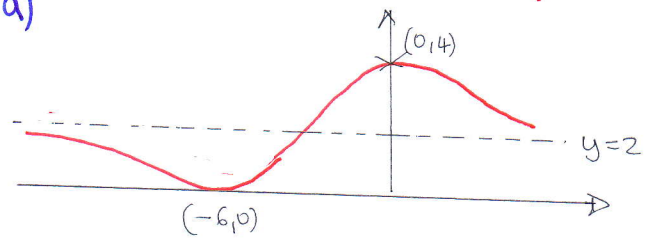
1. $3x^2 + 6x^{\frac{3}{2}} + 4x^{-1}$ (+ C) B3

$+ \frac{4}{x}$ OR

---

a)

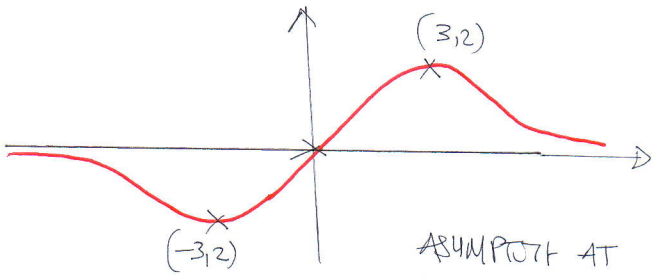


B1 CORRECT SHAPE WITH ASYMPTOTE AT $y=2$

B1 TOUCHING AT $(-6,0)$ AS MINIMUM

B1 MAX AT $(0,4)$

(b)

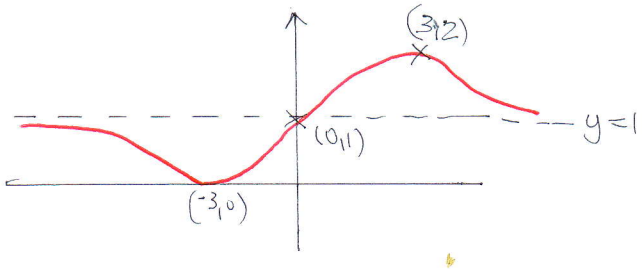


B1 CORRECT SHAPE THROUGH O

B1 ASYMPTOTE AT x AXIS (NO NEED TO LABEL) AND NO DOTTED LINE AT $y=2$

B1 $(-3,2)$ & $(3,2)$ (BOTH)

(c)



B1 CORRECT SHAPE WITH ASYMPTOTE LABELED AT $y=1$

B1 $(0,1)$

B1 $(-3,0)$, $(3,2)$ BOTH

---

2. a) 5 $-2\sqrt{6}$ A1 A1

b) $7\sqrt{12}$ OR $\sqrt{14}\sqrt{14}\sqrt{3}$ M1

$14\sqrt{3}$ A1

4. a) $6-2x-4<10$ OR $2-2x<10$ M1

$x>-4$ A1

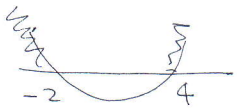
DO NOT ALLOW $-4<x$

b) $x^2+2x+1 \geqslant 4x+9$ } M1

$x^2-2x-8 \geqslant 0$

$(x+2)(x-4)$ M1

C.V < 4, -2 IMPLIED OR SEEN A1



OR EQUIVALENT DIAGRAM M1

"$x \leqslant -2$ OR $x \geqslant 4$" A1 dep

(BOTH)

← DO NOT ALLOW $< >$

DO NOT ALLOW $4 \leqslant x \leqslant -2$

ALLOW USE OF AND INSTEAD OF OR

c) $-4 < x \leqslant -2$ $x \geqslant 4$ B1 B1

---

5 $(x+4)(x-2)(x-4)$ B1

$x^3-2x^2-16x+32$ A1

$\frac{1}{2}x^3 - x^2 - 8x + 16$ A3 −1 eeoo

[SPECIAL CASE A3 IF $y = x^3-2x^2-16x+32$ AS FINAL ANSWER]

6. (a) ATTEMPT AT GRADIENT e.g. $\frac{6+2}{6+6}$ M1

GRAD = $\frac{2}{3}$ A1

"IMPLIED" OR SEEN $-\frac{3}{2}$ B1

$3x + 2y = 30$ O.E A1

(b) T(10,0) A1

R (12,12) A1 A1 } LABELS NOT NEEDED

---

7. a) $x^2 - 4x - 5 = 2x - 14$ M1

$(x-3)(x-3)$ OR $(x-3)^2$ A1

(3,−8) A2

b) CORRECT SHAPE ∪ WITH x INTERCEPTS (−1,0) & (5,0) B1

y INTERCEPT AT (0,5) ASSUMING CORRECT SHAPE B1

LINE WITH POSITIVE GRADIENT AND INTERCEPTS AT

(7,0) A1 } dep

(0,−14) A1

IGNORE THE RELATIVE POSITIONS OF C & L

---

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

-4 + COMMON A1

ALTERNATIVE

$(x+2)^2 - 4 + 5 = 0$ M1

$(x+2)^2 = -1$ + COMMON A1

b) $x^3 + 3x^2 + x - 5$ M1

$3x^2 + 6x + 1$ A1

GRAD IMPLIED −2 (OR SEEN) B1 ft

GRAD IMPLIED $\frac{1}{2}$ (OR SEEN) A1 ft

$y = 4$ OR (−1,−4) B1

$2y = x - 7$ OE A1

8(c) $-\frac{7}{2}$ OR $(0, -\frac{7}{2})$ OR $\frac{7}{2}$ B1

7 OR $(7, 0)$ B1

$\frac{1}{2} \times \frac{7}{2} \times 7 = 12.25$ OR $\frac{49}{4}$ OR $12\frac{1}{4}$ A1

---

9. a) $b^2 - 4ac = 0$ OR $(16-p)^2 - 4 \times 4 \times (13-p) = 0$ M1

$p^2 - 32p + 256 + 16p - 208 = 0$ A1

$p^2 - 16p + 48 = 0$ A1 ft

$(p-4)(p-12)$ M1

$p = \begin{matrix} 4 \\ 12 \end{matrix}$ BOTH A1 c.a.o DO NOT ACCEPT $x = \begin{matrix} 4 \\ 12 \end{matrix}$

b) $4x^2 + 12x + 9 = 0$ OR $4x^2 + 4x + 1 = 0$ M1

$(2x+3)^2 = 0$ OR $(2x+1)^2 = 0$ M1

$x = -\frac{3}{2}$ $x = -\frac{1}{2}$ A1 BOTH ANSWERS

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10 (a) $19 + 29 \times 4$ M1

135 A1 ft

(b) $\frac{30}{2}(19 + 135)$ OE OR $\frac{30}{2}[2 \times 19 + 29 \times 4]$ OE M1

2310 A1 ft

(c) $19 + (n-1) \times 4 < 250$ OR $= 250$ M1

$4n < \frac{235}{4}$ OE OR $=$ M1

58 c.a.o A1

(d) $\frac{n}{2}[2a + 4(n-1)] > 4000$ OR $=$ M1

$n(2n+17) > 4000$ OR $2n^2 + 17n - 4000 > 0$ (ACCEPT $=$) M1

TRIAL ATTEMPTS OR QUADRATIC FORMULA? M1

41 c.a.o A1