Guía de actividades

ECUACIONES DE SEGUNDO GRADO
Profesor Fernando Viso

Materia: Matemáticas Guía #96A.
Tema: Resolución de cuadráticas utilizando la revolvente. (Baldor, ejercicio # 265, 266, 267 y 270)
Fecha: _____
Profesor: Fernando Viso
Nombre del alumno:_____
Sección del alumno:_____

CONDICIONES:

- **Trabajo individual.**
- **Sin libros, ni cuadernos, ni notas.**
- **Sin celulares.**
- **Es obligatorio mostrar explícitamente, el procedimiento empleado para resolver cada problema.**
- **No se contestarán preguntas ni consultas de ningún tipo.**
- **No pueden moverse de su asiento. ni pedir borras, ni lápices, ni calculadoras prestadas.**

Marco Teórico:

Resolvente de la ecuación $ax^2 + bx + c = 0 \Rightarrow x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

PREGUNTAS:

EJERCICIO # 265.

1.- $3x^2 - 5x + 2 = 0$

Solución:

$$x = \frac{5 \pm \sqrt{(5)^2 - (4)(3)(2)}}{6} = \frac{5 \pm \sqrt{25 - 24}}{6} \Rightarrow x = \frac{5 \pm 1}{6} \Rightarrow x_1 = 1, x_2 = \frac{4}{6} = \frac{2}{3}$$

2.- $4x^2 + 3x - 22 = 0$

Solución:

$$x = \frac{-3 \pm \sqrt{(3)^2 + (4)(4)(22)}}{8} = \frac{-3 \pm \sqrt{9 + 352}}{8} = \frac{-3 \pm \sqrt{361}}{8} \Rightarrow$$

$$\Rightarrow x = \frac{-3 \pm 19}{8} \Rightarrow x_1 = \frac{16}{8} = 2; x_2 = \frac{-22}{8} = -\frac{11}{4}$$

3.- $x^2 + 11x = -24$

Solución:

$$x^2 + 11x = -24 \Rightarrow x^2 + 11x + 24 = 0 \Rightarrow x = \frac{-11 \pm \sqrt{(11)^2 - 4(24)}}{2} \Rightarrow$$

$$\Rightarrow x = \frac{-11 \pm \sqrt{121 - 96}}{2} = \frac{-11 \pm \sqrt{25}}{2} = \frac{-11 \pm 5}{2} \Rightarrow x_1 = \frac{-11 + 5}{2} = -3; x_2 = -\frac{16}{2} = -8$$

4.- $x^2 = 16x - 63$

Solución:

$$x^2 = 16x - 63 \Rightarrow x^2 - 16x + 63 = 0 \Rightarrow x = \frac{16 \pm \sqrt{(16)^2 - (4)(63)}}{2} =$$

$$x \frac{16 \pm \sqrt{256 - 252}}{2} = \frac{16 \pm \sqrt{4}}{2} = \frac{16 \pm 2}{2} \Rightarrow x_1 = 9; x_2 = 7$$

5.- $12x - 4 - 9x^2 = 0$

Solución:

$$12x - 4 - 9x^2 = 0 \Rightarrow 9x^2 - 12x + 4 = 0 \Rightarrow x = \frac{12 \pm \sqrt{(12)^2 - (4)(9)(4)}}{18} \Rightarrow$$

$$x = \frac{12 \pm \sqrt{144 - 144}}{18} = \frac{12}{18} = \frac{2}{3}$$

6.- $5x^2 - 7x - 90 = 0$

Solución:

$$5x^2 - 7x - 90 = 0 \Rightarrow x = \frac{7 \pm \sqrt{(7)^2 + (4)(5)(90)}}{10} = \frac{7 \pm \sqrt{49 + 1800}}{10} = \frac{7 \pm \sqrt{1849}}{10} = \frac{7 \pm 43}{10} \Rightarrow$$

$$\Rightarrow x_1 = 5; x = \frac{-36}{10} = -\frac{18}{5}$$

7.- $6x^2 = x + 222$

Solución:

$$6x^2 = x + 222 \Rightarrow 6x^2 - x - 222 = 0 \Rightarrow x = \frac{1 \pm \sqrt{1 + 4(6)(222)}}{12} \Rightarrow$$

$$x = \frac{1 \pm \sqrt{1 + 5328}}{12} = \frac{1 \pm \sqrt{5329}}{12} = \frac{1 \pm 73}{12} \Rightarrow x_1 = \frac{74}{12} = \frac{37}{6}; x_2 = -\frac{72}{12} = -6$$

8.- $x + 11 = 10x^2$

Solución:

$$x + 11 = 10x^2 \Rightarrow 10x^2 - x - 11 = 0 \Rightarrow x = \frac{1 \pm \sqrt{1 + 4(10)(11)}}{20} \Rightarrow$$

$$\Rightarrow x = \frac{1 \pm \sqrt{1 + 440}}{20} = \frac{1 \pm \sqrt{441}}{20} = \frac{1 \pm 21}{20} \Rightarrow x_1 = \frac{22}{20} = \frac{11}{10}; x_2 = -\frac{20}{20} = -1$$

9.- $49x^2 - 70x + 25 = 0$

Solución:

$$49x^2 - 70x + 25 = 0 \Rightarrow x = \frac{70 \pm \sqrt{(70)^2 - 4900}}{98} \Rightarrow$$

$$\Rightarrow x = \frac{70 \pm \sqrt{4900 - 4900}}{98} = \frac{70}{98} = \frac{10}{14} = \frac{5}{7}$$

10.- $12x - 7x^2 + 64 = 0$

Solución:

$$12x - 7x^2 + 64 = 0 \Rightarrow 7x^2 - 12x - 64 = 0 \Rightarrow x = \frac{12 \pm \sqrt{(12)^2 + 4(7)(64)}}{14} \Rightarrow$$

$$\Rightarrow x = \frac{12 \pm \sqrt{144 + 1792}}{14} = \frac{12 \pm \sqrt{1936}}{14} = \frac{12 \pm 44}{14} \Rightarrow x_1 = \frac{56}{14} = 4; x_2 = -\frac{32}{14} = -\frac{16}{7}$$

11.- $x^2 = -15x - 56$
Solución:

$$x^2 = -15x - 56 \Rightarrow x^2 + 15x + 56 = 0 \Rightarrow x = \frac{-15 \pm \sqrt{(15)^2 - 4(56)}}{2} \Rightarrow$$

$$\Rightarrow x = \frac{-15 \pm \sqrt{225 - 224}}{2} = \frac{-15 \pm 1}{2} \Rightarrow x_1 = -7; x_2 = -8$$

12.- $32x^2 + 18x - 17 = 0$

Solución:

$$32x^2 + 18x - 17 = 0 \Rightarrow x = \frac{-18 \pm \sqrt{(18)^2 + 4(32)(17)}}{64} \Rightarrow$$

$$\Rightarrow x = \frac{-18 \pm \sqrt{324 + 2176}}{64} = \frac{-18 \pm \sqrt{2500}}{64} = \frac{-18 \pm 50}{64} \Rightarrow$$

$$\Rightarrow x_1 = \frac{32}{64} = \frac{1}{2}; x_2 = -\frac{68}{64} = -\frac{34}{32} = -\frac{17}{16}$$

13.- $176x = 121 + 64x^2$

Solución:

$$176x = 121 + 64x^2 \Rightarrow 64x^2 - 176x + 121 = 0 \Rightarrow x = \frac{176 \pm \sqrt{(176)^2 - 4(64)(121)}}{128} \Rightarrow$$

$$\Rightarrow x = \frac{176 \pm \sqrt{30976 - 30976}}{128} = \frac{176}{128} = \frac{22}{16} = \frac{11}{8}$$

14.- $8x + 5 = 36x^2$

Solución:

$$8x + 5 = 36x^2 \Rightarrow 36x^2 - 8x - 5 = 0 \Rightarrow x = \frac{8 \pm \sqrt{(8)^2 + 4(36)(5)}}{72} \Rightarrow$$

$$\Rightarrow x = \frac{8 \pm \sqrt{64 + 720}}{72} = \frac{8 \pm \sqrt{784}}{72} = \frac{8 \pm 28}{72} \Rightarrow x_1 = \frac{36}{72} = \frac{1}{2}; x_2 = -\frac{20}{72} = -\frac{5}{18}$$

15.- $27x^2 + 12x - 7 = 0$

Solución:

$$27x^2 + 12x - 7 = 0 \Rightarrow x = \frac{-12 \pm \sqrt{(12)^2 + 4(27)(7)}}{54} \Rightarrow$$

$$\Rightarrow x = \frac{-12 \pm \sqrt{144 + 756}}{54} = \frac{-12 \pm \sqrt{900}}{54} = \frac{-12 \pm 30}{54} \Rightarrow$$

$$\Rightarrow x_1 = \frac{18}{54} = \frac{1}{3}; x_2 = \frac{-42}{54} = -\frac{7}{9}$$

16.- $15x = 25x^2 + 2$

Solución:

$$15x = 25x^2 + 2 \Rightarrow 25x^2 - 15x + 2 = 0 \Rightarrow x = \frac{15 \pm \sqrt{(15)^2 - 4(25)(2)}}{50} \Rightarrow$$

$$\Rightarrow x = \frac{15 \pm \sqrt{225 - 200}}{50} = \frac{15 \pm 5}{50} \Rightarrow x_1 = \frac{20}{50} = \frac{2}{5}; x_2 = \frac{10}{50} = \frac{1}{5}$$

17.- $8x^2 - 2x - 3 = 0$

Solución:

$$8x^2 - 2x - 3 = 0 \Rightarrow x = \frac{2 \pm \sqrt{(2)^2 + 4(8)(3)}}{16} = \frac{2 \pm \sqrt{4 + 96}}{16} = \frac{2 \pm 10}{16} \Rightarrow$$

$$\Rightarrow x_1 = \frac{12}{16} = \frac{3}{4}; x_2 = \frac{-8}{16} = -\frac{1}{2}$$

18.- $105 = x + 2x^2$

Solución:

$$105 = x + 2x^2 \Rightarrow 2x^2 + x - 105 = 0 \Rightarrow x = \frac{-1 \pm \sqrt{1 + 4(2)(105)}}{4} \Rightarrow$$

$$\Rightarrow x = \frac{-1 \pm \sqrt{1 + 840}}{4} = \frac{-1 \pm \sqrt{841}}{4} = \frac{-1 \pm 29}{4} \Rightarrow x_1 = \frac{28}{4} = 7; x_2 = -\frac{30}{4} = -\frac{15}{2}$$

EJERCICIO # 266.

