

1. (a) $(x-3)^2 - 2$ A1 A1

(b) $x^2 - 6x + 7 = 0$ or $(x-3)^2 - 2 = 0$ M1
 OR $(x-3)^2 = 2$

$x-3 = \pm\sqrt{2}$ (MUST HAVE \pm HERE) M1

$x = 3 \pm \sqrt{2}$ OR $(3 \pm \sqrt{2}, 0)$ A1

2 ATTEMPT TO RATIONALIZE EITHER DENOMINATOR M1

$\frac{2\sqrt{6} + 2\sqrt{2}}{2}$ OR $\sqrt{6} + \sqrt{2}$ M1 (1st fraction)

$2\sqrt{6} - 2\sqrt{3}$ M1 (2nd fraction)

$\sqrt{2} - \sqrt{6} + 2\sqrt{3}$ A2 (-1 eeo)

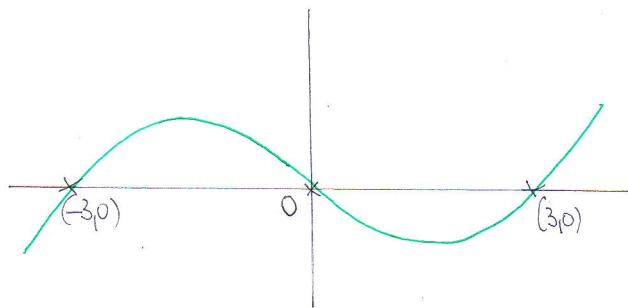
3 $x^2 - 6x + 10 = 1 - x$ M1

$x^2 - 5x + 9 = 0$ A1

$(-5)^2 - 4 \times 1 \times 9$ (PENALIZE -5^2) M1 OR ATTEMPT TO COMPLETE THE SQUARE

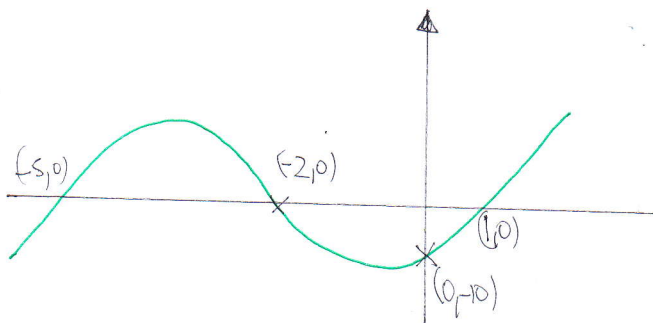
$-11 + \text{STATEMENT}$ A1 $(x - \frac{5}{2})^2 = -\frac{11}{4} + \text{STATEMENT WITHOUT ANY FURTHER WORKING}$

4. a)



$x(x+3)(x-3)$ M1 THIS NEED NOT BE PRESENT IF ALL CORRECT
 CORRECT SHAPE B1
 THROUGH 0 B1
 (3,0)(-3,0) BOTH B1

b)



CORRECT SHAPE THROUGH $(-1, 0)$
 $(-2, 0)$ B1
 $(-5, 0)$
 $(0, -10)$ B1

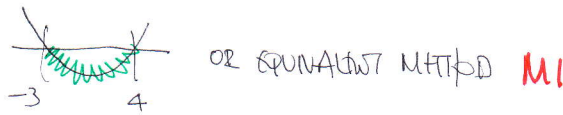
5. $6x-8 \geq -3x+1$ o.e M1

$x \geq 1$ A1

$x^2-x-12 < 0$ M1

$(x+3)(x-4)$ A1

CRITICAL VALUES INPUT 4, -3 A1
(MAY BE DRAWN IN A DIAGRAM)



