DISCRIMINANT PRACTICE

26
BASIC
QUESTIONS

Question 1 (**)

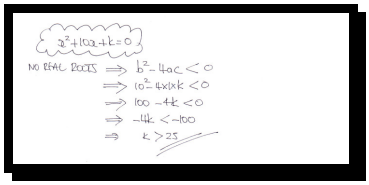
The quadratic equation

$$x^2+10x+k=0,$$

where k is a constant, has no real roots.

Find the range of the possible values of k.

$\boxed{k>25}$



Question 2 (**)

It is given that

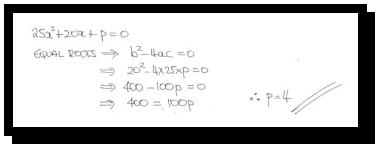
$$f(x)\equiv 25x^2+20x+p,$$

where p is a non zero constant.

The quadratic equation $f(x)=0$ has equal roots.

Find the value of p.

$\boxed{p=4}$



Question 3 (**)

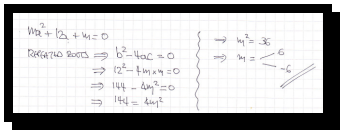
The quadratic equation

$$mx^2+12x+m=0\,,$$

where m is a constant, has repeated roots.

Find the possible values of m.

$$\boxed{m=\pm 6}$$



Question 4 (**)

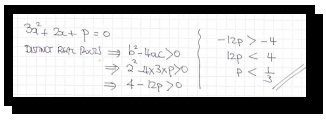
The quadratic equation

$$3x^2+2x+p=0\,,$$

where p is a constant, has two distinct real roots.

Find the range of possible values of p.

$$\boxed{p<\frac{1}{3}}$$



Question 5 (**)

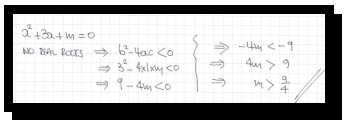
The quadratic equation

$$x^2+3x+m=0,$$

where m is a constant, has no real roots.

Find the range of possible values of m.

$$\boxed{m>\frac{9}{4}}$$



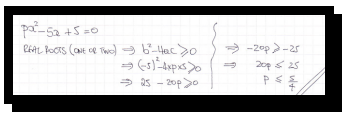
Question 6 (**)

Find the range of the possible values of the constant p, given that the equation

$$px^2-5x+5=0$$

has real roots.

$$\boxed{p\le\frac{5}{4}}$$



Question 7 **(**+)**

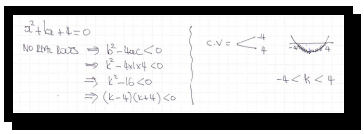
The quadratic equation

$$x^2 + kx + 4 = 0,$$

where k is a constant, has no real roots.

Find the range of possible values of k.

$\boxed{-4 < k < 4}$



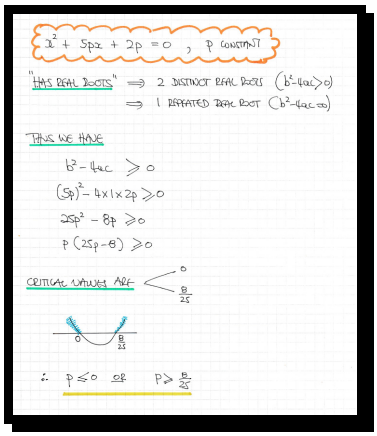
Question 8 **(**+)**

Find the range of the possible values of the constant p, given that the equation

$$x^2 + 5px + 2p = 0$$

has real roots.

$\boxed{\quad}$, $\boxed{p \leq 0 \quad \text{or} \quad p \geq \frac{8}{25}}$



Question 9 **(**+)**

$$f(x) \equiv 9x^2 - 6x + c,$$

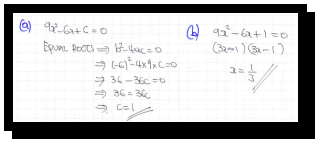
where c is a non zero constant.

The equation $f(x) = 0$ has equal roots.

a) Determine the value of c.

b) Solve the equation $f(x) = 0$ for the value of c found in part (a).

