6,0)$
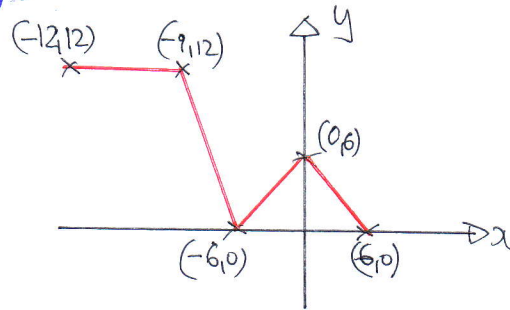
CORRECT REFLEXION   M1

CORRECT CO-ORDINATES (5) (ALLOW ONE ERROR OR OMMISION)   A1   dep.

(II)

$(9,6)$ $(12,6)$ $(0,6)$ $(-6,0)$ $(6,0)$

CORRECT SHAPE IN THE CORRECT QUADRANT   dep

CORRECT 5 SETS OF CO-ORDINATES   M3

−1 eeoo

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5. a) $(5,0)$ B1   MUST BE WRITTEN AS CO-ORDINATE

b) $\sqrt{(2-0)^2 + (10-4)^2}$ O.E   M1

$\sqrt{40}$ OR $2\sqrt{10}$ A1

c) $|AB| = \sqrt{160}$ OR $4\sqrt{10}$ B1

$\frac{1}{2} \times 4\sqrt{10} \times "2\sqrt{10}"$ O.E.   M1 ft

40   A1 c.a.o

d) SCALE FACTOR $\frac{1}{2}$ OR 2   B1

30   A1 c.a.o

6.

$\boxed{\dfrac{40}{2}} \left(\boxed{2 \times 1500} + \boxed{39(-7)} \right)$ **M3**   <u>MUST APPEAR IN THIS STRUCTURE</u> ONLY TO SCORE

54540   **A1 c.a.o**

<u>ALT 1</u>

1227   **B1**

$\boxed{\dfrac{40}{2} \left(1227 + 1500 \right)}$ **M2**

54540   **A1 c.a.o**

<u>ALT 2</u>

$\dfrac{200}{2} \left(2 \times 107 + 199 \times 7 \right)$ OR $\dfrac{160}{2} \left(2 \times 107 + 159 \times 7 \right)$ **M**

$\boxed{160\,700}$, $\boxed{106\,160}$ **A2**

54150   **A1 c.a.o**

7. a)

$x^2 (x-4) = x(10-x)$ **M1**

$x^2 - 3x - 10 = 0$ **A1**

$(x-5)(x+2)$ **M1**

$(0,0)$ $(5,25)$ $(-2,-24)$ **A2 −1 eeoo**

b)

CORRECT SHAPE OF CUBIC <u>TOUCHING</u> AT O $\boxed{B1}$

CORRECT SHAPE OF QUADRATIC THROUGH O $\boxed{B1}$ A

$(10,0), (4,0), (5,25), (-2,-24)$ **A2 −1eeoo**   dep

CORRECT RELATIVE POSITION BETWEEN GRAPHS   **M1**   dep

$(5,25)$

$(4,0)$ $(10,0)$

$(-2,-24)$
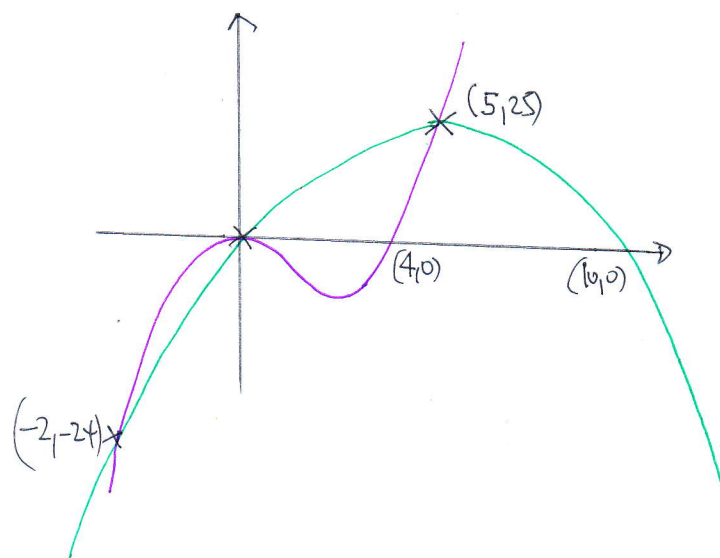
8. $x^2 - 4x + 5 = m + 2x - x^2$ M1

$2x^2 - 6x + 5 - m = 0$ M1   &cancel;

$(-6)^2 - 4 \times 2(5-m) = 0$ <u>or</u> STATES $b^2 - 4ac = 0$ M1

$m = \frac{1}{2}$ A1

$\left.\begin{array}{c} 2x^2 - 6x + \left(5 - \frac{1}{2}\right) \\ \underline{\text{OR}} \\ 4x^2 - 12x + 9 = 0 \\ \underline{\text{OR}} \\ (2x - 3)^2 = 0 \end{array}\right\}$ M1

$x = \frac{3}{2}$ A1   c.a.o

9. **a)** $\frac{dy}{dx} = 2 - x^{-2}$ <u>or</u> $2 - \frac{1}{x^2}$ M1

$A\left(\frac{1}{2}, 3\right)$ <u>or</u> $y = 3$ A1

$\frac{dy}{dx} = -2$ A1

NORMAL GRADIENT $\frac{1}{2}$ M1   ft

$4y - 2x = 11$ o.e   A1   ft

b) ATTEMPT TO SOLVE SIMULTANEOUS EQUATIONS   M1

$6x^2 - 11x + 4 = 0$ <u>or</u> $12y^2 - 77y + 123 = 0$ A1

$(2x - 1)(3x - 4) = 0$ <u>or</u> $(y - 3)(12y - 41)$ M1

$B\left(\frac{4}{3}, \frac{41}{12}\right)$ A2

10 a) SIGHT   .   OR USE OF PYTHAGORAS   M1

SIGHT OF $5x$ (AWARD 2 MARKS IF NO METHOD)   A1

$3x + (3x+1) + (7x+1) + 5x$ M1

$18x + 2$ A1

b) $\dfrac{(3x+1) + (7x+1)}{2} \times 3x$ or $\dfrac{10x+2}{2} \times 3x$

CORRECT CONVINCING SIMPLIFICATION

c) $x < 5$ $\underline{\text{dep}}$ on $18x+2 < 92$ A1

$5x^2 + x - 22 > 0$ O.E.   M1

$(5x+11)(x-2) > 0$ or $-\dfrac{11}{5}$ & 2 M1

$-\dfrac{5}{11}$ 2

        M1 (OR SIMILAR METHOD)

$x < -\dfrac{11}{5}$ or $x > 2$ A1 dep

$2 < x < 5$ A1