$-3 < x < 4$ c.a.o A1 dep

$1 \leq x < 4$ c.a.o A1

6. (a) $\frac{a+2x_1}{x_1}$ OR $\frac{a+2x_2}{2}$ M1

$(x_2) \frac{a+4}{2}$ A1

$\frac{a+2\left(\frac{a+4}{2}\right)}{\frac{a+4}{2}}$ OR $\frac{a+a+4}{\frac{a+4}{2}}$ M1

$(x_3) \frac{2(2a+4)}{a+4}$ OR $\frac{4a+8}{a+4}$ A1

(b) "THEIR $x_3 = 2$ " & ATTEMPT TO SOLVE WITH AT LEAST ONE VALID STEP M1

$a = -5$ c.a.o A1

7. (a) $\int 3x^2 - 8x + 4 \, dx$ M1

$x^3 - 4x^2 + 4x + C$ A3 (-1 eeo)

USES ORIGIN, OR (0,0)

OR $x=0$
 $y=0$

OR $0=0+C$

OR $C=0$

B1

A1 dep

$f(x) = x^3 - 4x^2 + 4x$ c.a.o

(b) $x(x^2 - 4x + 4)$ OR $x^2 - 4x + 4$ OR $x(x-2)^2$ M1

$(2,0)$ c.a.o A1

8 $\left(\frac{dy}{dx} = 2ax - 2x^{-\frac{1}{2}} - 8x^{-2}\right)$ O.E A3

$2a \times 4 - \frac{2}{\sqrt{4}} - \frac{8}{4^2} = 0$ O.E M1

$8a - 1 - \frac{1}{2}$ OR $8a - \frac{3}{2}$ M1
OR $8a = \frac{3}{2}$

$a = \frac{3}{16}$ O.E A1

9. $144 = 60 + (n-1) \times 3.5$ O.E M1

ATTEMPT TO SOLVE WITH AT LEAST ONE SIGNIFICANT SIMPLIFICATION STEP M1

$n = 25$ SEEN OR INPUT A1

$\frac{25}{2} [60 + 144]$ M1

ATTEMPT TO SIMPLIFY MULTIPLICATION e.g. 25×102 M1

2550 A1

\therefore COMMENT 2550 cm = 25.5 m E1

ALTERNATIVE

$\frac{25}{2} [2 \times 60 + 24 \times 3.5]$ M1

ATTEMPT TO SIMPLIFY $\frac{25}{2} \times 204$ M1

2550 A1

COMMENT 2550 cm = 25.5 m E1

10. (a) $\left(\frac{dy}{dx}\right) = 2x - 10$ B1

SIGHT OF -2 AS GRADIENT A1

$(4, -1)$ OR $y = -1$ B1

ATTEMPT AT $y - y_0 = m(x - x_0)$ o.e. M1

$y = -2x + 7$ o.e. A1

(b) $x^2 - 10x + 23 = \frac{1}{2}x - 3$ M1

$2x^2 - 21x + 52 (= 0)$ A1

$(2x \pm 13)(x \pm 4) (= 0)$ M1

$x = \begin{cases} 4 \\ \frac{13}{2} \end{cases}$ o.e. c.a.o. A1

$y = \begin{cases} -1 \\ \frac{1}{4} \end{cases}$ o.e. c.a.o. A1

(c) "SRAWATES" $\frac{dy}{dx} \Big|_{x=4}$ TO OBTAIN -2 M1

SINCE GRAD OF L IS $\frac{1}{2}$ & GRADIENT (OF TANGENT) IS -2 ETC E1

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GRAD AB IS $\frac{1}{4}$, MAY BE IMPLIED B1

LINE OC IS $y = \frac{1}{4}x$ A1

LINE AC IS $y = 6$ OR SOLVES $y = 6$ AND " $y = \frac{1}{4}x$ " M1

$(24, 6)$ -A1 dep

GRADIENT OB IS 1 OR LINE OB IS $y = x$ B1

D(6,6) B1

$\frac{1}{2} \times 6 \times 6 = 18$ A1

$\frac{1}{2} \times 18 \times 2 = 18$ A1