$\boxed{c = 1}$, $\boxed{x = \frac{1}{3}}$



Question 10 **(**+)**

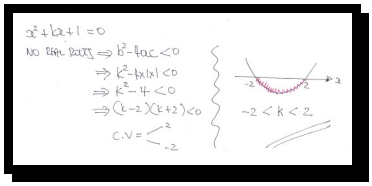
$$f(x) \equiv x^2 + kx + 1,$$

where k is a constant.

The equation $f(x) = 0$ has no real roots.

Determine the range of the possible values of k.

$\boxed{-2 < k < 2}$



Question 11 (+)**

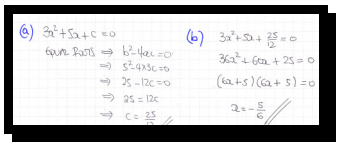
The equation $3x^2+5x+c=0$, where c is a constant, has equal roots.

a) Determine the value of c.

b) Solve the equation

$$3x^2+5x+c=0.$$

$\boxed{c=\frac{25}{12}}$, $\boxed{x=-\frac{5}{6}}$



Question 12 (+)**

It is given that

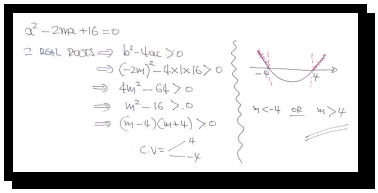
$$f(x)\equiv x^2-2mx+16,$$

where m is a constant.

The equation $f(x)=0$ has two distinct real roots.

Determine the range of values of m.

$\boxed{m<-4 \text{ or } m>4}$



Question 13 (+)**

It is given that

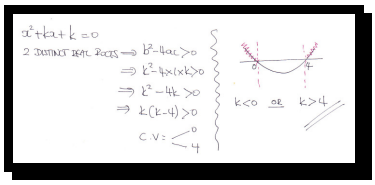
$$f(x) \equiv x^2 + kx + k,$$

where k is a constant.

The equation $f(x) = 0$ has two distinct real roots.

Determine the range of the possible values of k.

$$\boxed{k < 0 \text{ or } k > 4}$$



Question 14 (+)**

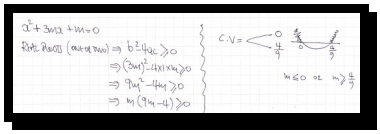
The quadratic equation

$$x^2 + 3mx + m = 0,$$

where m is a constant, has real roots.

Find the range of possible values of m.

$$\boxed{m \leq 0 \text{ or } m \geq \frac{4}{9}}$$



Question 15 (***)

The quadratic equation

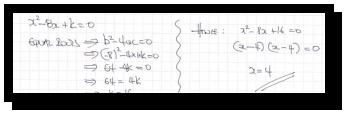
$$x^2-8x+k=0\,,$$

where k is a constant, has equal roots.

Solve the equation

$$x^2-8x+k=0\,.$$

$\boxed{x=4}$



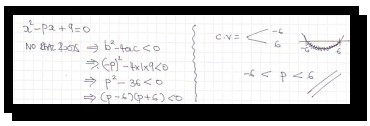
Question 16 (***)

Find the range of the values of the constant p, given that the quadratic equation

$$x^2-px+9=0$$

has no real roots.

$\boxed{-6<p<6}$



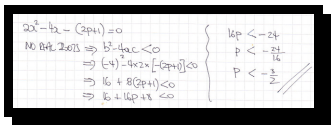
Question 17 (***)

Find the range of values of the constant p so that the quadratic equation

$$2x^2-4x-(2p+1)=0$$

has no real roots.

$$\boxed{p<-\frac{3}{2}}$$



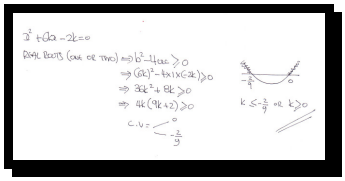
Question 18 (***)

Find the range of values of the constant k so that the quadratic equation

$$x^2+6kx-2k=0$$

has real roots.

$$\boxed{k\le -\frac{2}{9} \text{ or } k\ge 0}$$



Question 19 (***)

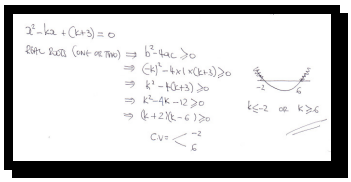
It is given that

$$f(x)=x^2-kx+(k+3),$$

where k is a non zero constant.