Resolver las ecuaciones siguientes, llevándolas a la forma $ax^2 + bx + c = 0$ y aplicando la fórmula general:

1.- $x(x+3) = 5x + 3$

Solución:

$$x(x+3) = 5x + 3 \Rightarrow x^2 + 3x = 5x + 3 \Rightarrow x^2 - 2x - 3 = 0 \Rightarrow$$

$$\Rightarrow x = \frac{2 \pm \sqrt{(2)^2 + 4(3)}}{2} = \frac{2 \pm \sqrt{16}}{2} = \frac{2 \pm 4}{2} \Rightarrow x_1 = \frac{6}{2} = 3; x_2 = \frac{-2}{2} = -1$$

2.- $3(3x - 2) = (x + 4)(4 - x)$

Solución:

$$3(3x-2)=(x+4)(4-x) \Rightarrow 9x^2-6=16-x^2 \Rightarrow 10x^2-22=0 \Rightarrow x^2=\frac{22}{10}=\frac{11}{5} \Rightarrow x=\pm\sqrt{\frac{11}{5}}$$

3.- $9x+1=3\left(x^2-5\right)-(x-3)(x+2)$

Solución:

$$9x+1=3\left(x^2-5\right)-(x-3)(x+2) \Rightarrow 9x+1=3x^2-15-\left(x^2-x-6\right) \Rightarrow$$

$$\Rightarrow 9x+1=3x^2-15-x^2+x+6 \Rightarrow 2x^2-8x-10=0 \Rightarrow x=\frac{8\pm\sqrt{(8)+4(2)(10)}}{4} \Rightarrow$$

$$\Rightarrow x=\frac{8\pm\sqrt{64+80}}{4}=\frac{8\pm\sqrt{144}}{4}=\frac{8\pm12}{4} \Rightarrow x_1=\frac{20}{4}=5; x_2=\frac{-4}{4}=-1$$

4.- $(2x-3)^2-(x+5)^2=-23$

Solución:

$$(2x-3)^2-(x+5)^2=-23 \Rightarrow \left(4x^2-12x+9\right)-\left(x^2+10x+25\right)=-23 \Rightarrow$$

$$\Rightarrow 3x^2-22x-16=-23 \Rightarrow 3x^2-22x+7=0 \Rightarrow x=\frac{22\pm\sqrt{(22)^2-4(3)(7)}}{6} \Rightarrow$$

$$\Rightarrow x=\frac{22\pm\sqrt{484-84}}{6}=\frac{22\pm\sqrt{400}}{6}=\frac{22\pm20}{6} \Rightarrow$$

$$\Rightarrow x_1=\frac{42}{6}=7; x_2=\frac{2}{6}=\frac{1}{3}$$

5.- $25(x+2)^2=(x-7)^2-81$

Solución:

$$25(x+2)^2=(x-7)^2-81 \Rightarrow 25\left(x^2+4x+4\right)=\left(x^2-14x+49\right)-81 \Rightarrow$$

$$\Rightarrow 24x^2+114x+132=0 \Rightarrow 4x^2+19x+22=0 \Rightarrow x=\frac{-19\pm\sqrt{(19)^2-4(4)(22)}}{8} \Rightarrow$$

$$x=\frac{-19\pm\sqrt{361-352}}{8}=\frac{-19\pm3}{8} \Rightarrow x_1=-\frac{16}{8}=-2; x_2=-\frac{22}{8}=-\frac{11}{4}$$

6.- $3x(x-2)-(x-6)=23(x-3)$

Solución:

$$3x(x-2)-(x-6)=23(x-3) \Rightarrow 3x^2-6x-x+6=23x-69 \Rightarrow$$

$$\Rightarrow 3x^2-30x+75=0 \Rightarrow x=\frac{30\pm\sqrt{(30)^2-4(3)(75)}}{6} \Rightarrow x=\frac{30\pm\sqrt{900-900}}{6} \Rightarrow$$

$$\Rightarrow x=\frac{30}{6}=5$$

7.- $7(x-3)-5(x^2-1)=x^2-5(x+2)$

Solución:

$$7(x-3)-5(x^2-1)=x^2-5(x+2) \Rightarrow$$
$$\Rightarrow 7x-21-5x^2+5=x^2-5x-10 \Rightarrow 6x^2-12x+6=0 \Rightarrow$$

$$\Rightarrow x^2-2x+1=0 \Rightarrow x=\frac{2\pm\sqrt{4-4(1)}}{2}=\frac{2}{2}=1$$

8.- $(x-5)^2-(x-6)^2=(2x-3)^2-118$

Solución:

$$(x-5)^2-(x-6)^2=(2x-3)^2-118 \Rightarrow$$
$$\Rightarrow (x^2-10x+25)-(x^2-12x+36)=(4x^2-12x+9)-118 \Rightarrow$$

$$\Rightarrow 4x^2-14x-170=0 \Rightarrow x=\frac{14\pm\sqrt{(14)^2+4(4)(170)}}{8}=\frac{14\pm\sqrt{196+2720}}{8} \Rightarrow$$

$$\Rightarrow x=\frac{14\pm\sqrt{2916}}{8}=\frac{14\pm54}{8} \Rightarrow x_1=\frac{68}{8}=\frac{17}{2}; x_2=-\frac{40}{8}=-5$$

9.- $(5x-2)^2-(3x+1)^2-x^2-60=0$

Solución:

$$(5x-2)^2-(3x+1)^2-x^2-60=0 \Rightarrow$$
$$(25x^2-20x+4)-(9x^2+6x+1)-x^2-60=0 \Rightarrow$$

$$\Rightarrow 15x^2-26x-57=0 \Rightarrow x=\frac{26\pm\sqrt{(26)^2+4(15)(57)}}{30} \Rightarrow$$

$$\Rightarrow x=\frac{26\pm\sqrt{676+3420}}{30}=\frac{26\pm\sqrt{4096}}{30}=\frac{30\pm64}{30} \Rightarrow$$

$$\Rightarrow x_1=\frac{94}{30}=\frac{47}{15}; x_2=-\frac{34}{30}=-\frac{17}{15}$$

10.- $(x+4)^3-(x-3)^3=343$

Solución:

$$(x+4)^3 - (x-3)^3 = 343 \Rightarrow$$
$$\Rightarrow (x^3 + 12x^2 + 48x + 64) - (x^3 - 9x^2 + 27x - 27) = 343 \Rightarrow$$
$$\Rightarrow 21x^2 + 21x - 252 = 0 \Rightarrow x^2 + x - 12 = 0 \Rightarrow (x+4)(x-3) = 0$$
$$\Rightarrow x_1 = -4; x_2 = 3$$

También:

$$x^2 + x - 12 = 0 \Rightarrow x = \frac{-1 \pm \sqrt{1 + 4(12)}}{2} = \frac{-1 \pm 7}{2} \Rightarrow$$
$$\Rightarrow x_1 = -\frac{8}{2} = -4; x_2 = \frac{6}{2} = 3$$

11.- $(x+2)^2 - (x-1)^2 = x(3x+4) + 8$

Solución:

$$(x+2)^2 - (x-1)^2 = x(3x+4) + 8 \Rightarrow$$
$$\Rightarrow (x^3 + 6x^2 + 12x + 8) - (x^3 - 3x^2 + 3x - 1) = 3x^2 + 4x + 8 \Rightarrow$$
$$\Rightarrow 9x^2 + 9x + 9 = 3x^2 + 4x + 8 \Rightarrow 6x^2 + 5x + 1 = 0 \Rightarrow$$
$$\Rightarrow x = \frac{-5 \pm \sqrt{25 - 24}}{12} = \frac{-5 \pm 1}{12} \Rightarrow x_1 = -\frac{1}{2}; x_2 = -\frac{4}{12} = -\frac{1}{3}$$

12.- $(5x-4)^2 - (3x+5)(2x-1) = 20x(x-2) + 27$

Solución:

$$(5x-4)^2 - (3x+5)(2x-1) = 20x(x-2) + 27 \Rightarrow$$
$$\Rightarrow 25x^2 - 40x + 16 - (6x^2 + 7x - 5) = 20x^2 - 40x + 27 \Rightarrow$$
$$\Rightarrow x^2 + 7x + 6 = 0 \Rightarrow x = \frac{-7 \pm \sqrt{49 - 4(6)}}{2} = \frac{-7 \pm 5}{2} \Rightarrow$$
$$\Rightarrow x_1 = -\frac{2}{2} = -1; x_2 = -\frac{12}{2} = -6$$

EJERCICIO # 267.

Resolver las siguientes ecuaciones:

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

Solución:

$$x^2 - 3x + 2 = 0 \Rightarrow x = \frac{3 \pm \sqrt{(3)^2 - 4(2)}}{2} = \frac{3 \pm 1}{2} \Rightarrow x_1 = 2; x_2 = 1$$

2.- $x^2 - 2x - 15 = 0$

Solución:

$$x^2 - 2x - 15 = 0 \Rightarrow x = \frac{2 \pm \sqrt{(2)^2 + 4(15)}}{2} = \frac{2 \pm 8}{2} \Rightarrow x_1 = 5; x_2 = -3$$

3.- $x^2 = 19x - 88$

Solución:

$$x^2 = 19x - 88 \Rightarrow x^2 - 19x + 88 = 0 \Rightarrow x = \frac{19 \pm \sqrt{(19)^2 - 4(88)}}{2} \Rightarrow$$

$$\Rightarrow x = \frac{19 \pm \sqrt{361 - 352}}{2} = \frac{19 \pm 3}{2} \Rightarrow x_1 = 11; x_2 = 8$$

4.- $x^2 + 4x = 285$

Solución:

$$x^2 + 4x = 285 \Rightarrow x^2 + 4x - 285 = 0 \Rightarrow x = \frac{-4 \pm \sqrt{(4)^2 + 4(285)}}{2} \Rightarrow$$

$$\Rightarrow x = \frac{-4 \pm \sqrt{16 + 1140}}{2} = \frac{-4 \pm \sqrt{1156}}{2} = \frac{-4 \pm 34}{2} \Rightarrow x_1 = 15; x_2 = -19$$

5.- $5x(x-1) - 2(2x^2 - 7x) = -8$

Solución:

$$5x(x-1) - 2(2x^2 - 7x) = -8 \Rightarrow$$

$$\Rightarrow 5x^2 - 5x - 4x^2 + 14x = -8 \Rightarrow x^2 + 9x + 8 = 0 \Rightarrow$$

$$\Rightarrow x = \frac{-9 \pm \sqrt{(9)^2 - 4(8)}}{2} = \frac{-9 \pm \sqrt{49}}{2} = \frac{-9 \pm 7}{2} \Rightarrow$$

$$\Rightarrow x_1 = \frac{-2}{2} = -1; x_2 = \frac{-16}{2} = -8$$

6.- $x^2 - (7x + 6) = x + 59$

Solución:

$$x^2 - (7x+6) = x+59 \Rightarrow x^2 - 8x - 65 = 0 \Rightarrow x = \frac{8 \pm \sqrt{(8)^2 + 4(65)}}{2} \Rightarrow$$

$$\Rightarrow x = \frac{8 \pm \sqrt{64+260}}{2} = \frac{8 \pm \sqrt{324}}{2} = \frac{8 \pm 18}{2} \Rightarrow x_1 = \frac{26}{2} = 13; x_2 = \frac{-10}{2} = -5$$

7.- $(x-1)^2 + 11x + 199 = 3x^2 - (x-2)^2$

Solución:

$$(x-1)^2 + 11x + 199 = 3x^2 - (x-2)^2 \Rightarrow$$

$$\Rightarrow x^2 - 2x + 1 + 11x + 199 = 3x^2 - (x^2 - 4x + 4) \Rightarrow$$

$$\Rightarrow x^2 - 5x - 204 = 0 \Rightarrow x = \frac{5 \pm \sqrt{(5)^2 + 4(204)}}{2} \Rightarrow$$

$$\Rightarrow x = \frac{5 \pm \sqrt{841}}{2} = \frac{5 \pm 29}{2} \Rightarrow x_1 = \frac{34}{2} = 17; x_2 = -\frac{24}{2} = -12$$

8.- $(x-2)(x+2) - 7(x-1) = 21$

Solución:

$$(x-2)(x+2) - 7(x-1) = 21 \Rightarrow x^2 - 4 - 7x + 7 = 21 \Rightarrow$$

$$\Rightarrow x^2 - 7x - 18 = 0 \Rightarrow x = \frac{7 \pm \sqrt{(7)^2 + 4(18)}}{2} = \frac{7 \pm \sqrt{121}}{2} \Rightarrow$$

$$\Rightarrow x = \frac{7 \pm 11}{2} \Rightarrow x_1 = \frac{18}{2} = 9; x_2 = \frac{-4}{2} = -2$$

9.- $2x^2 - (x-2)(x+5) = 7(x+3)$

Solución:

$$2x^2 - (x-2)(x+5) = 7(x+3) \Rightarrow 2x^2 - (x^2 + 3x - 10) = 7x + 21 \Rightarrow$$

$$\Rightarrow x^2 - 3x + 10 = 7x + 21 \Rightarrow x^2 - 10x - 11 = 0 \Rightarrow x = \frac{10 \pm \sqrt{100+44}}{2} \Rightarrow$$

$$\Rightarrow x = \frac{10 \pm 12}{2} \Rightarrow x_1 = \frac{22}{2} = 11; x_2 = \frac{-2}{2} = -1$$

10.- $(x-1)(x+2) - (2x-3)(x+4) - x + 14 = 0$

Solución:

$$(x-1)(x+2)-(2x-3)(x+4)-x+14=0 \Rightarrow$$
$$\Rightarrow x^2+x-2-(2x^2+5x-12)-x+14=0 \Rightarrow$$
$$\Rightarrow -x^2-5x+24=0 \Rightarrow x^2+5x-24=0 \Rightarrow x=\frac{-5\pm\sqrt{25+4(24)}}{2} \Rightarrow$$
$$\Rightarrow x=\frac{-5\pm\sqrt{121}}{2}=\frac{-5\pm11}{2} \Rightarrow x_1=\frac{6}{2}=3; x_2=\frac{-16}{2}=-8$$

EJERCICIO #268.

