UNIT 3: EQUATIONS, INEQUALITIES AND SYSTEMS

Exercise 1: Solve and factorize the following quadratic equations:

a) $x^2+64=0$
b) $9x^2-49=0$
c) $x^2+7x=0$
d) $6x^2-3+4x+1=x-2$
e) $x^2-4x-5=0$
f) $x^2+12x+36=0$
g) $2x^2-1=0$
h) $7x^2-9=0$

Exercise 2: Solve the equation $x(x-1)(x+2)(x-3)^2=0$

Exercise 3: Solve:

a) $(x+5)^2=0$
b) $(5x-2)^2=0$
c) $(x+3)(x-2)=0$
d) $(2x+1)(x-7)=0$

Exercise 4: Solve:

a) $(3x-1)^2=25$
b) $\frac{(x+3)^2}{25}=\frac{(x-5)^2}{9}$
c) $(x+7)^2+6x=-2$
d) $(x-1)^2-(2x+4)^2=5-x$
e) $\frac{x}{4}=\frac{x^2+2}{7x+2}$
f) $\frac{x+5}{2x-2}=\frac{x-1}{x-2}$

Exercise 5: Solve and factorize:

a) $x^4-13x^2+36=0$
b) $x^4-11x^2+18=0$
c) $x^4-3x^2-4=0$
d) $x^4-16=0$
e) $x^4-9x^2=0$
f) $x^4-10x^2+25=0$

Exercise 6: Solve the following radical equations:

a) $\sqrt{5x-1}=6$
b) $2\sqrt{x}-x=-3$
c) $\sqrt{3x+12}+x=2$
d) $\sqrt{1-4x}+x=1$
e) $\sqrt{9x+4}-2=x$

Exercise 7: Solve the following radical equations:

a) $\sqrt{3x+4}-\sqrt{2x+1}=1$
b) $\sqrt{3x+1}-\sqrt{x-1}=2$
c) $\sqrt{2x+5}-\sqrt{3x-2}=1$
d) $\sqrt{2x-3}-\sqrt{x+7}=2$

Exercise 8: Solve the following radical equations:

a) $\sqrt{1-3x}+\sqrt{x+6}=5$
b) $\sqrt{x+1}+\sqrt{1-3x}=2$
c) $\sqrt{2x+4}-\sqrt{3x+1}=3$
d) $\sqrt{x+2}+\sqrt{2x+2}=7$

Exercise 9: Solve and classify the following simultaneous equations using the indicated method:

a) $\left.\begin{matrix}3x-5y=4\\2x-3y=2\end{matrix}\right\}$ Elimination

b) $\left.\begin{matrix}x-3y=7\\2x=5+6y\end{matrix}\right\}$ Substitution

c) $\left.\begin{matrix}3x+5y=17\\2x-y=-6\end{matrix}\right\}$

d) $\left.\begin{matrix}6x+3y=9\\4x+2y=6\end{matrix}\right\}$

e) $\left.\begin{matrix}x+2y=6\\2x-y=7\end{matrix}\right\}$ Graphically

f) $\left.\begin{matrix}x+2y=6\\2x-y=7\end{matrix}\right\}$ Graphically

Exercise 10: Solve the following systems of nonlinear equations:

a) $\left.\begin{matrix}2x+y=1\\x^2+y^2=10\end{matrix}\right\}$

b) $\left.\begin{matrix}x+y=2\\x^2+y^2=2\end{matrix}\right\}$

c) $\left.\begin{matrix}x^2+y^2=25\\y-x=1\end{matrix}\right\}$

d) $\left.\begin{matrix}y=x^2\\3x=y+2\end{matrix}\right\}$

e) $\left.\begin{matrix}y^2=x+3\\2y=x+4\end{matrix}\right\}$

f) $\left.\begin{matrix}x^2-y^2=16\\x-2y=1\end{matrix}\right\}$

g) $\left.\begin{matrix}3x+y=9\\x^2-y^2=-5\end{matrix}\right\}$

h) $\left.\begin{matrix}x+2y=6\\x^2+4y^2=20\end{matrix}\right\}$

i) $\left.\begin{matrix}2x+y=3\\x^2+y^2=18\end{matrix}\right\}$

j) $\left.\begin{matrix}2x-y=3\\x^2-y=3\end{matrix}\right\}$

k) $\left.\begin{matrix}xy=2\\x^2-2y^2=2\end{matrix}\right\}$

l) $\left.\begin{matrix}x^2+y^2=13\\x^2-y^2=5\end{matrix}\right\}$

m) $\left.\begin{matrix}x^2+y^2=10\\x^2-y^2=-12\end{matrix}\right\}$

n) $\left.\begin{matrix}x^2-y=5\\x^2+y^2=25\end{matrix}\right\}$

o) $\left.\begin{matrix}xy=8\\x^2+y^2=20\end{matrix}\right\}$

p) $\left.\begin{matrix}xy=-2\\x^2+y^2=5\end{matrix}\right\}$

Exercise 11: Find the dimensions of a rectangle if its perimeter has a length of 60 m and its area measures 221 m^2

Exercise 12: Find two numbers so that their product is 8 and the sum of their squares is 20

Exercise 13: Solve the following linear inequalities:

a) $3x-8<5x+3$

b) $2(x-5)-3(x-2)\leq 0$

c) $1-(2x-3)>5x-8$

d) $3x-5(x-4)<7-2x$

Exercise 14: Solve the following second degree inequalities:

a) $(x-2)(x+3)>0$

b) $x^2+9x+8\geq 0$

c) $x^2-25<0$

d) $(x-7)^2\leq 0$

Exercise 15: Solve the following second degree inequalities:

a) $x^2-10x+25<0$

b) $(x+7)(x-7)-(x-4)(x+4)\geq 0$

c) $2(x-1)^2-(2x+1)^2>1$

d) $\dfrac{(x+2)(x-2)}{2}+x\leq\dfrac{3x+2}{2}$

Exercise 16: Solve the following systems of inequalities:

a) $\left.\begin{array}{l}8-2(x+3)\leq 4(x-1)\\ 1-(x-6)>3x-(3-x)\end{array}\right\}$

b) $\left.\begin{array}{l}x^2-4x+3\leq 0\\ x^2-9\geq 0\end{array}\right\}$

c) $\left.\begin{array}{l}x^2+3x-10\geq 0\\ x^2-4<0\end{array}\right\}$

d) $\left.\begin{array}{l}x^2+5x\leq 0\\ x^2-4>0\end{array}\right\}$

Exercise 17: Solve the following systems of inequalities:

a) $\left.\begin{array}{l}3(x-4)-2(x+5)\leq 3x-7(2x-3)\\ x^2-2x\geq 0\end{array}\right\}$

b) $\left.\begin{array}{l}x^2-6x+9>0\\ x^2-16<0\end{array}\right\}$

c) $\left.\begin{array}{l}x^3-x^2-2x\geq 0\\ x^2-4<0\end{array}\right\}$

d) $\left.\begin{array}{l}x^2+2x-15>0\\ x^2+4x-12\leq 0\end{array}\right\}$

Exercise 18: Solve the following systems of inequalities:

a) $\left.\begin{array}{l}x^2+8x+7\geq 0\\ x^2+10x+9\leq 0\end{array}\right\}$

b) $\left.\begin{array}{l}x^2-14x+49>0\\ x^2-49>0\end{array}\right\}$

c) $\left.\begin{array}{l}x^2-9<0\\ x^2-16\geq 0\end{array}\right\}$

d) $\left.\begin{array}{l}x^2+1\geq 0\\ x^2+4x+4\leq 0\end{array}\right\}$

Exercise 19: Solve the following systems of linear inequalities with two variables:

a) $\left.\begin{array}{l}x+2y\leq 1\\ 2x-y>7\end{array}\right\}$

b) $\left.\begin{array}{l}x+2y<0\\ 3x+y\geq -5\end{array}\right\}$

c) $\left.\begin{array}{l}5x-y<7\\ x+7y>4\end{array}\right\}$

d) $\left.\begin{array}{l}2x-y<0\\ 3x+y\geq 5\end{array}\right\}$

e) $\left.\begin{array}{l}x\geq 1\\ y\geq 2\\ x+y<7\end{array}\right\}$