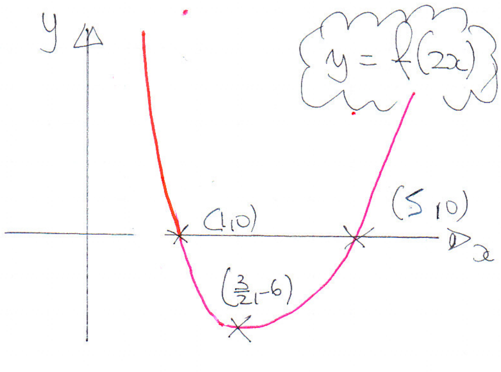
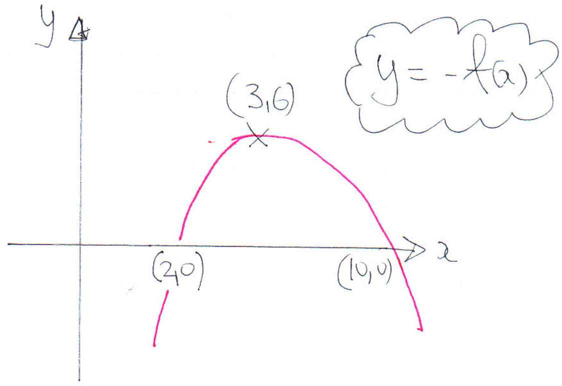
1.





HORIZONTAL STRETCH BY SCALE FACTOR OF $\frac{1}{2}$

REFLECTION IN THE x AXIS

2.
$$\frac{98}{(3+\sqrt{2})^2} = \frac{98}{9+2\times3\times\sqrt{2}+(\sqrt{2})^2} = \frac{98}{9+6\sqrt{2}+2} = \frac{98}{11+6\sqrt{2}} = \frac{98(11-6\sqrt{2})}{(11+6\sqrt{2})(11-6\sqrt{2})}$$

$$= \frac{98(11-6\sqrt{2})}{121-\cancel{66\sqrt{2}}+\cancel{66\sqrt{2}}-36\times2} = \frac{98(11-6\sqrt{2})}{121-72} = \frac{\overset{2}{\cancel{98}}(11-6\sqrt{2})}{\cancel{49}} = 22-12\sqrt{2}$$

3. a) $A(7,3)$ & $B(9,9)$

- GRADIENT $= \frac{y_2-y_1}{x_2-x_1} = \frac{9-3}{9-7} = \frac{6}{2} = 3$
- $y-y_0 = m(x-x_0)$
  $y-9 = 3(x-9)$
  $y-9 = 3x-27$
  $y = 3x-18$

b) L_2 HAS GRADIENT $-\frac{1}{3}$ & PASSES THROUGH $(7,3)$

$y-y_0 = m(x-x_0)$
$y-3 = -\frac{1}{3}(x-7)$
$3y-9 = -x+7$
$x+3y = 16$

c) $L_2: \ x+3y=16$

$L_3: \ y=\frac{x+9}{2}$

$\left.\begin{array}{l} L_2: x+3y=16 \\ L_3: y=\frac{x+9}{2}\end{array}\right\} \Rightarrow \left.\begin{array}{l} x=16-3y \\ 2y=x+9 \end{array}\right\} \Rightarrow 2y=16-3y+9$

$\Rightarrow 5y=25$

$\Rightarrow \boxed{y=5}$

$\therefore \ x=16-3y$

$x=16-3\times5$

$\boxed{x=1}$

$\therefore \ C(1,5)$ //

(d) A(7,3), B(9,9), C(1,5)

$d=\sqrt{(y_2-y_1)^2+(x_2-x_1)^2}$

$|AC|=\sqrt{(7-1)^2+(3-5)^2}=\sqrt{36+4}=\sqrt{40}$

$|AB|=\sqrt{(7-9)^2+(3-9)^2}=\sqrt{4+36}=\sqrt{40}$

$|AC|=|AB|$ INDEED ISOSCELES (NOTE $\hat{ACB}=90°$)

4. (a) (I) $2^{-5}-8^{-2}=\frac{1}{2^5}-\frac{1}{8^2}=\frac{1}{32}-\frac{1}{64}=\frac{2}{64}-\frac{1}{64}=\frac{1}{64}$ //