1.- $\dfrac{x^2}{5}-\dfrac{x}{2}=\dfrac{3}{10}$

Solución:

Multiplicando ambos miembros de la igualdad por 10:

$$\frac{x^2}{5}-\frac{x}{2}=\frac{3}{10} \Rightarrow 2x^2-5x=3 \Rightarrow 2x^2-5x-3=0 \Rightarrow$$
$$\Rightarrow x=\frac{5\pm\sqrt{(5)^2+4(2)(3)}}{4}=\frac{5\pm\sqrt{25+24}}{4}=\frac{5\pm\sqrt{49}}{4}=\frac{5\pm7}{4} \Rightarrow$$
$$\Rightarrow x_1=\frac{12}{4}=3; x_2=\frac{-2}{4}=-\frac{1}{2}$$

2.- $4x-\dfrac{13}{x}=\dfrac{3}{2}$

Solución:

$$4x-\frac{13}{x}=\frac{3}{2} \Rightarrow 2x\left(4x-\frac{13}{x}\right)=2x\left(\frac{3}{2}\right) \Rightarrow 8x^2-26=3x \Rightarrow$$
$$\Rightarrow 8x^2-3x-26=0 \Rightarrow x=\frac{3\pm\sqrt{9+4(8)(26)}}{16}=\frac{3\pm\sqrt{841}}{16}=\frac{3\pm29}{16} \Rightarrow$$
$$\Rightarrow x_1=\frac{32}{16}=2; x_2=-\frac{26}{16}=-\frac{13}{8}$$

3.- $\dfrac{x^2}{6}-\dfrac{x}{2}=3(x-5)$

Solución:

$$\frac{x^2}{6} - \frac{x}{2} = 3(x-5) \Rightarrow 6\left(\frac{x^2}{6} - \frac{x}{2}\right) = 6\left[3(x-5)\right] \Rightarrow$$

$$\Rightarrow x^2 - 3x = 18x - 90 \Rightarrow x^2 - 21x + 90 = 0 \Rightarrow x = \frac{21 \pm \sqrt{(21)^2 - 4(90)}}{2} =$$

$$x = \frac{21 \pm \sqrt{441 - 360}}{2} = \frac{21 \pm \sqrt{81}}{2} = \frac{21 \pm 9}{2} \Rightarrow x_1 = \frac{30}{2} = 15; x_2 = \frac{12}{2} = 6$$

4.- $\frac{1}{4}(x-4) + \frac{2}{5}(x-5) = \frac{1}{5}(x^2 - 53)$

Solución:

$$\frac{1}{4}(x-4) + \frac{2}{5}(x-5) = \frac{1}{5}(x^2 - 53) \Rightarrow 20\left[\frac{1}{4}(x-4) + \frac{2}{5}(x-5)\right] = 20\left[\frac{1}{5}(x^2 - 53)\right] \Rightarrow$$

$$\Rightarrow 5x - 20 + 8x - 40 = 4x^2 - 212 \Rightarrow 4x^2 + 13x - 152 = 0 \Rightarrow$$

$$\Rightarrow x = \frac{-13 \pm \sqrt{(13)^2 + 4(4)(152)}}{8} = \frac{-13 \pm \sqrt{169 + 2432}}{8} = \frac{-13 \pm 51}{8} \Rightarrow$$

$$\Rightarrow x_1 = \frac{38}{8} = \frac{19}{4}; x_2 = -\frac{64}{8} = -8$$

5.- $\frac{5}{x} - \frac{1}{(x+2)} = 1$

Solución:

$$\frac{5}{x} - \frac{1}{(x+2)} = 1 \Rightarrow x(x+2)\left[\frac{5}{x} - \frac{1}{(x+2)}\right] = x(x+2)(1) \Rightarrow$$

$$\Rightarrow 5(x+2) - x = x(x+2) \Rightarrow 5x + 10 - x = x^2 + 2x \Rightarrow$$

$$\Rightarrow x^2 - 2x - 10 = 0 \Rightarrow x = \frac{2 \pm \sqrt{(2)^2 + 4(10)}}{2} = \frac{2 \pm 2\sqrt{11}}{2} = 1 \pm \sqrt{11} \Rightarrow$$

$$\Rightarrow x_1 = 1 + \sqrt{11}; x_2 = 1 - \sqrt{11}$$

6.- $\frac{15}{x} - \frac{11x + 5}{x^2} = -1$

Solución:

$$\frac{15}{x} - \frac{11x+5}{x^2} = -1 \Rightarrow x^2\left[\frac{15}{x} - \frac{11x+5}{x^2}\right] = x^2(-1) \Rightarrow$$

$$\Rightarrow 15x - 11x - 5 = -x^2 \Rightarrow x^2 + 4x - 5 = 0 \Rightarrow x = \frac{-4 \pm \sqrt{(4)^2 + 4(5)}}{2} \Rightarrow$$

$$\Rightarrow \frac{-4 \pm 6}{2} \Rightarrow x_1 = \frac{2}{2} = 1; x_2 = \frac{-10}{2} = -5$$

7.- $\dfrac{8x}{3x+5} + \dfrac{5x-1}{x+1} = 3$

Solución:

$$\frac{8x}{3x+5} + \frac{5x-1}{x+1} = 3 \Rightarrow (3x+5)(x+1)\left[\frac{8x}{3x+5} + \frac{5x-1}{x+1}\right] = (3x+5)(x+1)(3) \Rightarrow$$

$$\Rightarrow 8x(x+1) + (5x-1)(3x+5) = 3(3x+5)(x+1) \Rightarrow$$

$$\Rightarrow 8x^2 + 8x + 15x^2 + 22x - 5 = 9x^2 + 24x + 15 \Rightarrow$$

$$\Rightarrow 14x^2 + 6x - 20 = 0 \Rightarrow 7x^2 + 3x - 10 = 0 \Rightarrow x = \frac{-3 \pm \sqrt{(3)^2 + 280}}{14} = \frac{-3 \pm 17}{14} \Rightarrow$$

$$\Rightarrow x_1 = \frac{14}{14} = 1; x_2 = \frac{-20}{14} = -\frac{10}{7}$$

8.- $\dfrac{1}{x-2} - \dfrac{1}{x-1} = \dfrac{1}{6}$

Solución:

$$\frac{1}{x-2} - \frac{1}{x-1} = \frac{1}{6} \Rightarrow 6(x-1)(x-2)\left[\frac{1}{x-2} - \frac{1}{x-1}\right] = 6(x-1)(x-2)\left(\frac{1}{6}\right) \Rightarrow$$

$$\Rightarrow 6(x-1) - 6(x-2) = (x-1)(x-2) \Rightarrow 6x - 6 - 6x + 12 = x^2 - 3x + 2 \Rightarrow$$

$$\Rightarrow x^2 - 3x - 4 = 0 \Rightarrow x = \frac{3 \pm \sqrt{(3)^2 + 4(4)}}{2} = \frac{3 \pm 5}{2} \Rightarrow x_1 = \frac{8}{2} = 4; x_2 = -\frac{2}{2} = -1$$

9.- $1 - \dfrac{2x-3}{x+5} = \dfrac{x-2}{10}$

Solución:

$$1 - \frac{2x-3}{x+5} = \frac{x-2}{10} \Rightarrow \frac{x+5-2x+3}{x+5} = \frac{x-2}{10} \Rightarrow \frac{8-x}{x+5} = \frac{x-2}{10} \Rightarrow$$

$$\Rightarrow 80 - 10x = x^2 + 3x - 10 \Rightarrow x^2 + 13x - 90 = 0 \Rightarrow$$

$$\Rightarrow x = \frac{-13 \pm \sqrt{(13)^2 + 4(90)}}{2} = \frac{-11 \pm \sqrt{169 + 360}}{2} = \frac{-13 \pm \sqrt{529}}{2} = \frac{-13 \pm 23}{2} \Rightarrow$$

$$\Rightarrow x_1 = \frac{10}{2} = 5; x_2 = -\frac{36}{2} = -18$$

10.- $\dfrac{x-13}{x} = 5 - \dfrac{10(5x+3)}{x^2}$

Solución:

$$\frac{x-13}{x} = 5 - \frac{10(5x+3)}{x^2} \Rightarrow x^2\left(\frac{x-13}{x}\right) = x^2\left[5 - \frac{10(5x+3)}{x^2}\right] \Rightarrow$$

$$\Rightarrow x^2 - 13x = 5x^2 - 50x - 30 \Rightarrow 4x^2 - 37x - 30 = 0 \Rightarrow$$

$$\Rightarrow x = \frac{37 \pm \sqrt{(37)^2 + 4(4)(30)}}{8} = \frac{37 \pm \sqrt{1369 + 480}}{8} \Rightarrow$$

$$\Rightarrow x = \frac{37 \pm \sqrt{1849}}{8} = \frac{37 \pm 43}{8} \Rightarrow x_1 = \frac{80}{8} = 10; x_2 = -\frac{6}{8} = -\frac{3}{4}$$

11.- $\dfrac{x}{x-2} - \dfrac{x-2}{x} = \dfrac{5}{2}$

Solución:

$$\frac{x}{x-2} - \frac{x-2}{x} = \frac{5}{2} \Rightarrow 2x(x-2)\left[\frac{x}{x-2} - \frac{(x-2)}{x}\right] = 2x(x-2) \cdot \frac{5}{2} \Rightarrow$$

$$\Rightarrow 2x^2 - 2(x-2)^2 = 5x(x-2) \Rightarrow 2x^2 - 2(x^2 - 4x + 4) = 5x^2 - 10x \Rightarrow$$

$$\Rightarrow 5x^2 - 14x + 8 = 0 \Rightarrow x = \frac{14 \pm \sqrt{(14)^2 - 4(5)(8)}}{10} = \frac{14 \pm \sqrt{196 - 160}}{10} \Rightarrow$$

$$\Rightarrow x = \frac{14 \pm \sqrt{36}}{10} = \frac{14 \pm 6}{10} \Rightarrow x_1 = \frac{20}{10} = 2; x_2 = \frac{8}{10} = \frac{4}{5}$$

12.- $\dfrac{4x^2}{x-1} - \dfrac{1-3x}{4} = \dfrac{20x}{3}$

Solución:

$$\frac{4x^2}{x-1} - \frac{1-3x}{4} = \frac{20x}{3} \Rightarrow 12(x-1)\left[\frac{4x^2}{x-1} - \frac{1-3x}{4}\right] = 12(x-1)\left(\frac{20x}{3}\right) \Rightarrow$$

$$\Rightarrow 48x^2 - 3(x-1)(1-3x) = 80x(x-1) \Rightarrow 48x^2 - 3(x-3x^2-1+3x) = 80x^2 - 80x \Rightarrow$$

$$\Rightarrow 48x^2 + 9x^2 - 12x + 3 = 80x^2 - 80x \Rightarrow 23x^2 - 68x - 3 = 0 \Rightarrow x = \frac{68 \pm \sqrt{(68)^2 + 4(23)(3)}}{46} \Rightarrow$$

$$\Rightarrow \frac{68 \pm \sqrt{4624 + 276}}{46} = \frac{68 \pm \sqrt{4900}}{46} = \frac{68 \pm 70}{46} \Rightarrow x_1 = \frac{138}{46} = 3; x_2 = \frac{-2}{46} = -\frac{1}{23}$$

13.- $\dfrac{3x-1}{x} - \dfrac{2x}{2x-1} - \dfrac{7}{6} = 0$

Solución:

$$\frac{3x-1}{x} - \frac{2x}{2x-1} - \frac{7}{6} = 0 \Rightarrow 6x(2x-1)\left[\frac{3x-1}{x} - \frac{2x}{2x-1} - \frac{7}{6}\right] = 0 \Rightarrow$$

$$\Rightarrow 6(2x-1)(3x-1) - 12x^2 - 7x(2x-1) = 0 \Rightarrow$$

$$\Rightarrow 6(6x^2 - 2x - 3x + 1) - 12x^2 - 14x^2 + 7x = 0 \Rightarrow$$

$$\Rightarrow 10x^2 - 23x + 6 = 0 \Rightarrow x = \frac{23 \pm \sqrt{(23)^2 - 4(10)(6)}}{20} \Rightarrow$$

$$\Rightarrow x = \frac{23 \pm \sqrt{529 - 240}}{20} = \frac{23 \pm \sqrt{289}}{20} \Rightarrow x = \frac{23 \pm 17}{20} \Rightarrow x_1 = \frac{40}{20} = 2; x_2 = \frac{6}{20} = \frac{3}{10}$$

