1. $\int y\,dx = \int 2x^2 - \frac{6}{x^3} + 8x^3\,dx = \int 2x^2 - 6x^{-3} + 8x^3\,dx$

$= \frac{2}{3}x^3 + 3x^{-2} + 2x^4 + C$

2. (a) $(4-\sqrt{5})^2 = 4^2 - 2\times4\times\sqrt{5} + (\sqrt{5})^2 = 16 - 8\sqrt{5} + 5 = 21 - 8\sqrt{5}$

(b) $2\sqrt{5}\times\sqrt{15} - \sqrt{75} - \frac{\sqrt{60}}{\sqrt{5}} = 2\sqrt{75} - \sqrt{75} - \sqrt{\frac{60}{5}} = \sqrt{75} - \sqrt{12}$

$= \sqrt{25}\sqrt{3} - \sqrt{4}\sqrt{3} = 5\sqrt{3} - 2\sqrt{3} = 3\sqrt{3}$

3. EXPAND & COMPARE

$5x^2 + Ax - 7 \equiv B(x+2)^2 + C$

$5x^2 + Ax - 7 \equiv B(x^2 + 4x + 4) + C$

$5x^2 + Ax - 7 \equiv Bx^2 + 4Bx + 4B + C$

$\therefore B = 5$

$A = 4B$

$A = 20$

$4B + C = -7$

$20 + C = -7$

$C = -27$

4. $x^2 + (m+3)x + (3m+4) = 0$

2 DISTINCT REAL ROOTS $\Rightarrow b^2 - 4ac > 0$

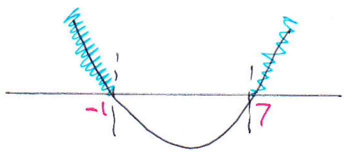
$\Rightarrow (m+3)^2 - 4\times1\times(3m+4) > 0$

$\Rightarrow m^2 + 6m + 9 - 12m - 16 > 0$

$\Rightarrow m^2 - 6m - 7 > 0$

$\Rightarrow (m+1)(m-7) > 0$

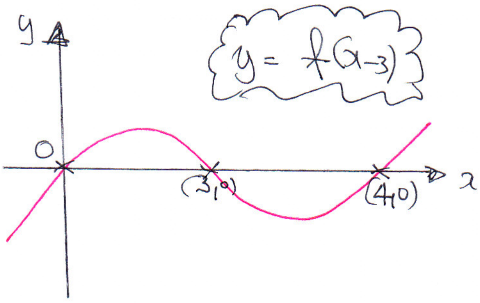
C.V = $\left\langle \begin{matrix} -1 \\ 7 \end{matrix} \right.$



$\therefore x < -1$ or $x > 7$

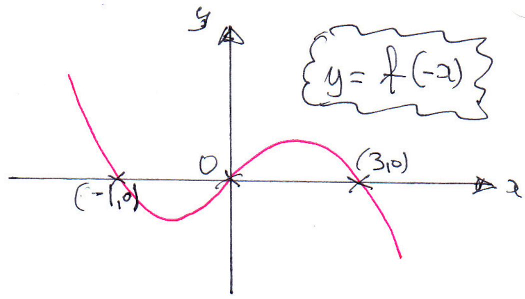
C1, IYGB, PAPER B

5. (a)



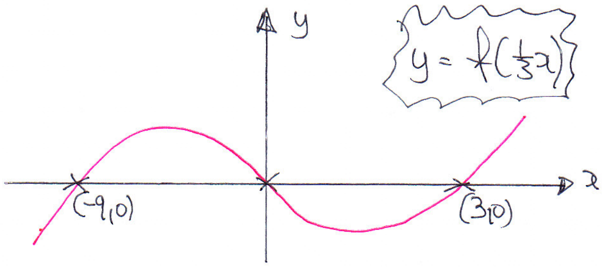
TRANSLATION "RIGHT" BY 3 UNITS

(b)