If the equation $f(x)=0$ has real roots find the range of the values of k.

$\square$, $\boxed{k\le -2}$, $\boxed{k\ge 6}$



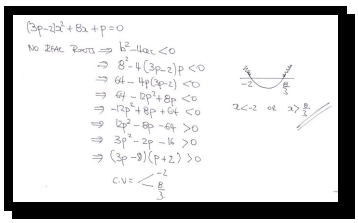
Question 20 (***)

Find the range of values of the constant p so that the quadratic equation

$$(3p-2)x^2+8x+p=0,\ p\neq\frac{2}{3}$$

has no real roots.

$\square$, $\boxed{p<-2 \text{ or } p>\frac{8}{3}}$



Question 21 (***)

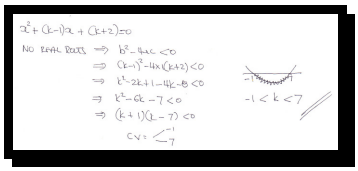
The quadratic equation

$$x^2+(k-1)x+(k+2)=0,$$

where k is a constant, has no real roots.

Find the range of possible values of k.

$\boxed{-1<k<7}$



Question 22 (***)

$$f(x)=x^2+(1-p)x+4,$$

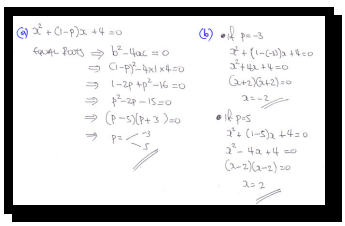
where p is a non zero constant.

The equation $f(x)=0$ has equal roots.

a) Determine the possible values of p.

b) Solve the equation $f(x)=0$ for each of the values of p found in part **(a)**.

$\boxed{p=-3,\ 5}$, $\boxed{x=\pm 2}$



Question 23 (***)

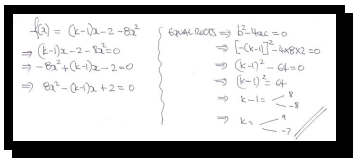
$$f(x)=(k-1)x-2-8x^2,$$

where k is a non zero constant

The equation $f(x)=0$ has equal roots.

Determine the possible values of k.

$\square$, $\boxed{k=-7,9}$



Question 24 (***)

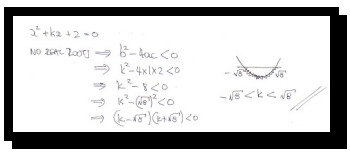
The quadratic equation

$$x^2+kx+2=0,$$

where k is a constant, has no real roots.

Find, as exact surds, the range of values of k.

$$\boxed{-\sqrt{8}<k<\sqrt{8}}$$



Question 25 (***)

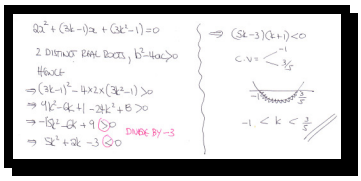
The quadratic equation

$$2x^2+(3k-1)x+\left(3k^2-1\right)=0,$$

where k is a constant, has two different real roots.

Find the range of values of k.

$$\boxed{-1<k<\frac{3}{5}}$$



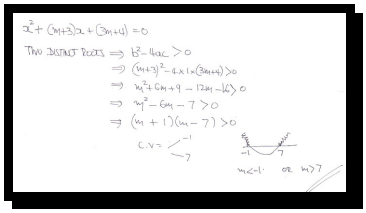
Question 26 (***)

Find the range of values of the constant m so that the quadratic equation

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

has two distinct real roots.

$$\boxed{\phantom{m<-1}}, \quad \boxed{m<-1 \text{ or } m>7}$$



25 STANDARD QUESTIONS

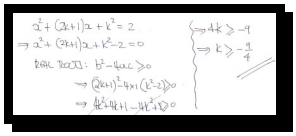
Question 1 (*+)**

Find the range of values of the constant k so that the quadratic equation

$$x^2+(2k+1)x+k^2=2$$

has real roots.