(II) $\left(\frac{4}{9}\right)^{\frac{3}{2}}=\left(\sqrt{\frac{4}{9}}\right)^3=\left(\frac{2}{3}\right)^3=\frac{8}{27}$ //

(b) $y^{-\frac{1}{3}}=8$

$\Rightarrow \frac{1}{y^{\frac{1}{3}}}=8$

$\Rightarrow \frac{1}{\sqrt[3]{y}}=8$

$\Rightarrow \left(\frac{1}{\sqrt[3]{y}}\right)^3=8^3$

$\Rightarrow \frac{1}{y}=512$

$\Rightarrow y=\frac{1}{512}$ //

ALTERNATIVE

$y^{-\frac{1}{3}}=8$

$\Rightarrow \left(y^{-\frac{1}{3}}\right)^{-3}=8^{-3}$

$\Rightarrow y^1=\frac{1}{8^3}$

$\Rightarrow y=\frac{1}{512}$

5. a) $x^2+4x-12=0$

$(x-2)(x+6)=0$

$x = \begin{cases} 2 \\ -6 \end{cases}$

b) $x^4+4x^2-12=0$

$(x^2)^2+4(x^2)-12$

$a^2+4a-12$

THIS IS A QUADRATIC

$(x^2-2)(x^2+6)=0$

$x^2 = \begin{cases} 2 \\ \cancel{-6} \end{cases}$

$x = \pm\sqrt{2}$

6. $\displaystyle\sum_{k=10}^{30}(4k+11) = \underbrace{51+55+59+\dots+131}$

THIS IS AN A.P WITH $a=51$, $d=4$, $l=131$, $n=21$ ← "FIRST 30" TAKE AWAY "FIRST 9"

$S_n = \frac{n}{2}[a+l]$

$S_{21} = \frac{21}{2}[51+131]$

$S_{21} = \frac{21}{2} \times 182$

$S_{21} = 21 \times 91$ ←

$$\begin{array}{r} 910 \\ 910 \\ 91 \\ \hline 1911 \end{array}$$

$S_{21} = 1911$

7. a) $\frac{dy}{dx} = 6x^2-6x-20$

$y = \int 6x^2-6x-20 \, dx$

$\boxed{y = 2x^3-3x^2-20x+C}$

BUT $x=0$, $y=0$ (THROUGH ORIGIN)

$0 = 0-0-0+C$

$\boxed{C=0}$

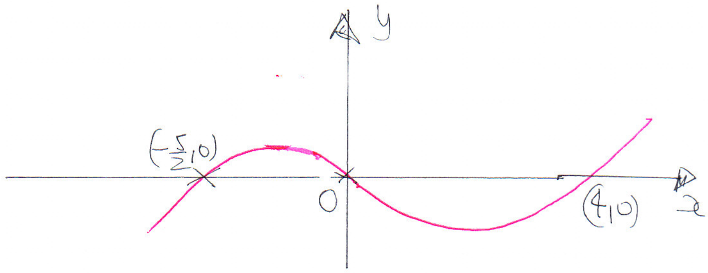
$\Rightarrow y = 2x^3-3x^2-20x$

$\Rightarrow y = x(2x^2-3x-20)$

$\Rightarrow y = x(2x+5)(x-4)$

(b)

- $+x^3$
- $x=0 \quad y=0$
- $y=0 \quad x = \begin{cases} 0 \\ 4 \\ -\frac{5}{2} \end{cases}$



8.

$$\left.\begin{aligned} 2y+x&=8 \\ y&=2x^2-6x+7 \end{aligned}\right\} \Rightarrow 2(2x^2-6x+7)+x=8$$

$$\Rightarrow 4x^2-12x+14+x=8$$

$$\Rightarrow 4x^2-11x+6=0$$

$$\Rightarrow (4x-3)(x-2)=0$$

$$\Rightarrow x = \begin{cases} 2 \\ \frac{3}{4} \end{cases}$$

Now
- $2y+2=8$, $2y=6$, $y=3$
- $2y+\frac{3}{4}=8$, $8y+3=32$, $8y=29$, $y=\frac{29}{8}$