REFLECTION IN THE y AXIS

(c)



HORIZONTAL STRETCH BY S.F OF 3

6. $\left.\begin{array}{l} x+2y=3 \\ 4y^2-x^2=33 \end{array}\right\} \Rightarrow \boxed{x=3-2y}$ SUB INTO THE QUADRATIC

$$\Rightarrow 4y^2-(3-2y)^2=33$$
$$\Rightarrow 4y^2-(9-12y+4y^2)=33$$
$$\Rightarrow \cancel{4y^2}-9+12y-\cancel{4y^2}=33$$
$$12y=42$$
$$y=\frac{42}{12}=\frac{21}{6}=\frac{7}{2}$$

$$\therefore x=3-\cancel{2}\times\frac{7}{\cancel{2}}=3-7=-4$$

$\therefore x=-4$
$y=\frac{7}{2}$

7. (a) $3x-2y=1$
$3x-1=2y$
$y=\frac{3}{2}x-\frac{1}{2}$

$\therefore$ GRAD OF $l_1=\frac{3}{2}$

$\therefore$ GRAD OF $l_2=-\frac{2}{3}$

THUS $y-y_0=m(x-x_0)$ $\boxed{m=-\frac{2}{3}}$

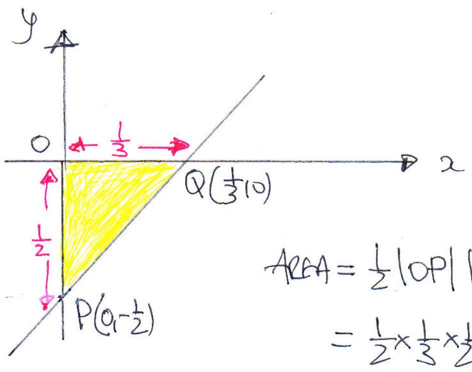
$y+1=-\frac{2}{3}(x-4)$

$3y+3=-2x+8$

$2x+3y=5$

(b) $l_1: 3x - 2y = 1$

- When $x = 0$: $-2y = 1$, $y = -\frac{1}{2}$, $\boxed{P(0, -\frac{1}{2})}$
- When $y = 0$: $3x = 1$, $x = \frac{1}{3}$, $\boxed{Q(\frac{1}{3}, 0)}$



$$\text{AREA} = \frac{1}{2}|OP||PQ|$$
$$= \frac{1}{2} \times \frac{1}{3} \times \frac{1}{2} = \frac{1}{12}$$

AS REQUIRED

8.