14.- $\dfrac{5x-8}{x-1} = \dfrac{7x-4}{x+2}$

Solución:

$$\frac{5x-8}{x-1} = \frac{7x-4}{x+2} \Rightarrow (5x-8)(x+2) = (7x-4)(x-1) \Rightarrow$$

$$\Rightarrow 5x^2 + 10x - 8x - 16 = 7x^2 - 7x - 4x + 4 \Rightarrow$$

$$\Rightarrow 2x^2 - 13x + 20 = 0 \Rightarrow x = \frac{13 \pm \sqrt{(13)^2 - 4(2)(20)}}{4} \Rightarrow$$

$$\Rightarrow x = \frac{13 \pm \sqrt{169 - 160}}{4} = \frac{13 \pm 3}{4} \Rightarrow x_1 = \frac{16}{4} = 4; x_2 = \frac{10}{4} = \frac{5}{2}$$

15.- $\dfrac{x+3}{2x-1} - \dfrac{5x-1}{4x+7} = 0$

Solución:

$$\frac{x+3}{2x-1} - \frac{5x-1}{4x+7} = 0 \Rightarrow \frac{x+3}{2x-1} = \frac{5x-1}{4x+7} \Rightarrow (x+3)(4x+7) = (2x-1)(5x-1) \Rightarrow$$

$$\Rightarrow 4x^2 + 7x + 12x + 21 = 10x^2 - 2x - 5x + 1 \Rightarrow$$

$$\Rightarrow 6x^2 - 26x - 20 = 0 \Rightarrow 3x^2 - 13x - 10 = 0 \Rightarrow x = \frac{13 \pm \sqrt{(13)^2 + 4(3)(10)}}{6} \Rightarrow$$

$$\Rightarrow x = \frac{13 \pm \sqrt{169 + 120}}{6} = \frac{13 \pm \sqrt{289}}{6} = \frac{13 \pm 17}{6} \Rightarrow x_1 = 5; x_2 = \frac{-4}{6} = -\frac{2}{3}$$

16.- $\dfrac{1}{4-x} - \dfrac{1}{6} = \dfrac{1}{x+1}$

Solución:

$$\frac{1}{4-x} - \frac{1}{6} = \frac{1}{x+1} \Rightarrow 6(4-x)(x+1)\left[\frac{1}{4-x} - \frac{1}{6}\right] = 6(4-x)(x+1)\left(\frac{1}{x+1}\right) \Rightarrow$$

$$\Rightarrow 6(x+1) - (4-x)(x+1) = 6(4-x) \Rightarrow$$

$$\Rightarrow 6x + 6 - (4x + 4 - x^2 - x) = 24 - 6x \Rightarrow x^2 + 3x + 2 = 24 - 6x \Rightarrow x^2 + 9x - 22 = 0 \Rightarrow$$

$$\Rightarrow x = \frac{-9 \pm \sqrt{(9)^2 + 4(22)}}{2} = \frac{-9 \pm \sqrt{81 + 88}}{2} = \frac{-9 \pm \sqrt{169}}{2} = \frac{-9 \pm 13}{2} \Rightarrow x_1 = \frac{4}{2} = 2; x_2 = -\frac{22}{2} = -11$$

17.- $\dfrac{x+4}{x+5} - \dfrac{x+2}{x+3} = \dfrac{1}{24}$

Solución:

$$\frac{x+4}{x+5} - \frac{x+2}{x+3} = \frac{1}{24} \Rightarrow 24(x+5)(x+3)\left[\frac{x+4}{x+5} - \frac{x+2}{x+3}\right] = 24(x+5)(x+3)\left(\frac{1}{24}\right) \Rightarrow$$

$$\Rightarrow 24(x+3)(x+4) - 24(x+2)(x+5) = (x+3)(x+5) \Rightarrow$$

$$\Rightarrow 24(x^2 + 7x + 12) - 24(x^2 + 7x + 10) = x^2 + 8x + 15 \Rightarrow$$

$$\Rightarrow 48 = x^2 + 8x + 15 \Rightarrow x^2 + 8x - 33 = 0 \Rightarrow x = \frac{-8 \pm \sqrt{(8)^2 + 4(33)}}{2} \Rightarrow$$

$$\Rightarrow \frac{-8 \pm \sqrt{64 + 132}}{2} = \frac{-8 \pm \sqrt{196}}{2} = \frac{-8 \pm 14}{2} \Rightarrow x_1 = \frac{6}{2} = 3; x_2 = -\frac{22}{2} = -11$$

18.- $\dfrac{5}{x^2-1} - \dfrac{6}{x+1} = \dfrac{29}{8}$

Solución:

$$\frac{5}{x^2-1} - \frac{6}{x+1} = \frac{29}{8} \Rightarrow 8(x^2-1)\left[\frac{5}{x^2-1} - \frac{6}{x+1}\right] = 8(x^2-1)\cdot\frac{29}{8} \Rightarrow$$

$$\Rightarrow 40 - 48(x-1) = 29(x^2-1) \Rightarrow 40 - 48x + 48 = 29x^2 - 29 \Rightarrow$$

$$\Rightarrow 29x^2 + 48x - 77 = 0 \Rightarrow x = \frac{-48 \pm \sqrt{(48)^2 + 4(29)(77)}}{96} \Rightarrow$$

$$\Rightarrow \frac{-48 \pm \sqrt{2304 + 8932}}{96} = \frac{-48 \pm \sqrt{11236}}{96} = \frac{-48 \pm 106}{96} \Rightarrow$$

$$\Rightarrow x_1 = \frac{58}{48} = \frac{29}{24}; x_2 = -\frac{154}{48} = -\frac{77}{24}$$

19.- $\dfrac{x-1}{x+1} + \dfrac{x+1}{x-1} = \dfrac{2x+9}{x+3}$

Solución:

$$\frac{x-1}{x+1} + \frac{x+1}{x-1} = \frac{2x+9}{x+3} \Rightarrow (x^2-1)(x+3)\left[\frac{x-1}{x+1} + \frac{x+1}{x-1}\right] = (x^2-1)(x+3)\left(\frac{2x+9}{x+3}\right) \Rightarrow$$

$$\Rightarrow (x+3)(x-1)^2 + (x+3)(x+1)^2 = (x^2-1)(2x+9) \Rightarrow$$

$$\Rightarrow (x+3)(x^2-2x+1) + (x+3)(x^2+2x+1) = (x^2-1)(2x+9) \Rightarrow$$

$$\Rightarrow x^3 - 2x^2 + x + 3x^2 - 6x + 3 + x^3 + 2x^2 + x + 3x^2 + 6x + 3 = 2x^3 + 9x^2 - 2x - 9 \Rightarrow$$

$$\Rightarrow 3x^2 - 4x - 15 = 0 \Rightarrow x = \frac{4 \pm \sqrt{(4)^2 + 4(3)(15)}}{6} = \frac{4 \pm \sqrt{16+180}}{6} = \frac{4 \pm \sqrt{196}}{6} = \frac{4 \pm 14}{6} \Rightarrow$$

$$\Rightarrow x_1 = \frac{18}{6} = 3; x_2 = -\frac{10}{6} = -\frac{5}{3}$$

20.- $\dfrac{3}{x+2} - \dfrac{1}{x-2} = \dfrac{1}{x+1}$

Solución:

$$\frac{3}{x+2} - \frac{1}{x-2} = \frac{1}{x+1} \Rightarrow (x^2-4)(x+1)\left[\frac{3}{x+2} - \frac{1}{x-2}\right] = (x^2-4)(x+1)\left(\frac{1}{x+1}\right) \Rightarrow$$

$$\Rightarrow 3(x-2)(x+1) - (x+2)(x+1) = (x^2-4) \Rightarrow$$

$$\Rightarrow 3(x^2-x-2) - (x^2+3x+2) = x^2-4 \Rightarrow$$

$$\Rightarrow 3x^2 - 3x - 6 - x^2 - 3x - 2 = x^2 - 4 \Rightarrow x^2 - 6x - 4 = 0 \Rightarrow$$

$$\Rightarrow x = \frac{6 \pm \sqrt{(6)^2 + 4(4)}}{2} = \frac{6 \pm \sqrt{36+16}}{2} = \frac{6 \pm \sqrt{52}}{2} = \frac{6 \pm 2\sqrt{13}}{2} = 3 \pm \sqrt{13} \Rightarrow$$

$$\Rightarrow x_1 = 3 + \sqrt{13}; x_2 = 3 - \sqrt{13}$$

EJERCICIO # 270:

Resolver las siguientes ecuaciones literales:

$$Ax^2 + Bx + C = 0 \Rightarrow x = \frac{-B \pm \sqrt{B^2 - 4AC}}{2A}$$

1.- $x^2 + 2ax - 35a^2 = 0$

Solución:

$$x^2 + 2ax - 35a^2 = 0 \Rightarrow x = \frac{-2a \pm \sqrt{(2a)^2 + 4(35a^2)}}{2} \Rightarrow$$

$$\Rightarrow x = \frac{-2a \pm \sqrt{4a^2 + 4 \cdot 35 \cdot a^2}}{2} = \frac{-2a \pm 2a\sqrt{1+35}}{2} = -a \pm 6a \Rightarrow$$

$$\Rightarrow x_1 = 5a; x_2 = -7a$$

2.- $10x^2 = 36a^2 - 9ax$

Solución:

$$10x^2 = 36a^2 - 9ax \Rightarrow 10x^2 + 9ax - 36a^2 = 0 \Rightarrow x = \frac{-9a \pm \sqrt{(9a)^2 + 4(10)(36a^2)}}{20} \Rightarrow$$

$$\Rightarrow x = \frac{-9a \pm \sqrt{81a^2 + 1440a^2}}{20} = \frac{-9a \pm \sqrt{81a^2 + 1440a^2}}{20} = \frac{-9a \pm \sqrt{1521a^2}}{20} = \frac{-9a \pm 39a}{20} \Rightarrow$$

$$\Rightarrow x_1 = \frac{-9a + 39a}{20} = \frac{30a}{20} = \frac{3a}{2}; x_2 = \frac{-9a - 39a}{20} = -\frac{48a}{20} = -\frac{12a}{5}$$

3.- $a^2 x^2 + abx - 2b^2 = 0$

Solución:

$$a^2 x^2 + abx - 2b^2 = 0 \Rightarrow x = \frac{-ab \pm \sqrt{(ab)^2 + 4(a^2)(2b^2)}}{2a^2} \Rightarrow$$

$$\Rightarrow x = \frac{-ab \pm ab\sqrt{1+8}}{2a^2} = \frac{-ab \pm ab\sqrt{9}}{2a^2} = \frac{-ab \pm 3ab}{2a^2} \Rightarrow$$

$$\Rightarrow x_1 = \frac{2ab}{2a^2} = \frac{b}{a}; x_2 = -\frac{4ab}{2a^2} = -\frac{2b}{a}$$

4.- $89bx = 42x^2 + 22b^2$

Solución:

$$89bx = 42x^2 + 22b^2 \Rightarrow 42x^2 - 89bx + 22b^2 \Rightarrow$$

$$\Rightarrow x = \frac{89b \pm \sqrt{(89b)^2 - 4(42)(22b^2)}}{84} = \frac{89b \pm \sqrt{7921b^2 - 3696b^2}}{84} \Rightarrow$$

$$\Rightarrow x = \frac{89b \pm \sqrt{4225b^2}}{84} = \frac{89b \pm 65b}{84} \Rightarrow x_1 = \frac{154b}{84} = \frac{77b}{42} = \frac{11b}{6}; x_2 = \frac{24b}{42} = \frac{4b}{7}$$

5.- $x^2 + ax = 20a^2$

Solución:

$$x^2 + ax = 20a^2 \Rightarrow x^2 + ax - 20a^2 = 0 \Rightarrow x = \frac{-a \pm \sqrt{(a)^2 + 4(20a^2)}}{2} \Rightarrow$$

$$\Rightarrow x = \frac{-a \pm a\sqrt{81}}{2} \Rightarrow x_1 = \frac{-a + 9a}{2} = \frac{8a}{2} = 4a; x_2 = -\frac{10a}{2} = -5a$$

