1. $x^2 + 9 = \frac{15}{2}x$ OR $2x + \frac{18}{x} = 15$ M1

$2x^2 - 15x + 18$ M1

$(2x-3)(x-6)$ M1

$x = < \frac{3}{2}, 6$ BOTH A1

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2. a) SIGHT OF 8 OR $\frac{1}{2}$ B1

$\frac{17}{2}$ O.E A1

b) $4y^{-3}$ O.E B1, B1

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3. $6x^2 - 5x^{\frac{3}{2}}$ B1 B1

$2x^3 - 2x^{\frac{5}{2}} + C$ A1 A1 A1

---

4. $\frac{100}{2}[2 + 497]$ +1 STRUCTURE M4

24950 A1 cao

OR

$\frac{100}{2}[2\times2 + 99\times5]$ +1 STRUCTURE M4

24950 A1 cao

IF NO MARKS ARE AWARDED AWARD ~~ONE MARK~~ FOR SIGHT OF 2+7+12+....

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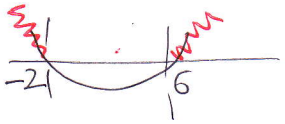
5. $b^2 - 4ac \geqslant 0$ OR $b^2 - 4ac > 0$ OR $(-k)^2 - 4\times1\times(k+3)$ M1

$k^2 - 4k - 12$ M1

$(k-6)(k+2)$ M1

SIGHT OF 6, -2 (BOTH) A1



M1 (OR SIMILAR)

$k \leqslant 2$ OR $k \geqslant 6$ A1 c.a.o (ALLOW USE OF AND INSTEAD OF OR)

6. $\frac{EF}{\sqrt{3}} = \frac{\sqrt{12}+2}{\sqrt{12}-2}$ o.e e.g $\frac{EF}{\sqrt{12}+2} = \frac{\sqrt{3}}{\sqrt{12}-2}$ M1

$\ldots = \frac{\sqrt{3}(\sqrt{12}+2)}{\sqrt{12}-2}$ M1

$\frac{6+2\sqrt{3}}{\sqrt{12}-2}$ OR $\frac{6+2\sqrt{3}}{2\sqrt{3}-2}$ M1

ATTEMPT TO RATIONALIZE EITHER OF THE ABOVE M1

$24+16\sqrt{3}$ AS NUMERATOR A1

$3+2\sqrt{3}$ A1 c.a.o

---

7. START of $f(\frac{1}{3}x)$ OR $\sqrt{27(\frac{1}{3}x)^3+1}$ M1

$\sqrt{x^3+1}$ A1

---

8. a) GRAD $= \frac{6-4}{2+4}$ o.e M1

GRAD $= \frac{1}{3}$ A1

REQUIRED GRAD $= -3$ M1 ft

$y-6 = "-3"(x-2)$ o.e e.g $y = -3x+12$ A1

b) FINDS C AS $(0,12)$ B1 ft from their int

ATTEMPT TO FIND DISTANCE AB OR BC M1

SHOWS $\sqrt{40}$ TWICE & CORRECTLY A1

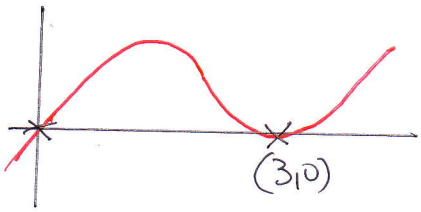
c) M$(-2,8)$ B1 B1

D$(-6,10)$ B1 B1

9. a) $x(x^2-6x+9)$ M1

$x(x-3)(x-3)$ o.e A1

b)



CORRECT SHAPE ~ B1

THROUGH (0,0) B1

TOUCHES AT (3,0) B1

c) $y = x^3 + 6x^2 + 9x$ B2 -1 eeoo

OR

$y = x(x+3)^2$ M1

$y = x(x+3)^2$ A1

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10. a) $800 + 9 \times 100$ M1

1700 A1

b) $\frac{20}{2}[2 \times 800 + 19 \times 100]$ M1 M1 dep on structure

35000 A1

c) $\frac{40}{2}[2 \times 800 + 39 \times 100] = \frac{40}{2}[2 \times 1580 + 39d]$ M2 (1 MARK FOR EITHER SIDE)

($\frac{40}{2}$ MAY BE MISSING IF BOTH SIDES ARE PRESENT)

ATTEMPTS SOLUTION (AT LEAST ONE SIGNIFICANT STEP) M1

$d = 60$ A1

11. a) $(12k)^2 - 4\times4\times(-9)$ M1

$144k^2 + 144$ A1

IMPLIES THIS IS ALWAYS POSITIVE / OR AT LEAST 144 SO A1

b) $\dfrac{-12k \pm \sqrt{144k^2+144}}{2\times4}$ O.E M1

(ALLOW SIMILAR IF COMPLETING THE SQUARE)

SIGHT OF $12\sqrt{k^2+1}$ B1

$-\frac{3}{3} \pm \frac{3}{2}\sqrt{k^2+1}$ A1 c.a.o

---

12. a) $\left(\frac{dy}{dx} =\right) 3x^2 - 6x + 2$ B1

IMPLIES GRAD IS 2 OR $3\times2^2 - 6\times2 + 2$ M1

$y - 9 = 2(x-2)$ M1

$y = 2x + 5$ A1 c.a.o

b) $"3x^2 - 6x + 2" = "-\frac{1}{2}"$ B1 M1

$6x^2 - 12x + 5 = 0$ M1

USES QUADRATIC FORMULA OR COMPLETES THE SQUARE (GOOD ATTEMPT) M1

PRODUCES CONVINCINGLY $\frac{6 \pm \sqrt{6}}{6}$ A1

JUSTIFIES $x = \frac{6-\sqrt{6}}{6}$ IS NOT ACCEPTABLE A1