$n = 16$
$u_{16} = 15 \leftarrow L$
$S_{16} = 288$

- $S_n = \frac{n}{2}(a + L)$

$288 = \frac{16}{2}(a + 15)$

$288 = 8(a + 15)$

$36 = a + 15$

$\boxed{21 = a}$

$\frac{288}{8} = \frac{200 + 88}{8} = 25 + 11 = 36$

- $u_n = a + (n-1)d$

$15 = 21 + 15d$

$-6 = 15d$

$d = -\frac{6}{15}$

$\boxed{d = -\frac{2}{5}}$

$\therefore u_n = a + (n-1)d$

$u_{11} = 21 + 10(-\frac{2}{5})$

$u_{11} = 21 - 4$

$u_{11} = 17$

ALTERNATIVE

- $u_{16} = 15$

$\boxed{u_n = a + (n-1)d}$

$15 = a + 15d$

$30 = 2a + 30d$

$\boxed{30 - 30d = 2a}$

- $S_{16} = 288$

$\boxed{S_n = \frac{n}{2}[2a + (n-1)d]}$

$288 = \frac{16}{2}[2a + 15d]$

$\boxed{288 = 8(2a + 15d)}$

$288 = 8[(30 - 30d) + 15d]$

$288 = 8(30 - 15d)$

$288 = 240 - 120d$

$120d = -48$

$d = -\frac{48}{120} = -\frac{4}{10}$

$\boxed{d = -\frac{2}{5}}$

$\therefore 15 = a + 15d$

$15 = a + \cancel{15}^{3}(-\frac{2}{\cancel{5}})$

$15 = a - 6$

$\boxed{21 = a}$

$\therefore u_n = a + (n-1)d$

$u_{11} = 21 + 10(-\frac{2}{5})$

$u_{11} = 21 - 4$

$u_{11} = 17$

AS BEFORE

9. (a) $a_{n+1} = 5 - \frac{18}{4+a_n}$

$a_2 = 0$

$a_3 = 5 - \frac{18}{4+a_2} = 5 - \frac{18}{4} = 5 - \frac{9}{2} = \frac{10}{2} - \frac{9}{2} = \frac{1}{2}$

$a_4 = 5 - \frac{18}{4+a_3} = 5 - \frac{18}{4+\frac{1}{2}} = 5 - \frac{18\times2}{2\times4+\frac{1}{2}\times2} = 5 - \frac{36}{8+1} = 5-4 = 1$

$a_5 = 5 - \frac{18}{4+a_4} = 5 - \frac{18}{4+1} = 5 - \frac{18}{5} = \frac{25}{5} - \frac{18}{5} = \frac{7}{5}$

(b)

$a_2 = 5 - \frac{18}{4+a_1}$

$0 = 5 - \frac{18}{4+a_1}$

$\frac{18}{4+a_1} = 5$

$18 = 5(4+a_1)$

$18 = 20 + 5a_1$

$-2 = 5a_1$

$a_1 = -\frac{2}{5}$

(c) $\sum_{r=1}^{5} a_r = a_1 + a_2 + a_3 + a_4 + a_5$

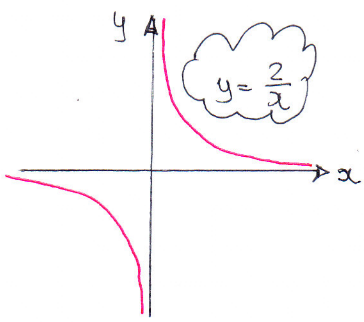
$= -\frac{2}{5} + 0 + \frac{1}{2} + 1 + \frac{7}{5}$

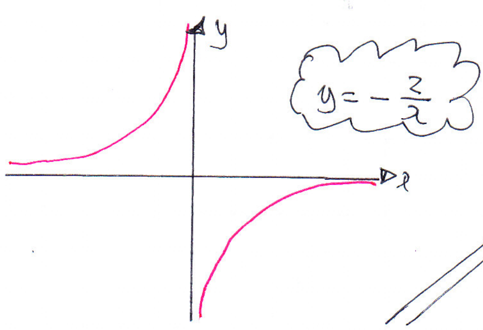
$= 1 + \frac{1}{2} + 1$

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

$= \frac{5}{2}$

10. (a)