6.- $2x^2 = abx + 3a^2b^2$

Solución:

$$2x^2 = abx + 3a^2b^2 \Rightarrow 2x^2 - abx - 3a^2b^2 = 0 \Rightarrow$$

$$\Rightarrow x = \frac{ab \pm \sqrt{(ab)^2 + 4(2)(3a^2b^2)}}{4} = \frac{ab \pm ab\sqrt{1 + 24}}{4} \Rightarrow$$

$$\Rightarrow x = \frac{ab \pm ab\sqrt{25}}{4} \Rightarrow \frac{ab \pm 5ab}{4} \Rightarrow x_1 = \frac{6ab}{4} = \frac{3ab}{2}; x_2 = -\frac{4ab}{4} = -ab$$

7.- $b^2x^2 + 2abx = 3a^2$
Solución:

$$b^2x^2 + 2abx = 3a^2 \Rightarrow b^2x^2 + 2abx - 3a^2 = 0 \Rightarrow$$

$$\Rightarrow x = \frac{-2ab \pm \sqrt{(2ab)^2 + 4(b^2)(3a^2)}}{2b^2} = \frac{-2ab \pm \sqrt{4a^2b^2 + 12a^2b^2}}{2b^2} \Rightarrow$$

$$\Rightarrow x = \frac{-2ab \pm 2ab\sqrt{1 + 3}}{2b^2} = \frac{-2ab \pm 4ab}{2b^2} = \frac{-a \pm 2a}{b} \Rightarrow$$

$$\Rightarrow x_1 = \frac{a}{b}; x_2 = -\frac{3a}{b}$$

8.- $x^2 + ax - bx = ab$

Solución:

$$x^2 + ax - bx = ab \Rightarrow x^2 + (a-b)x - ab = 0 \Rightarrow x = \frac{-(a-b) \pm \sqrt{(a-b)^2 + 4(ab)}}{2} \Rightarrow$$

$$\Rightarrow x = \frac{b - a \pm \sqrt{a^2 - 2ab + b^2 + 4ab}}{2} = \frac{b - a \pm \sqrt{(a+b)^2}}{2} \Rightarrow$$

$$\Rightarrow x = \frac{b - a \pm (a+b)}{2} \Rightarrow x_1 = b; x_2 = -a$$

9.- $x^2 - 2ax = 6ab - 3bx$

Solución:

$$x^2 - 2ax = 6ab - 3bx \Rightarrow x^2 - (2a - 3b)x - 6ab = 0 \Rightarrow$$

$$\Rightarrow x = \frac{(2a - 3b) \pm \sqrt{(2a - 3b)^2 + 4(6ab)}}{2} \Rightarrow$$

$$\Rightarrow x = \frac{(2a - 3b) \pm \sqrt{4a^2 - 12ab + 9b^2 + 24ab}}{2} \Rightarrow$$

$$\Rightarrow x = \frac{(2a - 3b) \pm \sqrt{(2a + 3b)^2}}{2} = \frac{(2a - 3b) \pm (2a + 3b)}{2} \Rightarrow x_1 = \frac{4a}{2}; x_2 = -\frac{4b}{2} = -2b$$

10.- $3(2x^2 - mx) + 4nx - 2mn = 0$

Solución:

$$3(2x^2 - mx) + 4nx - 2mn = 0 \Rightarrow 6x^2 - 3mx + 4nx - 2mn = 0 \Rightarrow$$

$$\Rightarrow 6x^2 + (4n - 3m)x - 2mn = 0 \Rightarrow x = \frac{(3m - 4n) \pm \sqrt{(4n - 3m)^2 + 4(6)(2mn)}}{12} \Rightarrow$$

$$\Rightarrow x = \frac{(3m - 4n) \pm \sqrt{(4n + 3m)^2}}{2} = \frac{3m - 4n \pm (4n + 3m)}{2} \Rightarrow$$

$$\Rightarrow x_1 = \frac{6m}{2} = 3m; x_2 = -\frac{8n}{2} = -4n$$

11.- $x^2 - a^2 - bx - ab = 0$

Solución:

$$x^2 - a^2 - bx - ab = 0 \Rightarrow x^2 - bx - (a^2 + ab) = 0 \Rightarrow$$

$$\Rightarrow x = \frac{b \pm \sqrt{(b)^2 + 4(a^2 + ab)}}{2} = \frac{b \pm \sqrt{(2a + b)^2}}{2} = \frac{b \pm (2a + b)}{2} \Rightarrow$$

$$\Rightarrow x_1 = \frac{2(a+b)}{2} = a + b; x_2 = -\frac{2a}{2} = -a$$

12.- $abx^2 - x(b - 2a) = 2$

Solución:

$abx^2 - x(b - 2a) = 2 \Rightarrow abx^2 - (b - 2a)x - 2 = 0 \Rightarrow$

$\Rightarrow x = \dfrac{(b - 2a) \pm \sqrt{(b - 2a)^2 + 4(ab)(2)}}{2ab} = \dfrac{(b - 2a) \pm \sqrt{(b + 2a)^2}}{2ab} \Rightarrow$

$\Rightarrow x = \dfrac{(b - 2a) \pm (b + 2a)}{2ab} \Rightarrow x_1 = \dfrac{2b}{2ab} = \dfrac{1}{a}; x_2 - \dfrac{4a}{2ab} = -\dfrac{2}{b}$

13.- $x^2 - 2ax + a^2 - b^2 = 0$

Solución:

$x^2 - 2ax + a^2 - b^2 = 0 \Rightarrow x = \dfrac{2a \pm \sqrt{(2a)^2 - 4(a^2 - b^2)}}{2} \Rightarrow$

$\Rightarrow \dfrac{2a \pm 2b}{2} = a \pm b \Rightarrow x_1 = a + b; x_2 = a - b$

14.- $4x(x - b) + b^2 = 4m^2$

Solución:

$4x(x - b) + b^2 = 4m^2 \Rightarrow 4x^2 - 4bx + (b^2 - 4m^2) = 0 \Rightarrow x = \dfrac{4b \pm \sqrt{(4b)^2 - 4(4)(b^2 - 4m)}}{8} \Rightarrow$

$\Rightarrow x = \dfrac{4b \pm \sqrt{16b^2 - 16b^2 + 64m^2}}{8} = \dfrac{4b \pm 8m}{8} \Rightarrow x_1 = \dfrac{b}{2} + m; x_2 = \dfrac{b}{2} - m$

15.- $x^2 - b^2 + 4a^2 - 4ax = 0$

Solución:

$x^2 - b^2 + 4a^2 - 4ax = 0 \Rightarrow x^2 - 4ax + (4a^2 - b^2) = 0 \Rightarrow$

$\Rightarrow x = \dfrac{4a \pm \sqrt{(4a)^2 - 4(4a^2 - b^2)}}{2} = \dfrac{4a \pm \sqrt{4b^2}}{2} = 2a \pm b \Rightarrow$

$\Rightarrow x_1 = 2a + b; x_2 = 2a - b$

16.- $x^2 - (a + 2)x = -2a$

Solución:

$$x^2 - (a+2)x = -2a \Rightarrow x^2 - (a+2)x + 2a = 0 \Rightarrow$$

$$\Rightarrow x = \frac{(a+2) \pm \sqrt{(a+2)^2 - 4(2a)}}{2} = \frac{(a+2) \pm \sqrt{(a-2)^2}}{2} \Rightarrow$$

$$\Rightarrow x = \frac{(a+2) \pm (a-2)}{2} \Rightarrow x_1 = \frac{2a}{2} = a; x_2 = -\frac{4}{2} = 2$$

17.- $x^2 + 2x(4-3a) = 48a$

Solución:

$$x^2 + 2x(4-3a) = 48a \Rightarrow x^2 + 2(4-3a)x - 48a = 0 \Rightarrow$$

$$\Rightarrow x = \frac{-2(4-3a) \pm \sqrt{[2(4-3a)]^2 + 4(48a)}}{2} \Rightarrow$$

$$\Rightarrow x = \frac{-2(4-3a) \pm 2\sqrt{(4-3a)^2 + 48a}}{2} = -(4-3a) \pm \sqrt{(4+3a)^2} \Rightarrow$$

$$\Rightarrow x = (3a-4) \pm (4+3a) \Rightarrow x_1 = 6a; x_2 = -8$$

18.- $x^2 - 2x = m^2 + 2m$

Solución:

$$x^2 - 2x = m^2 + 2m \Rightarrow x^2 - 2x - (m^2 + 2m) = 0 \Rightarrow$$

$$\Rightarrow x = \frac{2 \pm \sqrt{(2)^2 + 4(m^2 + 2m)}}{2} = \frac{2 \pm 2\sqrt{1 + m^2 + 2m}}{2} \Rightarrow$$

$$\Rightarrow x = 1 \pm \sqrt{(m+1)^2} = 1 \pm (m+1) \Rightarrow x_1 = 2+m; x_2 = -m$$

19.- $x^2 + m^2 x(m-2) = 2m^5$

Solución:

$$x^2 + m^2 x(m-2) = 2m^5 \Rightarrow x^2 + m^2(m-2)x - 2m^5 = 0 \Rightarrow$$

$$\Rightarrow x = \frac{m^2(2-m) \pm \sqrt{[m^2(m-2)]^2 + 4(2m^5)}}{2} \Rightarrow$$

$$\Rightarrow x = \frac{m^2(2-m) \pm m^2\sqrt{(m-2)^2 + 8m}}{2} \Rightarrow$$

$$\Rightarrow x = \frac{m^2(2-m) \pm m^2\sqrt{(m+2)^2}}{2} = \frac{m^2}{2}[(2-m) \pm (m+2)] \Rightarrow$$

$$\Rightarrow x_1 = \left(\frac{m^2}{2}\right)(4) = 2m^2; x_2 = \left(\frac{m^2}{2}\right)(-2m) = -m^3$$

20.- $6x^2 - 15ax = 2bx - 5ab$

Solución:

$$6x^2 - 15ax = 2bx - 5ab \Rightarrow 6x^2 - (15a + 2b)x + 5ab = 0 \Rightarrow$$

$$\Rightarrow x = \frac{(15a + 2b) \pm \sqrt{(15a + 2b)^2 - 4(6)(5ab)}}{12} \Rightarrow$$

$$x = \frac{(15a + 2b) \pm \sqrt{(15a - 2b)^2}}{12} = \frac{(15a + 2b) \pm (15a - 2b)}{12} \Rightarrow$$

$$\Rightarrow x_1 = \frac{30a}{12} = \frac{5a}{2}; x_2 = \frac{4b}{12} = \frac{b}{3}$$

21.- $\dfrac{3x}{4} + \dfrac{a}{2} - \dfrac{x^2}{2a} = 0$

Solución:

$$\frac{3x}{4} + \frac{a}{2} - \frac{x^2}{2a} \Rightarrow 4a\left(\frac{3x}{4} + \frac{a}{2} - \frac{x^2}{2a}\right) = 0 \Rightarrow 3ax + 2a^2 - 2x^2 = 0 \Rightarrow$$

$$\Rightarrow 2x^2 - 3ax - 2a^2 = 0 \Rightarrow x = \frac{3a \pm \sqrt{(3a)^2 + 4(2)(2a^2)}}{4} = \frac{3a \pm \sqrt{25a^2}}{4} \Rightarrow$$

$$\Rightarrow x = \frac{3a \pm 5a}{4} \Rightarrow x_1 = \frac{8a}{4} = 2a; x_2 = -\frac{2a}{4} = -\frac{a}{2}$$

22.- $\dfrac{2x - b}{2} = \dfrac{2bx - b^2}{3x}$

Solución:

$$\frac{2x - b}{2} = \frac{2bx - b^2}{3x} \Rightarrow 6x^2 - 3bx = 4bx - 2b^2 \Rightarrow$$

$$\Rightarrow 6x^2 - 7bx + 2b^2 = 0 \Rightarrow x = \frac{7b \pm \sqrt{(7b)^2 - 4(6)(2b^2)}}{12} \Rightarrow$$

$$\Rightarrow x = \frac{7b \pm \sqrt{49b^2 - 48b^2}}{12} \Rightarrow x = \frac{7b \pm b}{12} \Rightarrow x_1 = \frac{8b}{12} = \frac{2b}{3}; x_2 = \frac{6b}{12} = \frac{b}{2}$$

