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C1 IYGB PAPER B

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

(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 $\Rightarrow b^2 - 4ac > 0$

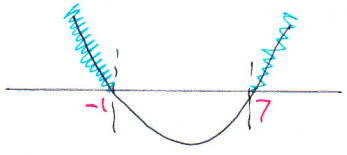
$\Rightarrow (m+3)^2 - 4\times 1\times(3m+4) > 0$

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

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

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

C.V = -1, 7



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

Q1 IYGB PAPER B

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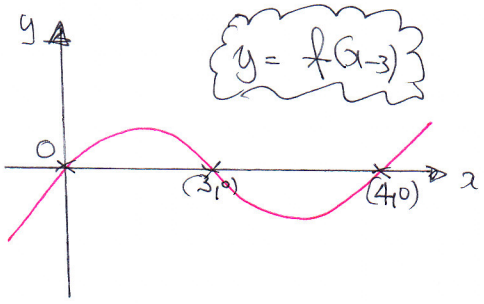
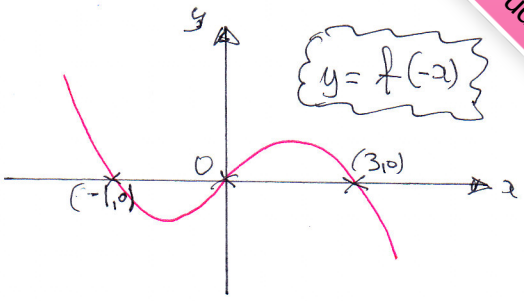
5. (a)



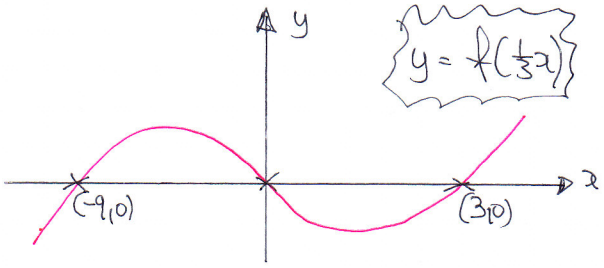
TRANSLATION "RIGHT" BY 3 UNITS

(b)



REFLECTION IN THE y AXIS

(c)



HORIZONTAL STRETCH BY S.F OF 3

6.

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

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

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

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

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

$$y+1=-\frac{2}{3}(x-4)$$
$$3y+3=-2x+8$$
$$2x+3y=5$$

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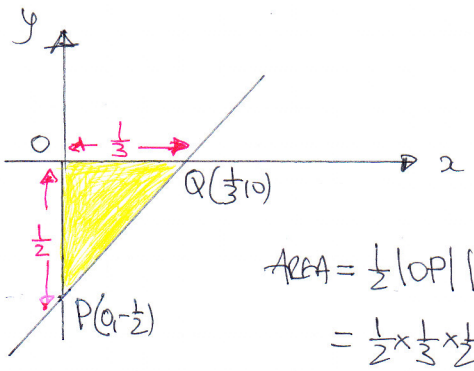
(b) $l_1: 3x-2y=1$

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



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

$= \frac{1}{2}\times\frac{1}{3}\times\frac{1}{2} = \frac{1}{12}$

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

- $u_{16}=15$

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

$15=a+15d$

$30=2a+30d$

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

- $S_{16}=288$

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

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

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

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

$288=8(30-15d)$

$288=240-120d$

$120d=-48$

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

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

$\therefore 15=a+15d$

$15=a+\cancel{15}^{3}(-\frac{2}{\cancel{5}_{1}})$

$15=a-6$

$\boxed{21=a}$

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

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

$u_{11}=21-4$

$u_{11}=17$

AS REQUIRED

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

$a_2 = 0$

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

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

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

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

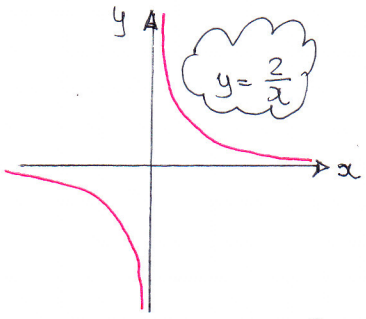
$= -\frac{2}{5} + 0 + \frac{1}{2} + 1 + \frac{7}{5}$