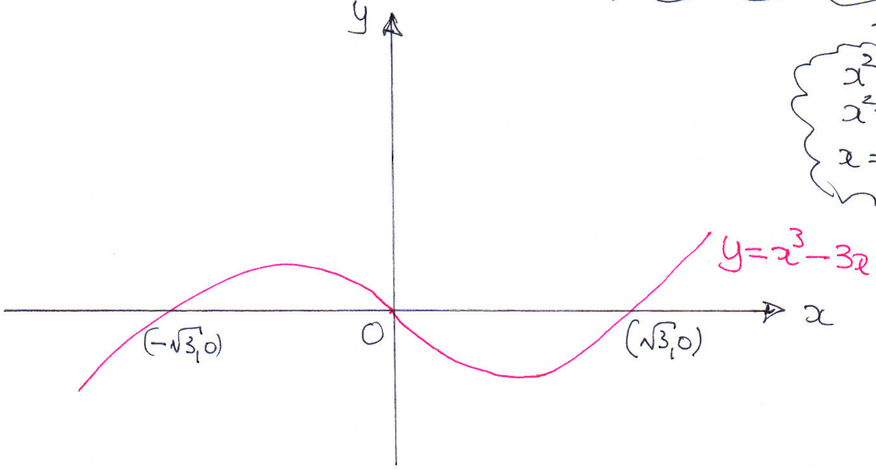


REFLECTION IN THE x AXIS

C1, IYGB, PAPER B

(b) $y = x^3 - 3x = x(x^2-3) \Rightarrow$ $(0,0)$ & $(\sqrt{3},0)$ $(-\sqrt{3},0)$

$x^2 - 3 = 0$
$x^2 = 3$
$x = \pm\sqrt{3}$



(c) SOLVING SIMULTANEOUSLY

$$\left.\begin{array}{l} y = x^3 - 3x \\ y = -\frac{2}{x} \end{array}\right\} \Rightarrow x^3 - 3x = -\frac{2}{x} \quad (\times x)$$

$x^4 - 3x^2 = -2$

$x^4 - 3x^2 + 2 = 0$ ← THIS IS A "FAKE" QUARTIC IT IS A QUADRATIC IN x^2

$(x^2 - 1)(x^2 - 2)$

$x^2 = \begin{cases} 1 \\ 2 \end{cases}$

$x = \begin{cases} 1 \\ -1 \\ \sqrt{2} \\ -\sqrt{2} \end{cases}$

11. (a) $y = 2x^2 - x + 3$

- BY INSPECTION $P(0,3)$
- $\frac{dy}{dx} = 4x - 1$

$\left.\frac{dy}{dx}\right|_{x=0} = 4\times0 - 1 = -1$ ← TANGENT GRADIENT

$\therefore$ NORMAL GRADIENT IS 1

THUS

$\Rightarrow y - y_0 = m(x - x_0)$

$\Rightarrow y - 3 = 1(x - 0)$

$\Rightarrow y - 3 = x$

$\Rightarrow y = x + 3$

(b) SOLVING SIMULTANEOUSLY

$$\left.\begin{array}{l} y = 2x^2 - x + 3 \\ y = x + 3 \end{array}\right\} \Rightarrow 2x^2 - x + \cancel{3} = x + \cancel{3}$$

$$\Rightarrow 2x^2 - 2x = 0$$

$$\Rightarrow 2x(x-1)$$

$$\Rightarrow x = \begin{cases} 0 \leftarrow P \\ 1 \leftarrow Q \end{cases}$$

"$y = x + 3$"

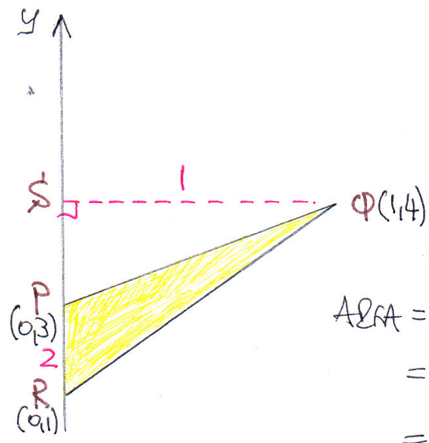
$\therefore Q(1,4)$

(c) $\left.\dfrac{dy}{dx}\right|_{\substack{Q \\ (x=1)}} = 4\times1 - 1 = 3$

$\therefore$ TANGENT l_2

$$y - y_0 = m(x - x_0)$$
$$y - 4 = 3(x-1)$$
$$y - 4 = 3x - 3$$
$$\boxed{y = 3x + 1}$$

$\therefore$ BY INSPECTION $R(0,1)$



AREA $= \frac{1}{2} \times$ BASE $\times$ HEIGHT

$= \frac{1}{2}|PR||SQ|$

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

$= 1$

AS REQUIRED