23.- $\dfrac{a + x}{a - x} + \dfrac{a - 2x}{a + x} = -4$

Solución:

$$\frac{a+x}{a-x}+\frac{a-2x}{a+x}=-4 \Rightarrow \left(a^2-x^2\right)\left[\frac{a+x}{a-x}+\frac{a-2x}{a+x}\right]=-4\left(a^2-x^2\right) \Rightarrow$$

$$\Rightarrow (a+x)^2+(a-x)(a-2x)=-4\left(a^2-x^2\right) \Rightarrow \left(a^2+2ax+x^2\right)+\left(a^2-3ax+2x^2\right)=-4a^2+4x^2 \Rightarrow$$

$$\Rightarrow x^2+ax-6a^2=0 \Rightarrow x=\frac{-a\pm\sqrt{a^2+4\left(6a^2\right)}}{2}=\frac{-a\pm\sqrt{25a^2}}{2}=\frac{-a\pm 5a}{2} \Rightarrow$$

$$\Rightarrow x_1=\frac{4a}{2}=2a; x_2=-\frac{6a}{2}=-3a$$

24.- $\dfrac{x^2}{x-1}=\dfrac{a^2}{2(a-2)}$

Solución:

$$\frac{x^2}{x-1}=\frac{a^2}{2(a-2)} \Rightarrow \left(x^2\right)2(a-2)=a^2(x-1) \Rightarrow$$

$$\Rightarrow 2(a-2)x^2-a^2x+a^2=0 \Rightarrow x=\frac{a^2\pm\sqrt{a^4-4\left[2(a-2)\left(a^2\right)\right]}}{4(a-2)} \Rightarrow$$

$$\Rightarrow x=\frac{a^2\pm\sqrt{a^4-8a^3+16a^2}}{4(a-2)}=\frac{a^2\pm\sqrt{a^2\left(a^2-8a+16\right)}}{4(a-2)}=\frac{a^2\pm a(a-4)}{4(a-2)} \Rightarrow$$

$$\Rightarrow x_1=\frac{2a^2-4a}{4(a-2)}=\frac{2a(a-2)}{4(a-2)}=\frac{2a}{4}=\frac{a}{2}; x_2=\frac{4a}{4(a-2)}=\frac{a}{a-2}$$

25.- $x+\dfrac{2}{x}=\dfrac{1}{a}+2a$

Solución:

$$x+\frac{2}{x}=\frac{1}{a}+2a \Rightarrow ax\left(x+\frac{2}{x}\right)=ax\left(\frac{1}{a}+2a\right) \Rightarrow ax^2+2a=x+2a^2x \Rightarrow$$

$$\Rightarrow ax^2-\left(1+2a^2\right)x+2a=0 \Rightarrow x=\frac{\left(1+2a^2\right)\pm\sqrt{\left(1+2a^2\right)^2-4(a)(2a)}}{2a} \Rightarrow$$

$$\Rightarrow x=\frac{\left(1+2a^2\right)\pm\sqrt{\left(1-2a^2\right)^2}}{2a}=\frac{\left(1+2a^2\right)\pm\left(1-2a^2\right)}{2a} \Rightarrow$$

$$\Rightarrow x=\frac{2}{2a}=\frac{1}{a}; x_2=\frac{4a^2}{2a}=2a$$

26.- $\dfrac{2x-b}{b}-\dfrac{x}{x+b}=\dfrac{2x}{4b}$

Solución:

$$\frac{2x-b}{b} - \frac{x}{x+b} = \frac{x}{2b} \Rightarrow 2b(x+b)\left[\frac{2x-b}{b} - \frac{x}{x+b}\right] = 2b(x+b)\left(\frac{x}{2b}\right) \Rightarrow$$

$$\Rightarrow 2(x+b)(2x-b) - 2b(x) = x(x+b) \Rightarrow 2(2x^2 + xb - b^2) = x^2 + xb \Rightarrow$$

$$\Rightarrow 4x^2 + 2bx - 2b^2 = x^2 + bx \Rightarrow 3x^2 + bx - 2b^2 = 0 \Rightarrow$$

$$\Rightarrow x = \frac{-b \pm \sqrt{b^2 + 4(3)(2b^2)}}{6} = \frac{-b \pm 5b}{6} \Rightarrow x_1 = \frac{4b}{6} = \frac{2b}{3}; x_2 = \frac{-6b}{6} = -b$$

GUIA DE TRABAJO
Materia: Matemáticas Guía #97.
Tema: Resolución de bicuadráticas utilizando la resolvente.
(Hoffmann 3r año, ejercicios #45 y #48).
Fecha: _____
Profesor: Fernando Viso
Nombre del

alumno:_____

Sección del

alumno:_____

CONDICIONES:
- **Trabajo individual.**
- **Sin libros, ni cuadernos, ni notas.**
- **Sin celulares.**
- **Es obligatorio mostrar explícitamente, el procedimiento empleado para resolver cada problema.**
- **No se contestarán preguntas ni consultas de ningún tipo.**
- **No pueden moverse de su asiento. ni pedir borras, ni lápices, ni calculadoras prestadas.**

Marco Teórico:

Resolvente de la ecuación $ax^2 + bx + c = 0 \Rightarrow x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

PREGUNTAS:

EJERCICIO #45.

Resolver las siguientes ecuaciones con raíces irracionales:

1.- $x^2 + 2x - 1 = 0$

Solución:

$$x^2 + 2x - 1 = 0 \Rightarrow x = \frac{-2 \pm \sqrt{(2)^2 + 4(1)}}{2} = \frac{-2 \pm 2\sqrt{2}}{2} \Rightarrow$$
$$\Rightarrow x_1 = -1 + \sqrt{2}; x_2 = -1 - \sqrt{2}$$

2.- $x^2 + 6x - 4 = 0$
Solución:

$$x^2 + 6x - 4 = 0 \Rightarrow x = \frac{-6 \pm \sqrt{6^2 + 4(4)}}{2} = \frac{-6 \pm \sqrt{52}}{2} \Rightarrow$$

$$\Rightarrow x = -3 \pm \sqrt{13} \Rightarrow x_1 = -3 + \sqrt{13}; x_2 = -3 - \sqrt{13}$$

3.- $x^2 - 5x - 3 = 0$

Solución:

$$x^2 - 5x - 3 = 0 \Rightarrow x = \frac{5 \pm \sqrt{(5)^2 + 4(3)}}{2} = \frac{5 \pm \sqrt{37}}{2} \Rightarrow$$

$$\Rightarrow x_1 = \frac{5 + \sqrt{37}}{2}; x_2 = \frac{5 - \sqrt{37}}{2}$$

4.- $4x^2 - 9x + 3 = 0$

Solución:

$$4x^2 - 9x + 3 = 0 \Rightarrow x = \frac{9 \pm \sqrt{(9)^2 - 4(4)(3)}}{8} = \frac{9 \pm \sqrt{81 - 48}}{8} \Rightarrow$$

$$\Rightarrow x = \frac{9 \pm \sqrt{33}}{8} \Rightarrow x_1 = \frac{9 + \sqrt{33}}{8}; x_2 = \frac{9 - \sqrt{33}}{8}$$

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

Solución:

$$x^2 + 2x + 5 = 0 \Rightarrow x = \frac{-2 \pm \sqrt{(2)^2 - 4(5)}}{2} = \frac{-2 \pm \sqrt{-16}}{2}$$

NO TIENE RAICES REALES.

6.- $3x^2 + 2x - 3 = 0$

Solución:

$$3x^2 + 2x - 3 = 0 \Rightarrow x = \frac{-2 \pm \sqrt{(2)^2 + 4(3)(3)}}{6} = \frac{-2 \pm 2\sqrt{10}}{6} \Rightarrow$$

$$\Rightarrow x = \frac{-1 \pm \sqrt{10}}{3} \Rightarrow x_1 = \frac{-1 + \sqrt{10}}{3}; x_2 = \frac{-1 - \sqrt{10}}{3}$$

7.- $2x^2 + 3x + 3 = 0$

Solución:

$$2x^2 + 3x + 3 = 0 \Rightarrow x = \frac{-3 \pm \sqrt{(3)^2 - 4(2)(3)}}{4} = \frac{-3 \pm \sqrt{-15}}{4}$$

NO TIENE RAICES REALES.

8.- $3m^2 + 7m + 3 = 0$

Solución:

$$3m^2 + 7m + 3 = 0 \Rightarrow m = \frac{-7 \pm \sqrt{(7)^2 - 4(3)(3)}}{6} = \frac{-7 \pm \sqrt{49 - 36}}{6} \Rightarrow$$
$$\Rightarrow x_1 = \frac{-7 + \sqrt{13}}{6}; x_2 = \frac{-7 - \sqrt{13}}{6}$$

9.- $5x^2 - 8x + 2 = 0$

Solución:

$$5x^2 - 8x + 2 = 0 \Rightarrow x = \frac{8 \pm \sqrt{(8)^2 - 4(5)(2)}}{10} = \frac{8 \pm \sqrt{24}}{10} \Rightarrow$$
$$\Rightarrow x = \frac{8 \pm 2\sqrt{6}}{10} = \frac{4 \pm \sqrt{6}}{5} \Rightarrow x_1 = \frac{4 + \sqrt{6}}{5}; x_2 = \frac{4 - \sqrt{6}}{5}$$

10.- $x^2 + 6x + 2 = 0$

Solución:

$$x^2 + 6x + 2 = 0 \Rightarrow x = \frac{-6 \pm \sqrt{(6)^2 - 4(2)}}{2} = \frac{-6 \pm \sqrt{28}}{2} \Rightarrow$$
$$\Rightarrow x = -3 \pm \sqrt{7} \Rightarrow x_1 = -3 + \sqrt{7}; x_2 = -3 - \sqrt{7}$$

11.- $5x^2 + 7x + 6 = 0$

Solución:

$$5x^2 + 7x + 6 = 0 \Rightarrow x = \frac{-7 \pm \sqrt{(7)^2 - 4(5)(6)}}{10} = \frac{-7 \pm \sqrt{-71}}{10}$$

NO TIENE RAICES REALES.

12.- $6x^2 - 11x - 4 = 0$

Solución:

$$6x^2 - 11x - 4 = 0 \Rightarrow x = \frac{11 \pm \sqrt{(11)^2 + 4(6)(4)}}{12} = \frac{11 \pm \sqrt{121 + 96}}{12} \Rightarrow$$

$$\Rightarrow x = \frac{11 \pm \sqrt{217}}{12} \Rightarrow x_1 = \frac{11 + \sqrt{217}}{12}; x_2 = \frac{11 - \sqrt{217}}{12}$$

13.- $7a^2 - 6a - 2 = 0$

Solución:

$$7a^2 - 6a - 2 = 0 \Rightarrow a = \frac{6 \pm \sqrt{(6)^2 + 4(7)(2)}}{14} = \frac{6 \pm \sqrt{92}}{14} \Rightarrow$$

$$\Rightarrow a = \frac{6 \pm 2\sqrt{23}}{14} = \frac{3 \pm \sqrt{23}}{7} \Rightarrow x_1 = \frac{3 + \sqrt{23}}{7}; x_2 = \frac{3 - \sqrt{23}}{7}$$

