I- a) Expand:

i- $\left(2-\sqrt{5}\right)^2$.

ii- $\left(3-\sqrt{2}\right)^2$

b) Determine if possible, the roots of:

1) $x^2+\left(2+\sqrt{5}\right)x=-2\sqrt{5}$.

2) $x^2+\left(3+\sqrt{2}\right)x+3\sqrt{2}=0$

II- Solve in $\mathbb{R}$ the following equations:

a. $9x^4+5x^2-4=0$

b. $\left(3x^2-2x+1\right)^2-3\left(3x^2-2x+1\right)+2=0$

c. $x(x+1)\left(x^2+x+1\right)=42$ $(Let: u=x(x+1))$

d. $x-2+\sqrt{(3x-4)^2}=2$

e. $\sqrt{9x^2-6x+1}=3x-1$

f. $2x^6-3x^3=-1$

III- Determine the numerical value of b, so that the equation: $4x^2+bx+b=0$, admits a double root in $\mathbb{R}$.

IV- Consider the trinomials: $R(x)=5x^2+x-6$ & $N(x)=7x^2+4x-3$.

a. For what values of x is:

i. $R(x)$ strictly positive.

ii. $N(x)$ strictly negative.

b. Deduce the solution of the system: $\begin{cases} N(x)<0 \\ R(x)>0 \end{cases}$

c. Deduce the domain of: $\sqrt{R(x)}$.

V- Let $p(x)=(m-1)x^2-2(m+1)x+2m+4$ be any parametric trinomial.

a. Study according to the values of m the existence of the roots of $p(x)$.

b. Determine the set of value of m so that $p(x)>0$, $\forall x \in \mathbb{R}$.

c. Determine the numerical value of m if:

i. The roots of $p(x)$ are opposite.

ii. $+1$ is not a root of $p(x)$.

VI- Answer with justification by ***true*** or ***false***:

a. The 2nd degree trinomial: $E(x)=-3x^2+5x-4$, admits two strictly positive roots. (*<u>Don't compute the roots</u>*).

b. If $g(x)=ax^2+bx+c$ and:

i. $g(x)=0$ admits two opposite real roots, then $a\neq 0$ & $c=0$

ii. The product: $ac>0$, then $g(x)$ will always have two distinct roots.

iii. $g(x)>0$ for all real numbers x, then it is sufficient that $\Delta<0$.

VII- Consider the parametric equation: $(1+m)x^2+3x+m=0$.

1) Determine the value of m in each of the following cases:
   a. (E) admits a single root to be determined.
   b. (E) has a double root to be determined.
2) Given on the axis $(x'ox)$ the points $M'\&M''$ respective abscissa $x'\&x''$, and the point $I(+1)$. Find the values of m for which $\overline{IM'} \times \overline{IM''} < 3$?

VIII- Let $f(x)=(m+1)x^2-2(m-1)x-m-5$ be a quadratic function with the parametric coefficient m.

a. Prove that: For all $m \in \mathbb{R}-\{-1\}$, $f(x)$ admits in $\mathbb{R}$ two distinct roots $x'\&x''$ to be determined.

b. Determine the set of values of m for which $x'<x''<0$.

IX- For what values of m is the inequality: $(E):(3m-1)x^2-2(3m-1)x-4>0$.

X- Consider the parametric equation $(E):(3m+1)x^2-2(2m+3)x+m-3=0$.

a. Discuss according to the values of m the existence and the sign of the roots of (E).

b. Determine m so that the sum of cube the roots of (E) equals zero.

XI- Consider the parametric equation $(E):x^2-2x-m^2+2m-5=0$

1. Show that: For all $m \in R$, (E) admits two different roots.
2. Consider in the orthonormal system $(O,\vec{i},\vec{j})$ the points $A(x',0)$ & $B(0,x'')$ where $x'\&x''$ are the roots of (E).
   a. Calculate m so that $AB=\sqrt{20}cm$.
   b. Find m if area of the triangle AOB is $6.5cm^2$

XII- Consider the parametric equation $(E):(m+1)x^2-2(m-3)x+2m-5=0$.

a. Discuss according to the values of m the existence and the sign of the roots of (E).

b. Determine the set of values of m such that (E) admits two distinct roots.

c. Determine m so that: $(E)<0, \forall x \in R$.

XIII- Consider the parametric equation $(E):mx^2-2(m-3)x+2m-1=0$.

a. Discuss according to the values of m the existence and the sign of the roots of (E).

b. Find among the roots, when they exist, a relation independent of m.

XIV- Sara bought a number of scarfs at Malik's for 150$. If each scarf had been 5$ more, 5 fewer could have been purchased. Find the price of each scarf.

Mastering problems		
Chapter	*Exercises*	*Pages*
CH-: Second degree equations	1&2	3
	13,14&16	5&6
	18&21	7&8