$\square$, $\boxed{k\geq -\frac{9}{4}}$



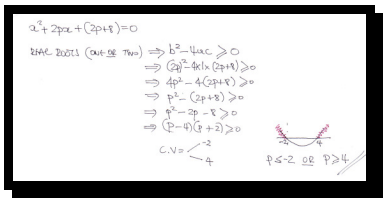
Question 2 (*+)**

Find the range of values of the constant p so that the quadratic equation

$$x^2+2px+(2p+8)=0$$

has real roots.

$\boxed{p\leq -2 \text{ or } p\geq 4}$



Question 3 (*+)**

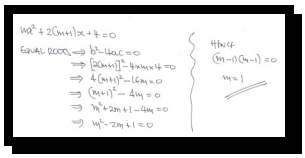
The quadratic equation

$$mx^2+2(m+1)x+4=0,$$

where m is a constant, has equal roots.

Find the possible value of m.

$$\boxed{m=1}$$



Question 4 (*+)**

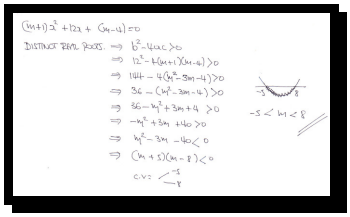
The quadratic equation

$$(m+1)x^2+12x+(m-4)=0,$$

where m is a constant, such that $m\neq -1$, has two distinct real roots.

Determine the range of possible values of m.

$$\boxed{-5<m<8,\ m\neq -1}$$



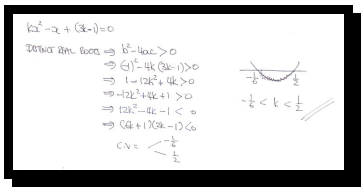
Question 5 (*+)**

Find the possible range of the values of the non zero constant k, so that the quadratic equation

$$kx^2 - x + (3k - 1) = 0$$

has distinct real roots.

$$\boxed{-\frac{1}{6} < k < \frac{1}{2},\ k \neq 0}$$



Question 6 (*+)**

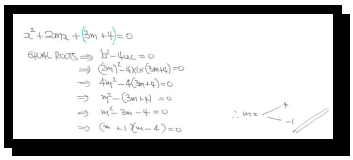
The quadratic equation

$$x^2 + 2mx + 3m + 4 = 0,$$

where m is a constant, has equal roots.

Find the possible values of m.

$$\boxed{},\ \boxed{m = -1, 4}$$



Question 7 (*+)**

The quadratic equation

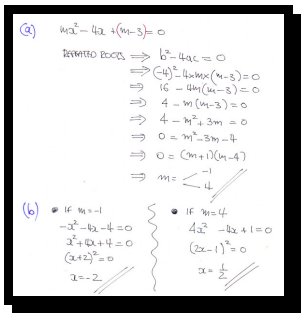
$$mx^2-4x+m-3=0\,,$$

where m is a non zero constant, has repeated roots.

a) Find the possible values of m.

b) Hence solve the equation for each value of m found in part **(a)**.

$\boxed{m=-1,4}$, $\boxed{x=-2,\frac{1}{2}}$



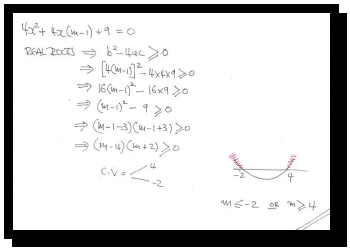
Question 8 (*+)**

Find the range of the possible values of the constant m, given that the equation

$$4x^2+4x\left(m-1\right)+9=0$$

has real roots.