14.- $7,32x^2 - 13,7x + 0,045 = 0$

Solución:

$$7,32x^2 - 13,7x + 0,045 = 0 \Rightarrow x = \frac{13,7 \pm \sqrt{(13,7)^2 - 4(7,32)(0,045)}}{2(7,32)} \Rightarrow$$

$$\Rightarrow x = \frac{13,7 \pm \sqrt{187,69 - 1,3176}}{14,64} = \frac{13,7 \pm \sqrt{186,3724}}{14,64} \Rightarrow$$

$$\Rightarrow x = \frac{13,7 \pm 13,6518}{14,64} \Rightarrow x_1 = \frac{13,7 + 13,6518}{14,64} = \frac{27,3518}{14,64} = 1,86829;$$

$$x_2 = \frac{13,7 - 13,6518}{14,64} = \frac{0,0482}{14,64} = 0,00329$$

15.- $3,09x^2 - 0,071x - 0,0943 = 0$

Solución:

$$3,09x^2 - 0,071x - 0,0943 = 0 \Rightarrow x = \frac{0,071 \pm \sqrt{(0,071)^2 + 4(3,09)(0,0943)}}{6,18} \Rightarrow$$

$$\Rightarrow x = \frac{0,071 \pm \sqrt{0,005041 + 1,165548}}{6,18} = \frac{0,071 \pm \sqrt{1,170589}}{6,18} = \frac{0,071 \pm 1,0819}{6,18} \Rightarrow$$

$$\Rightarrow x_1 = \frac{0,071 + 1,0819}{6,18} = \frac{1,15293}{6,18} = 0,186559$$

$$x_2 = \frac{0,071 - 1,0819}{6,18} = -\frac{1,0109}{6,18} = -0,16357$$

16.- $6,0066x^2 + 11,051x + 2,003 = 0$

Solución:

$$6,0066x^2 + 11,051x + 2,003 = 0 \Rightarrow x = \frac{-11,051 \pm \sqrt{(11,051)^2 - 4(6,0066)(2,003)}}{12,0132} \Rightarrow$$

$$\Rightarrow x = \frac{-11,051 \pm \sqrt{122,1246 - 48,120072}}{12,0132} = \frac{-11,051 \pm \sqrt{74,004528}}{12,0132} = \frac{-11,051 \pm 8,602588}{12,0132} \Rightarrow$$

$$\Rightarrow x_1 = \frac{-2,44841}{12,0132} = -0,20381; x_2 = -\frac{19,653588}{12,0132} = -1,63086$$

17.- $7,43 \cdot 10^{56} x^2 - 1,598 \cdot 10^{57} x + 8,45 \cdot 10^{55} = 0$

Solución:

$$7,43 \cdot 10^{56} x^2 - 1,598 \cdot 10^{57} x + 8,45 \cdot 10^{55} = 0 \Rightarrow$$

$$\Rightarrow x = \frac{1,598 \cdot 10^{57} \pm \sqrt{(1,598 \cdot 10^{57})^2 - 4(7,43 \cdot 10^{56})(8,45 \cdot 10^{55})}}{2(7,43 \cdot 10^{56})} \Rightarrow$$

$$\Rightarrow x = \frac{1,598 \cdot 10^{57} \pm \sqrt{2,5536 \cdot 10^{114} - 251 \cdot 10^{111}}}{14,86 \cdot 10^{56}} = \frac{1.598 \cdot 10^{57} \pm \sqrt{(2,5536 - 0,251) \cdot 10^{114}}}{14,86 \cdot 10^{56}} \Rightarrow$$

$$\Rightarrow x = \frac{1,598 \cdot 10^{57} \pm \sqrt{2,3026 \cdot 10^{114}}}{14,86 \cdot 10^{56}} = \frac{1,598 \cdot 10^{57} \pm 1,5174 \cdot 10^{57}}{14,86 \cdot 10^{56}} \Rightarrow$$

$$\Rightarrow x_1 = \frac{30,772 \cdot 10^{56}}{14,86 \cdot 10^{56}} = 2,07079; x_2 = \frac{0,424 \cdot 10^{56}}{14,86 \cdot 10^{56}} = 0,0285329$$

18.- $4,437 \cdot 10^{-72} x^2 + 5,904 \cdot 10^{-70} x - 8,127 \cdot 10^{-71} = 0$

Solución:

$$4,437 \cdot 10^{-72} x^2 + 5,904 \cdot 10^{-70} x - 8,127 \cdot 10^{-71} = 0 \Rightarrow$$

$$\Rightarrow x = \frac{-5,904 \cdot 10^{-70} \pm \sqrt{(5,904 \cdot 10^{-70})^2 + 4(4,437 \cdot 10^{-72})(8,127 \cdot 10^{-71})}}{2(4,437 \cdot 10^{-72})} \Rightarrow$$

$$\Rightarrow x = \frac{-5,904 \cdot 10^{-70} \pm \sqrt{(34,857 \cdot 10^{-140}) + 144,2379 \cdot 10^{-143}}}{8,934 \cdot 10^{-72}} \Rightarrow$$

$$\Rightarrow x = \frac{-5,904 \cdot 10^{-70} \pm \sqrt{(34,857 + 0,14423779) \cdot 10^{-140}}}{8,934 \cdot 10^{-72}} \Rightarrow$$

$$\Rightarrow x = \frac{-5,904 \cdot 10^{-70} \pm 10^{-70} \cdot \sqrt{35,00123}}{8,934 \cdot 10^{-72}} = \frac{-5,904 \pm 5,9161}{8,934 \cdot 10^{-2}} \Rightarrow$$

$$\Rightarrow x_1 = \frac{0,0121}{8,934} \cdot 10^2 = 0,13; x_2 = -\frac{11,8201}{8,934} \cdot 10^2 = -132,3$$

EJERCICIO # 48. (Ecuaciones literales)

1.- $x^2 + ax - 6a^2 = 0$

Solución:

$$x^2 + ax - 6a^2 = 0 \Rightarrow x = \frac{-a \pm \sqrt{a^2 + 4\left(6a^2\right)}}{2} = \frac{-a \pm \sqrt{25a^2}}{2} = \frac{-a \pm 5a}{2} \Rightarrow$$

$$\Rightarrow x_1 = \frac{4a}{2} = 2a; x_2 = -\frac{6a}{2} = -3a$$

2.- $x^2 - 2ax - 8a^2 = 0$

Solución:

$$x^2 - 2ax - 8a^2 = 0 \Rightarrow x = \frac{2a \pm \sqrt{\left(2a\right)^2 + 4\left(8a^2\right)}}{2} = \frac{2a \pm \sqrt{36a^2}}{2} = \frac{2a \pm 6a}{2} \Rightarrow$$

$$\Rightarrow x_1 = \frac{8a}{2} = 4a; x_2 = -\frac{4a}{2} = -2a$$

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

Solución:

$$ax^2 - \left(a^2 + 1\right)x + a = 0 \Rightarrow x = \frac{\left(a^2 + 1\right) \pm \sqrt{\left(a^2 + 1\right)^2 - 4(a)(a)}}{2a} \Rightarrow$$

$$\Rightarrow x = \frac{\left(a^2 + 1\right) \pm \sqrt{\left(a^2 - 1\right)^2}}{2a} = \frac{\left(a^2 + 1\right) \pm \left(a^2 - 1\right)}{2a} \Rightarrow$$

$$\Rightarrow x_1 = \frac{2a^2}{2a} = a; x_2 = \frac{2}{2a} = \frac{1}{a}$$

4.- $3ax^2 - \left(6a^2 - 1\right)x - 2a = 0$

Solución:

$$3ax^2 - \left(6a^2 - 1\right)x - 2a = 0 \Rightarrow x = \frac{\left(6a^2 - 1\right) \pm \sqrt{\left(6a^2 - 1\right)^2 + 4(3a)(2a)}}{6a} \Rightarrow$$

$$\Rightarrow x = \frac{\left(6a^2 - 1\right) \pm \sqrt{\left(6a^2 + 1\right)}}{6a} = \frac{\left(6a^2 - 1\right) \pm \left(6a^2 + 1\right)}{6a} \Rightarrow$$

$$\Rightarrow x_1 = \frac{12a^2}{6a} = 2a; x_2 = \frac{-2}{6a} = -\frac{1}{3a}$$

5.- $ax^2+\left(2a^2+3\right)x+6a=0$

Solución:

$$ax^2+\left(2a^2+3\right)x+6a=0 \Rightarrow x=\frac{-\left(2a^2+3\right)\pm\sqrt{\left(2a^2+3\right)^2-4(a)(6a)}}{2a} \Rightarrow$$

$$\Rightarrow x=\frac{-\left(2a^2+3\right)\pm\sqrt{\left(2a^2-3\right)^2}}{2a}=\frac{-\left(2a^2+3\right)\pm\left(2a^2-3\right)}{2a} \Rightarrow$$

$$\Rightarrow x_1=-\frac{6}{2a}=-\frac{3}{a}\,;x_2=-\frac{4a^2}{2a}=-2a$$

6.- $4x^2-5ax+6a^2=0$

Solución:

$$4x^2-5ax-6a^2=0 \Rightarrow x=\frac{5a\pm\sqrt{\left(5a\right)^2+4(4)\left(6a^2\right)}}{8} \Rightarrow$$

$$\Rightarrow x=\frac{5a\pm\sqrt{121a^2}}{8}=\frac{5a\pm11a}{8} \Rightarrow x_1=\frac{16a}{8}=2a\,;x_2=-\frac{6a}{8}=-\frac{3a}{4}$$

7.- $2x^2+7\sqrt{2}ax+6a^2=0$

Solución:

$$2x^2+7\sqrt{2}ax+6a^2=0 \Rightarrow x=\frac{-7\sqrt{2}a\pm\sqrt{\left(7\sqrt{2}a\right)^2-4(2)\left(6a^2\right)}}{4} \Rightarrow$$

$$\Rightarrow x=\frac{-7\sqrt{2}a\pm\sqrt{98a^2-48a^2}}{4}=\frac{-7\sqrt{2}a\pm5\sqrt{2}a}{4} \Rightarrow$$

$$\Rightarrow x_1=\frac{-2\sqrt{2}a}{4}=-\frac{\sqrt{2}a}{2}\,;x_2=-\frac{12\sqrt{2}a}{4}=-3\sqrt{2}a$$

8.- $\left(x-a\right)^2+2a=x+a^2$

Solución:

$$(x-a)^2 + 2a = x + a^2 \Rightarrow x^2 - 2ax + a^2 + 2a = x + a^2 \Rightarrow$$

$$\Rightarrow x^2 - (2a+1)x + 2a = 0 \Rightarrow x = \frac{(2a+1) \pm \sqrt{(2a+1)^2 - 4(2a)}}{2} \Rightarrow$$

$$\Rightarrow x = \frac{(2a+1) \pm \sqrt{(2a-1)^2}}{2} = \frac{(2a+1) \pm (2a-1)}{2} \Rightarrow$$

$$\Rightarrow x_1 = \frac{4a}{2} = 2a; x_2 = \frac{2}{2} = 1$$

9.- $3x^2 - a = (1-2a)x + a^2$

Solución:

$$3x^2 - a = (1-2a)x + a^2 \Rightarrow 3x^2 - (1-2a)x - a(a+1) = 0 \Rightarrow$$

$$\Rightarrow x = \frac{(1-2a) \pm \sqrt{(1-2a)^2 + 4(3)\left[a(a+1)\right]}}{6} \Rightarrow$$

$$\Rightarrow x = \frac{(1-2a) \pm \sqrt{1 - 4a + 4a^2 + 12a^2 + 12a}}{6} \Rightarrow$$

$$\Rightarrow x = \frac{(1-2a) \pm \sqrt{1 + 8a + 16a^2}}{6} = \frac{(1-2a) \pm \sqrt{(1+4a)^2}}{6} \Rightarrow$$

$$\Rightarrow x = \frac{(1-2a) \pm (1+4a)}{6} \Rightarrow x_1 = \frac{2+2a}{6} = \frac{1+a}{3}; x_2 = -\frac{6a}{6} = -a$$

10.- $(2a+1)x^2 - 4ax + (2a-1) = 0$

Solución:

$$(2a+1)x^2 - 4ax + (2a-1) = 0 \Rightarrow$$

$$\Rightarrow x = \frac{4a \pm \sqrt{(4a)^2 - 4(2a+1)(2a-1)}}{2(2a+1)} = \frac{4a \pm \sqrt{16a^2 - 4(4a^2-1)}}{2(2a+1)} \Rightarrow$$

$$\Rightarrow x = \frac{4a \pm 2}{4a+2} \Rightarrow x_1 = \frac{4a+2}{4a+2} = 1; x_2 = \frac{4a-2}{2(2a+1)} = \frac{2a-1}{2a+1}$$

11.- $x^2 - 2ax + a^2 - b^2 = 0$

Solución:

$$x^2 - 2ax + a^2 - b^2 = 0 \Rightarrow x = \frac{2a \pm \sqrt{(2a)^2 - 4(a^2 - b^2)}}{2} \Rightarrow$$

$$\Rightarrow x = \frac{2a \pm \sqrt{4b^2}}{2} = a \pm b \Rightarrow x_1 = a + b; x_2 = a - b$$

