EXERCISE 4B

1a $x_{1,2} = \frac{-3 \pm \sqrt{9+20}}{2} = \frac{-3 \pm \sqrt{29}}{2}$

b. $x_{1,2} = \frac{4 \pm \sqrt{16+28}}{2} = \frac{4 \pm \sqrt{44}}{2} = \frac{4 \pm 2\sqrt{11}}{2}$

$x_1 = 2 + \sqrt{11}$

$x_2 = 2 - \sqrt{11}$

c. $x_{1,2} = \frac{-6 \pm \sqrt{36-36}}{2}$

$x_{1,2} = -3$

d $x_{1,2} = \frac{-5 \pm \sqrt{25-8}}{2} = \frac{-5 \pm \sqrt{17}}{2}$

e $x_{1,2} = \frac{-1 \pm \sqrt{1-4}}{2} = \frac{-1 \pm \sqrt{-3}}{2}$ No Solution

f $x_{1,2} = \frac{5 \pm \sqrt{25+72}}{6}$

$= \frac{5 \pm \sqrt{97}}{6}$

g $x_{1,2} = \frac{-7 \pm \sqrt{49-24}}{4} = \frac{-7 \pm 5}{4}$

$x_1 = -3, \; x_2 = -\frac{1}{2}$

h $x_{1,2} = \frac{3 \pm \sqrt{9+32}}{-2} = \frac{3 \pm \sqrt{41}}{-2}$

i $x_{1,2} = \frac{-4 \pm \sqrt{16+120}}{-12} = \frac{-4 \pm \sqrt{136}}{-12}$

$= \frac{1}{3} \pm \frac{2\sqrt{34}}{-12}$

$= \frac{1}{3} \pm \frac{1}{6}\sqrt{34}$

2b $x^2 + 2x + 1 = 0$

$D = 4 - 4(1)(1) = 4 - 4 = 0$

$D = 0 \Rightarrow$ 1 root

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

$D = (-3)^2 - 4(1)(4) = 9 - 16$

$D < 0 \Rightarrow$ no root

f. $5x^2 + 9x + 4 = 0$

$D = 81 - 45.4 = 1$

$D > 0 \Rightarrow$ 2 roots

h. $3 - 7x - 4x^2 = 0$

$D = (-7)^2 - 4(-4)(3) = 49 + 48$

$D > 0 \Rightarrow$ 2 roots

3a $x^2 + 3x - k = 0$, $D = 0$

$9 - 4(1)(-k) = 0$

$9 + 4k = 0$

$k = -\frac{9}{4}$ //

b $kx^2 + 5x - 8 = 0$

$25 - 4k(-8) = 0$

$25 = -32k$

$k = -\frac{25}{32}$

c $x^2 - 18x + k = 0$

$(-18)^2 - 4(1)k = 0$

$18^2 = 4k$

$k = \frac{18 \times 18}{4} = 81$

d. $-3 + kx - 2x^2 = 0$

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

$D = k^2 - 4(-2)(-3) = 0$

$k^2 - 24 = 0$

$k^2 = 24$

$k = \pm\sqrt{24} = \pm 2\sqrt{6}$

e. $4x^2 - kx + 6 = 0$

$D = (-k)^2 - 4(4)(6) = 0$

$k^2 = 16 \times 6$

$k = \pm 4\sqrt{6}$

4d. $3x^2+5x-k=0$

$D=25-4.3.(-k)>0$

$25+12k>0$

$12k>-25$

$k>-\frac{25}{12}$

e. $x^2-4x+3k=0$ (1)

$D=(-4)^2-4(1)(3k)=0$

$16-12k=0$

$k=\frac{16}{12}=\frac{4}{3}$

f. $kx^2-5x+7=0$ (0)

$D=(-5)^2-4k.(7)<0$

$25-28k<0$

$25<28k$

$k>\frac{25}{28}$

5e $\left.\begin{matrix} y=x^2-10 \\ y=0 \end{matrix}\right\} 0=x^2-10$

$D=0-4(1)(-10)=40$

$D>0 \Rightarrow$ 2 points of intersection

f. $\left.\begin{matrix} y=3-4x-2x^2 \\ y=0 \end{matrix}\right\} 0=-2x^2-4x+3$

$D=(-4)^2-4(-2)(3)$

$=16+24$

$D>0 \Rightarrow$ 2 points of intersection

g $\left.\begin{matrix} y=3x^2-5x+7 \\ y=0 \end{matrix}\right\} 0=3x^2-5x+7$

$D=(-5)^2-4(3)(7)=25-84$

$D<0 \Rightarrow$ No intersection with x-axis

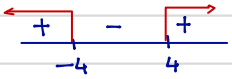
4g $x^2-kx+4=0$ (2)

$D=(-k)^2-4(1)(4)>0$

$k^2-16>0$

$(k+4)(k-4)>0$

zv. $k=-4,4$



$k<-4$, $k>4$

8A i Sum of roots

$x_1+x_2=-\frac{b}{2a}+\left(-\frac{b}{2a}\right)=-\frac{b}{a}$ //

ii Product of the roots:

$x_1 \times x_2=\left(-\frac{b}{2a}\right)^2-\frac{b^2-4ac}{4a^2}$

$=-\frac{b^2}{4a^2}-\frac{b^2}{4a^2}+\frac{4ac}{4a^2}$

$x_1 \times x_2=\frac{c}{a}$ //

B $\alpha=\frac{-b+\sqrt{b^2-4c}}{2}=-\frac{b}{2}+\frac{\sqrt{b^2-4c}}{2}$

$\beta=\frac{-b-\sqrt{b^2-4c}}{2}=-\frac{b}{2}-\frac{\sqrt{b^2-4c}}{2}$

$\alpha+\beta=-\frac{b}{2}+\left(-\frac{b}{2}\right)=-\frac{2b}{2}=-\frac{b}{a}$

$\alpha \times \beta=\frac{b^2}{4}-\frac{b^2-4c}{4}=\frac{c}{a}$

C. $\alpha+\beta=-\frac{b}{a}$

$\alpha \times \beta=\frac{c}{a}$