$\therefore (2,3)$ or $(\frac{3}{4},\frac{29}{8})$

ALTERNATIVE — NOT SENSIBLE

$$\left.\begin{aligned} 2y+x&=8 \\ y&=2x^2-6x+7 \end{aligned}\right\} \Rightarrow \boxed{x=8-2y}$$

$\therefore y=2(8-2y)^2-6(8-2y)+7$

$y=2(64-32y+4y^2)-48+12y+7$

$y=128-64y+8y^2-48+12y+7$

$0=8y^2-52y+87$

$0=(8y-29)(y-3)$

$$y = \begin{cases} 3 \\ \frac{29}{8} \end{cases}$$

$$x = \begin{cases} 8-2\times3 = 2 \\ 8-2\times\frac{21}{8} = 8-\frac{29}{4} = \frac{3}{4} \end{cases}$$

THUS

$\therefore (2,3)$ & $(\frac{3}{4},\frac{29}{8})$

C1, IYGB, PAPER G

9. $1x^2 + \boxed{2(2p-1)}x + \boxed{7p+4} = 0$

NO REAL ROOTS $\Rightarrow b^2 - 4ac < 0$

$\Rightarrow [2(2p-1)]^2 - 4 \times 1 \times (7p+4) < 0$

$\Rightarrow 4(2p-1)^2 - 4(7p+4) < 0$

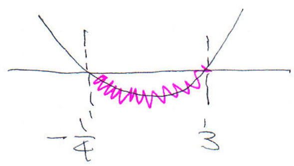
$\Rightarrow (2p-1)^2 - (7p+4) < 0$

$\Rightarrow 4p^2 - 4p + 1 - 7p - 4 < 0$

$\Rightarrow 4p^2 - 11p - 3 < 0$

$\Rightarrow (4p+1)(p-3) < 0$

C.V $= \left\langle \begin{matrix} 3 \\ -\frac{1}{4} \end{matrix} \right.$



$-\frac{1}{4} < p < 3$ //

10, a) $y = 2x^3 - 9x^2 + 12x - 10$

$\frac{dy}{dx} = 6x^2 - 18x + 12$

$0 = 6x^2 - 18x + 12$

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

$0 = (x-2)(x-1)$

$x = \left\langle \begin{matrix} 1 \\ 2 \end{matrix} \right.$

$y = \left\langle \begin{matrix} 2 - 9 + 12 - 10 = -5 \\ 16 - 36 + 24 - 10 = -6 \end{matrix} \right.$

$\therefore (1, -5)$ & $(2, -6)$ //

b) $\frac{dy}{dx} = 6x^2 - 18x + 12$

$\left.\frac{dy}{dx}\right|_{x=-1} = 6(-1)^2 - 18(-1) + 12$

$= 6 + 18 + 12$

$= 36$ //

(c) $\frac{dy}{dx} = 36$

$6x^2 - 18x + 12 = 36$

$x^2 - 3x + 2 = 6$

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

$(x-4)(x+1) = 0$

$x = \left\langle \begin{matrix} 4 \leftarrow Q \\ -1 \leftarrow P \end{matrix} \right.$

THUS IF $x=4$ $y = 2\times4^3 - 9\times4^2 + 12\times4 - 10$

$y = 128 - 144 + 48 - 10$

$y = 176 - 154$

$y = 22$

$\therefore Q(4,22)$

11. • TOTAL SUM OF 40 = 360000 IE $S_{40} = 360,000$

• $\frac{1}{3}\times 360000 = 120000$

• SUM OF FIRST 30 = 360 000 − 120 000 = 240000

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

• $360000 = \frac{40}{2}\left[2a + 39d\right]$

$360000 = 20(2a + 39d)$

$18000 = 2a + 39d$

$\boxed{2a = 18000 - 39d}$

• $240000 = \frac{30}{2}\left[2a + 29d\right]$

$240000 = 15\left[2a + 29d\right]$

$80000 = 5\left[2a + 29d\right]$

$\boxed{16000 = 2a + 29d}$

$16000 = 18000 - 39d + 29d$

$10d = 2000$

$\boxed{d = 200}$

$\therefore 2a = 18000 - 39d$

$2a = 18000 - 39\times200$

$a = 9000 - 39\times100$

$a = 9000 - 3900$

$a = 5100$