$\boxed{m\le -2 \quad \text{or} \quad m\ge 4}$



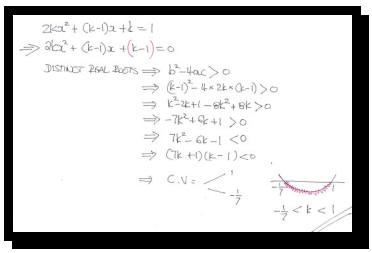
Question 9 (*+)**

Find the range of values of the non zero constant k, given that the quadratic equation

$$2kx^2+(k-1)x+k=1$$

has distinct real roots.

$$\boxed{-\frac{1}{7}<k<1,\ k\neq 0}$$



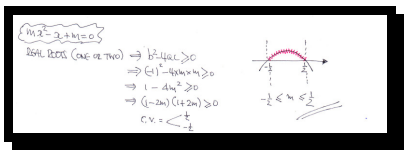
Question 10 (*+)**

Find the range of values of the constant m so that the quadratic equation

$$mx^2-x+m=0$$

has real roots.

$$\boxed{-\frac{1}{2}\leq m\leq\frac{1}{2}}$$



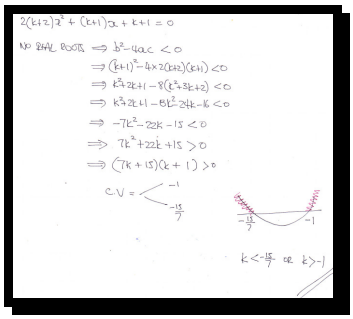
Question 11 (*+)**

Find the range of the possible values of the constant k, $k \neq -2$, so that the quadratic equation

$$2(k+2)x^2+(k+1)x+(k+1)=0$$

has no real roots.

$\boxed{k<-\frac{15}{7} \text{ or } k>-1}$



Question 12 (****)

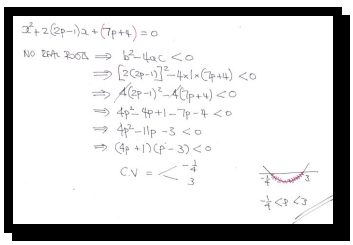
$$f(x)=x^2+2(2p-1)x+7p+4,$$

where p is a constant

The equation $f(x)=0$ has no real roots.

Determine the range of the possible values of p.

$\boxed{}$, $\boxed{-\frac{1}{4}<p<3}$



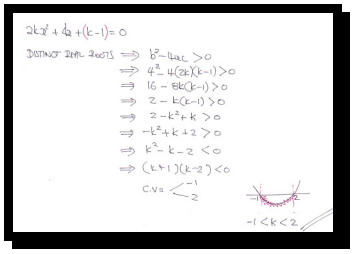
Question 13 (****)

Find the range of values of the non zero constant k so that the quadratic equation

$$2kx^2+4x+k-1=0$$

has two distinct real roots.

$$\boxed{-1<k<2,\ k\neq 0}$$



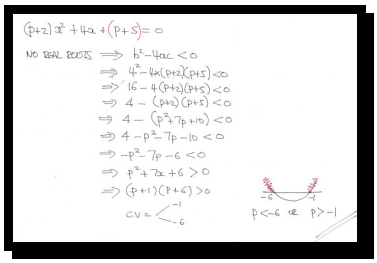
Question 14 (****)

Find the range of values of the constant p, $p\neq -2$, so that the quadratic equation

$$(p+2)x^2+4x+p+5=0$$

has no real roots.

$$\boxed{p<-6 \text{ or } p>-1}$$



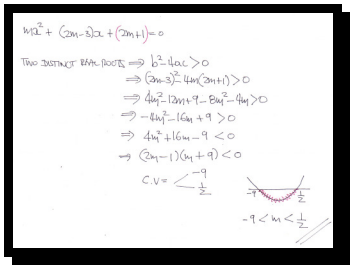
Question 15 (****)

Find the range of values of the non zero constant m so that the quadratic equation

$$mx^2+(2m-3)x+2m+1=0$$

has two distinct real roots.

