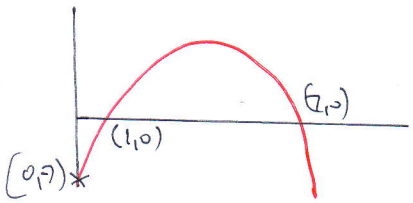
1 (a) $(x-4)^2 - 9$ B1 B1

ALLOW MISREAD AS $9-(x-4)^2$

(b) $(4, 9)$ B1 B1

(c)



SHAPE & RELATIVE POSITION B1

$(1,0)$ $(7,0)$ BOTH A1

$(0,-7)$ A1

2. $x = 3y - 1$ B1

$(3y-1)^2 - 3y(3y-1) + y^2 = 11$ O.E M1

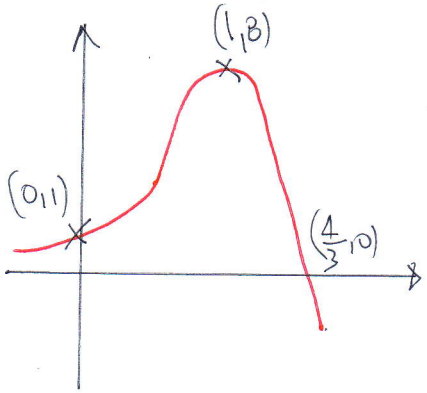
$y^2 - 3y - 10 = 0$ A1

$(y-5)(y+2)$ M1

$y = \begin{cases} -2 \\ 5 \end{cases}$ BOTH A1

$x = \begin{cases} -7 \\ 14 \end{cases}$ BOTH A1

3. (a)

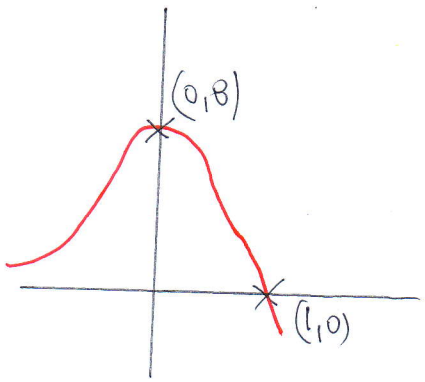


CORRECT SHAPE & RELATIVE POSITION A1 dep

$(1,8)$ $(\frac{4}{3},0)$ BOTH A1 dep

$(0,1)$

(b)



TRANSLATION "LEFT" IMPLIED A1 dep

$(0,8)$ MAX ON y AXIS A1 dep

$(1,0)$

4. $2z\sqrt{8}\sqrt{2} - 6\sqrt{2} = 2z$ OR $4z - 6\sqrt{2} = 2z$ M1

Allow variations

$2z = 6\sqrt{2}$ M1

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

---

5. a) $\frac{-2+14}{3+1}$ OR $\frac{-14+2}{-1-3}$ OR GRAD = 3 B1

$y+14 = 3(x+1)$ OR $y+2 = 3(x-3)$ M1

$y = 3x - 11$ A1

b) BELOW L A1 dep

METHOD M1

CLEAR DIAGRAM DRAWN OR $-312 < -311$ o.e

---

6. a) $4x^{\frac{3}{2}} - \frac{25}{16}x^2$ B1

$6x^{\frac{1}{2}}$ $-\frac{25}{8}x$ A1 A1 c.a.o

b) $y = 4 \times 4 \times \sqrt{4} - \frac{25}{16} \times 4^2$ $6 \times 4^{\frac{1}{2}} - \frac{25}{8} \times 4$ M1 M1

$y = 7$ OR $(4, 7)$ GRAD is $-\frac{1}{2}$ A1 A1

$y - 7 = -\frac{1}{2}(x-4)$ M1 dep

$x + 2y = 18$ A1 c.a.o

7. $\frac{n}{2}[2\times 50 + (n-1)\times 3]$ o.e B1

$\frac{n}{2}[2\times 200 + (n-1)(-2)]$ o.e B1

$\frac{n}{2}(97+3n) > \frac{n}{2}(402-2n)$ M1

MAY BE UNSIMPLIFIED

$97+3n > 402-2n$ o.e M1

$5n > 305$ OR $n > 61$ M1

$n = 62$ A1 c.a.o

---

8. a) $(-2m)^2 - 4\times 1(-5)$ o.e M1

$4m^2+20$ M1

$4m^2+20 \geqslant 20$

OR

$4m^2+20 > 0$ WITH CORRECT EXPLANATION E1

b) $(x-m)^2 - m^2 - 5 = 0$ ← M1 → $\frac{-(-2m) \pm \sqrt{4m^2+20}}{2}$ ALT

$(x-m) = \pm\sqrt{m^2+5}$ ← M1 → $\frac{2m \pm 2\sqrt{m^2+5}}{2}$

$x = m \pm \sqrt{m^2+5}$ ← A1 → $x = m \pm \sqrt{m^2+5}$

9. a) 19 97 211 A1 A1ft A1ft

b) 3^n, 2^n B1 B1

$3^n + (-2)^n$ c.a.o A1

---

10. $4x+8$ o.e. B1

x^2+4x o.e B1

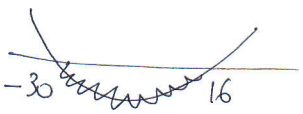
$5 \times "(4x+8)" + "(x^2+4x)" \times 2 \leqslant 1000$ A1ft.

(OR 0.05 ; OR 0.02 ; OR 10)

$x^2 + 14x - 480$ A1

$(x-16)(x-30)$ OR

16 & 30 SEEN OR IMPLIED } M1



OR EQUIVALENT METHOD M1

$-30 \leqslant x \leqslant 16$ M1 dep

$0 < x \leqslant 16$ A1 c.a.o dep

Allow < THROUGHOUT EXCEPT IN THE LAST MARK

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11. a) $y = \int 3x^2 - 12x + 9 \, dx$ B1

$y = x^3 - 6x^2 + 9x + C$ o.e A3 −1 eeoo

$0 = 1 - 6 + 9 + C$ M1

$C = -4$ OR $y = x^3 - 6x^2 + 9x - 4$ A1

b) $R(4,0)$ c.a.o inc R B1

$P(0,-4)$ c.a.o inc P B1

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12. GRAD "AD" IS OR IMPLIED AS -2 B1

GRAD "PAB" IS OR IMPLIED AS $\frac{1}{2}$ A1ft

$D(0,6)$ B1

$A(3,0)$ B1

$y - 0 = \frac{1}{2}(x-3)$ OR $2y = x - 3$ o.e M1

$P(0, -\frac{3}{2})$ A1

$6 + \frac{3}{2} = 7.5$ OR $\frac{15}{2}$ A1