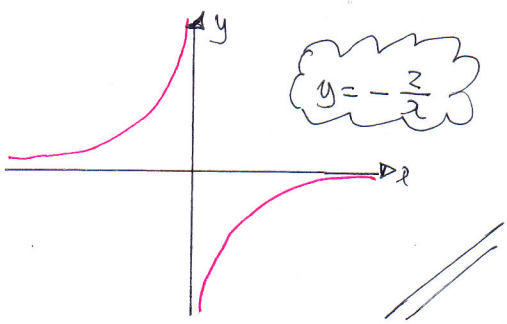
$= 1 + \frac{1}{2} + 1$

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

$= \frac{5}{2}$

10. (a)





REFLECTION IN THE x AXIS

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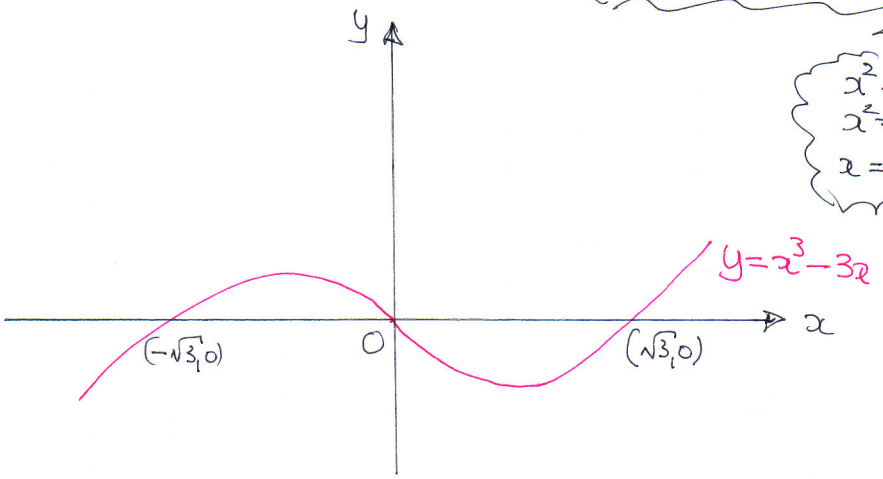
C1, IYGB, PAPER B

(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

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

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

$$x^4 - 3x^2 + 2 = 0$$

THIS IS A "FAKE" QUARTIC
IT IS A QUADRATIC IN x^2

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

$x^2 =$ 1, 2

$x =$ 1, -1, $\sqrt{2}$, $-\sqrt{2}$

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

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

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

∴ NORMAL GRADIENT IS 1

THUS

$\Rightarrow y - y_0 = m(x - x_0)$
$\Rightarrow y - 3 = 1(x - 0)$
$\Rightarrow y - 3 = x$
$\Rightarrow y = x + 3$

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

$\therefore$ TANGENT l_2

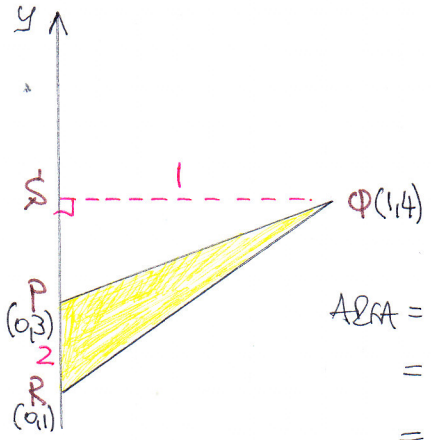
$$y - y_0 = m(x - x_0)$$

$$y - 4 = 3(x-1)$$

$$y - 4 = 3x - 3$$

$$\boxed{y = 3x + 1}$$

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



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

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

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

$$= 1$$

AS REQUIRED