$$\boxed{-\frac{9}{2}<m<\frac{1}{2},\ m\neq 0}$$



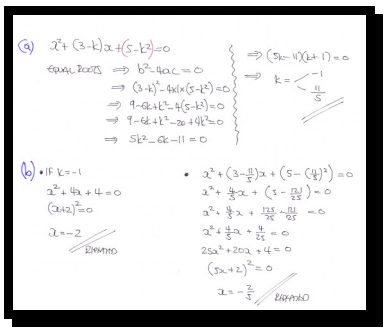
Question 16 (****)

$$f(x)=x^2+(3-k)x+5-k^2,\text{ where } k \text{ is a constant.}$$

a) Given that the equation $f(x)=0$ has equal roots, find the possible values of k.

b) Solve the equation $f(x)=0$, for each value of k found in part (a)

$$\boxed{k=-1,\frac{11}{5}},\quad \boxed{k=-2,\frac{2}{5}}$$



Question 17 (****)

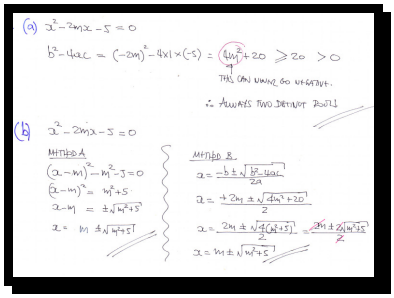
$f(x)=x^2-2mx-5$, where m is a constant.

a) **Without** attempting a solution, show that the equation $f(x)=0$ has two distinct real roots for all possible values of the constant m.

b) Find, in terms of m and in fully simplified form, the roots of the equation

$$f(x)=0.$$

$\square$, $\boxed{x=m\pm\sqrt{m^2+5}}$



Question 18 (****)

The quadratic equation

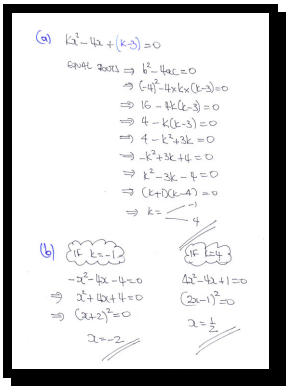
$$kx^2 - 4x + k - 3 = 0,$$

where k is a non zero constant, has equal roots.

a) Determine the possible values of k.

b) Solve the equation for each value of k found in part (a).

$\boxed{k = -1, 4}$, $\boxed{x = -2, \frac{1}{2}}$



Question 19 (****)

The quadratic equation

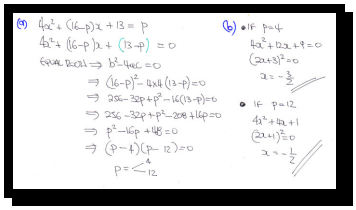
$$4x^2+(16-p)x+13=p\,,$$

where p is a constant, has equal roots.

a) Determine the possible values of p.

b) Solve the equation for each of the values of p found in part (a).

$\square$, $\boxed{p=4,\ 12}$, $\boxed{x=-\frac{3}{2},\ -\frac{1}{2}}$



Question 20 (****)

The quadratic equation

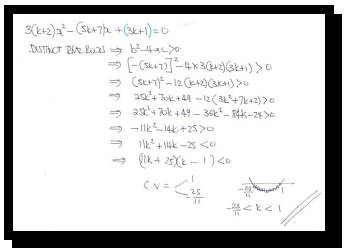
$$3(k+2)x^2-(5k+7)x+3k+1=0,$$

where k is a constant, $k \neq -2$, has two distinct real roots.

Show clearly that

$$-\frac{25}{11}<k<1.$$

, proof



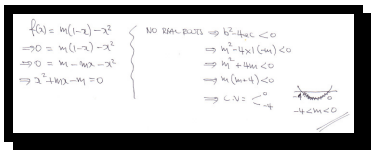
Question 21 (****)

$f(x)=m(1-x)-x^2$, where m is a constant.

The equation $f(x)=0$ has no real roots.

Determine the range of the possible values of m.

, $-4<m<0$



Question 22 (****)

A curve C has equation

$$y = x^2 + 2mx + (3m + 4),$$

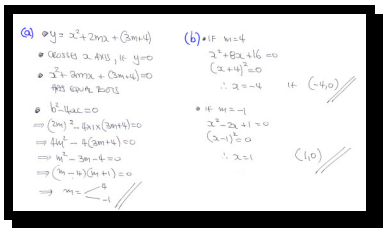
where m is a real constant.

The graph of C **touches** the x axis.

a) Determine the possible values of m.

b) For each value of m found in part in part (a), find the x coordinate of the point where the graph of C touches the x axis.

$\boxed{}$, $\boxed{m=-1,4}$, $\boxed{x=-2,1}$



Question 23 (****)

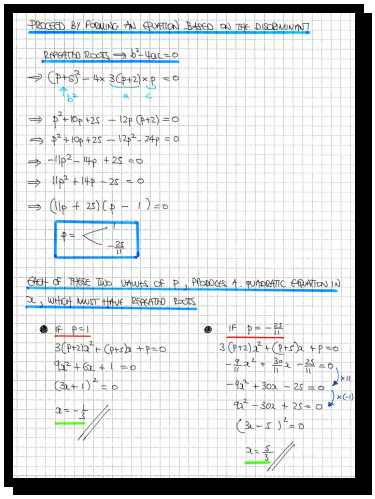
The quadratic equation

$$3(p+2)x^2+(p+5)x+p=0,$$

where p is a constant, $p\neq -2$, has repeated roots.

Find the possible roots of the equation.

$\boxed{}$, $\boxed{x=-\frac{1}{3},\ x=\frac{5}{3}}$



Question 24 (****)

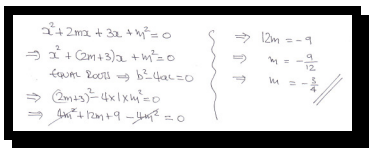
The quadratic equation, where m is a constant,

$$x^2+2mx+3x+m^2=0,$$

has equal roots.

Find the value of m.

$\boxed{}$, $\boxed{m=-\frac{3}{4}}$



Question 25 (****)

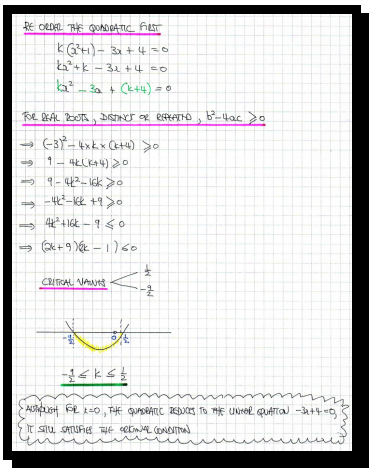
The quadratic equation

$$k\left(x^2+1\right)-3x+4=0,$$

where k is a non zero constant, has real roots.

Find the range of possible values of k.

$\square$, $\boxed{-\frac{9}{2}\le k\le\frac{1}{2}}$



2

HARD QUESTIONS

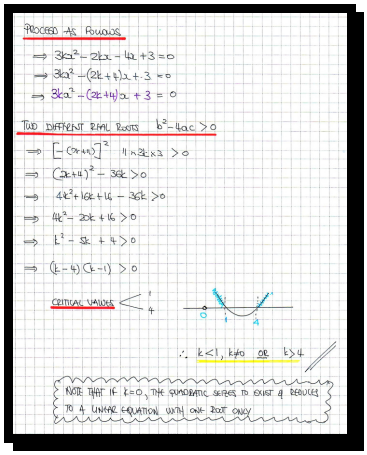
Question 1 (**+)**

Find the range of values of the non zero constant k, given that the quadratic equation

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

has two different real roots.

$\boxed{}$, $\boxed{k < 1 \quad \text{or} \quad k > 4, \quad k \neq 0}$



Question 2 **(****+)**

It is given that

$$f(x)=x^2+2x-m\left(x^2-2x+2\right)-2,$$

where m is a constant such that $m\neq 1$.

The equation $f(x)=0$ has distinct real roots.

Determine the range of values of m.

$\boxed{}$, $\boxed{-1<m<3,\ m\neq 1}$