12.- $x^2 + 9a^2 = 6ax + b^2$

Solución:

$$x^2 + 9a^2 = 6ax + b^2 \Rightarrow x^2 - 6ax + 9a^2 - b^2 = 0 \Rightarrow$$

$$\Rightarrow x = \frac{6a \pm \sqrt{(6a)^2 - 4(9a^2 - b^2)}}{2} = \frac{6a \pm 2b}{2} = 3a \pm b \Rightarrow$$

$$\Rightarrow x_1 = 3a + b; x_2 = 3a - b$$

13.- $x^2 - 6bx - a^2 + 9b^2 = 0$

Solución:

$$x^2 - 6bx - a^2 + 9b^2 = 0 \Rightarrow x^2 - 6bx - (a^2 - 9b^2) = 0 \Rightarrow$$

$$\Rightarrow x = \frac{6b \pm \sqrt{(6b)^2 + 4(a^2 - 9b^2)}}{2} = \frac{6b \pm \sqrt{4a^2}}{2} = \frac{6b \pm 2a}{2} \Rightarrow$$

$$\Rightarrow x = 3b \pm a \Rightarrow x_1 = 3b + a; x_2 = 3b - a$$

14.- $(a^2 - b^2)x^2 - 2ax + 1 = 0$
Solución:

$$(a^2 - b^2)x^2 - 2ax + 1 = 0 \Rightarrow x = \frac{2a \pm \sqrt{(2a)^2 - 4(a^2 - b^2)}}{(2)(a^2 - b^2)} \Rightarrow$$

$$\Rightarrow x = \frac{2a \pm 2b}{2(a^2 - b^2)} = \frac{a \pm b}{a^2 - b^2} \Rightarrow x_1 = \frac{a + b}{a^2 - b^2} = \frac{1}{a - b}; x_2 = \frac{a - b}{a^2 - b^2} = \frac{1}{a + b}$$

15.- $x^2 - 3(a - 2b)x - 18ab = 0$

Solución:

$$x^2 - 3(a-2b)x - 18ab = 0 \Rightarrow x = \frac{3(a-2b) \pm \sqrt{[3(a-2b)]^2 + 4(18ab)}}{2} \Rightarrow$$

$$\Rightarrow x = \frac{3(a-2b) \pm \sqrt{9(a-2b)^2 + 72ab}}{2} = \frac{(a-2b) \pm \sqrt{9(a+2b)^2}}{2} \Rightarrow$$

$$\Rightarrow x = \frac{3(a-2b) \pm 3(a+2b)}{2} \Rightarrow x_1 = \frac{6a}{2} = 3a ; x_2 = -\frac{12b}{2} = -6b$$

16.- $\sqrt{3}x^2 - 7ax + 2\sqrt{3}a^2 = 0$

Solución:

$$\sqrt{3}x^2 - 7ax + 2\sqrt{3}a^2 = 0 \Rightarrow x = \frac{7a \pm \sqrt{(7a)^2 - 4(\sqrt{3})(2\sqrt{3}a^2)}}{2\sqrt{3}} \Rightarrow$$

$$\Rightarrow x = \frac{7a \pm \sqrt{49a^2 - 24a^2}}{2\sqrt{3}} = \frac{7a \pm 5a}{2\sqrt{3}} \Rightarrow$$

$$x_1 = \frac{12a}{2\sqrt{3}} = \frac{6a}{\sqrt{3}} = \frac{6\sqrt{3}a}{3} = 2\sqrt{3}a ; x_2 = \frac{2a}{2\sqrt{3}} = \frac{a}{\sqrt{3}} = \frac{\sqrt{3}a}{3}$$

17.- $x(x+a) = bx + ab$

Solución:

$$x(x+a) = bx + ab \Rightarrow x^2 + (a-b)x - ab = 0 \Rightarrow$$

$$\Rightarrow x = \frac{-(a-b) \pm \sqrt{(a-b)^2 + 4(ab)}}{2} = \frac{(b-a) \pm \sqrt{(a+b)^2}}{2} \Rightarrow$$

$$\Rightarrow x = \frac{(b-a) \pm (a+b)}{2} \Rightarrow x_1 = \frac{2b}{2} = b ; x_2 = -\frac{2a}{2} = -a$$

18.- $x^2 - ax = bx - ab$

Solución:

$$x^2 - ax = bx - ab \Rightarrow x^2 - (a+b)x + ab = 0 \Rightarrow$$

$$\Rightarrow x = \frac{(a+b) \pm \sqrt{(a+b)^2 - 4(ab)}}{2} = \frac{(a+b) \pm \sqrt{(a-b)^2}}{2} \Rightarrow$$

$$\Rightarrow x = \frac{(a+b) \pm (a-b)}{2} \Rightarrow x_1 = \frac{2a}{2} = a ; x_2 = \frac{2b}{2} = b$$

19.- $(a^2 - b^2)x^2 - 2(a^2 + b^2)x + (a^2 - b^2) = 0$

Solución:

$$\left(a^2 - b^2\right)x^2 - 2\left(a^2 + b^2\right)x + \left(a^2 - b^2\right) = 0 \Rightarrow$$

$$\Rightarrow x = \frac{2\left(a^2 + b^2\right) \pm \sqrt{\left[2\left(a^2 + b^2\right)\right]^2 - 4\left(a^2 - b^2\right)\left(a^2 - b^2\right)}}{2\left(a^2 - b^2\right)} \Rightarrow$$

$$\Rightarrow x = \frac{2\left(a^2 + b^2\right) \pm \sqrt{4a^4 + 8a^2b^2 + 4b^4 - 4\left(a^4 - 2a^2b^2 + b^4\right)}}{2\left(a^2 - b^2\right)} \Rightarrow$$

$$\Rightarrow x = \frac{2\left(a^2 + b^2\right) \pm \sqrt{16a^2b^2}}{2\left(a^2 - b^2\right)} = \frac{2\left(a^2 + b^2\right) \pm 4ab}{2\left(a^2 - b^2\right)} \Rightarrow$$

$$\Rightarrow x_1 = \frac{2\left(a^2 + b^2 + 2ab\right)}{2\left(a^2 - b^2\right)} = \frac{\left(a + b\right)^2}{\left(a - b\right)\left(a + b\right)} = \frac{a + b}{a - b};$$

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

20.- $\left(a - b\right)^2 x^2 + 2\left(a^2 + b^2\right)x + \left(a + b\right)^2 = 0$

Solución:

$$\left(a - b\right)^2 x^2 + 2\left(a^2 + b^2\right)x + \left(a + b\right)^2 = 0 \Rightarrow$$

$$\Rightarrow x = \frac{-2\left(a^2 + b^2\right) \pm \sqrt{\left[2\left(a^2 + b^2\right)\right]^2 - 4\left[\left(a - b\right)\left(a + b\right)\right]^2}}{2\left(a - b\right)^2} \Rightarrow$$

$$\Rightarrow x = \frac{-2\left(a^2 + b^2\right) \pm \sqrt{4\left(a^4 + 2a^2b^2 + b^4\right) - 4\left(a^4 - 2a^2b^2 + b^4\right)}}{2\left(a - b\right)^2} \Rightarrow$$

$$\Rightarrow x = \frac{-2\left(a^2 + b^2\right) \pm \sqrt{16a^2b^2}}{2\left(a - b\right)^2} = \frac{-2\left(a^2 + b^2\right) \pm 4ab}{2\left(a - b\right)^2} \Rightarrow$$

$$\Rightarrow \frac{-\left(a^2 + b^2\right) \pm 2ab}{\left(a - b\right)^2} \Rightarrow x_1 = -\frac{\left(a - b\right)^2}{\left(a - b\right)^2} = -1; x_2 = -\frac{\left(a + b\right)^2}{\left(a - b\right)^2}$$

21.- $\left(x - a\right)\left(x + b\right) = -ab$

Solución:
$$\left(x - a\right)\left(x + b\right) = -ab \Rightarrow x^2 - \left(a - b\right)x - ab + ab = 0 \Rightarrow$$
$$\Rightarrow x^2 - \left(a - b\right)x = 0 \Rightarrow x\left[x - \left(a - b\right)\right] = 0 \Rightarrow x_1 = 0; x_2 = a - b$$

Si aplicamos la resolvente:

$$x = \frac{(a-b) \pm \sqrt{(a-b)^2}}{2} \Rightarrow \frac{(a-b) \pm (a-b)}{2} \Rightarrow x_1 = 0; x_2 = \frac{2(a-b)}{2} = a-b$$

22.- $(a-b)x^2 - (a+b)x = 0$

Solución:

$$(a-b)x^2 - (a+b)x = 0 \Rightarrow x = \frac{(a+b) \pm \sqrt{(a+b)^2}}{2(a-b)} \Rightarrow$$

$$\Rightarrow x = \frac{(a+b) \pm (a+b)}{2(a-b)} \Rightarrow x_1 = \frac{2(a+b)}{2(a-b)} = \frac{a+b}{a-b}; x_2 = 0$$

23.- $\dfrac{x}{a} - \dfrac{x}{b} = \dfrac{b-a}{x}$

Solución:

$$\frac{x}{a} - \frac{x}{b} = \frac{b-a}{x} \Rightarrow (abx)\left[\frac{x}{a} - \frac{x}{b}\right] = (abx)\left(\frac{b-a}{x}\right) \Rightarrow$$

$$\Rightarrow bx^2 - ax^2 = ab(b-a) \Rightarrow (b-a)x^2 = ab(b-a) \Rightarrow$$

$$\Rightarrow x^2 = ab \Rightarrow x = \pm\sqrt{ab} \Rightarrow x_1 = \sqrt{ab}; x_2 = -\sqrt{ab}$$

24.- $\dfrac{x}{a+b} - \dfrac{a+b}{(a-b)^2 x} = 0$

Solución:

$$\frac{x}{a+b} - \frac{a+b}{(a-b)^2 x} = 0 \Rightarrow \frac{x}{a+b} = \frac{a+b}{(a-b)^2 x} \Rightarrow (a-b)^2 x^2 = (a+b)^2 \Rightarrow$$

$$x = \pm\frac{a+b}{a-b} \Rightarrow x_1 = \frac{a+b}{a-b}; x_2 = -\frac{a+b}{a-b}$$

25.- $\dfrac{x+a}{x-a} + \dfrac{x-a}{x+a} = \dfrac{2(1+a^2)}{1-a^2}$

Solución:

$$\frac{x+a}{x-a}+\frac{x-a}{x+a}=\frac{2\left(1+a^2\right)}{1-a^2}\Rightarrow\frac{\left(x+a\right)^2+\left(x-a\right)^2}{x^2-a^2}=\frac{2\left(1+a^2\right)}{1-a^2}\Rightarrow$$

$$\Rightarrow\frac{2\left(x^2+a^2\right)}{x^2-a^2}=\frac{2\left(1+a^2\right)}{1-a^2}\Rightarrow\left(x^2+a^2\right)\left(1-a^2\right)=\left(x^2-a^2\right)\left(1+a^2\right)\Rightarrow$$

$$\Rightarrow x^2\left[\left(1-a^2\right)-\left(1+a^2\right)\right]+a^2\left[\left(1-a^2\right)+\left(1+a^2\right)\right]=0\Rightarrow$$

$$\Rightarrow\left(-2a^2\right)x^2+2a^2=0\Rightarrow x=\pm1$$

26.- $x^2-\left(\dfrac{a-b}{a+b}\right)x=\left(\dfrac{a+b}{a-b}\right)x-1$

Solución:

$$x^2-\left(\frac{a-b}{a+b}\right)x=\left(\frac{a+b}{a-b}\right)x-1\Rightarrow\left(a+b\right)\left(a-b\right)\left[x^2-\left(\frac{a-b}{a+b}\right)x\right]=\left(a+b\right)\left(a-b\right)\left[\left(\frac{a+b}{a-b}\right)x-1\right]\Rightarrow$$

$$\Rightarrow\left(a^2-b^2\right)x^2-\left(a-b\right)^2x=\left(a+b\right)^2x-\left(a^2-b^2\right)\Rightarrow$$

$$\Rightarrow\left(a^2-b^2\right)x^2-\left[\left(a-b\right)^2+\left(a+b\right)^2\right]x+\left(a^2-b^2\right)=0\Rightarrow$$

$$\Rightarrow\left(a^2-b^2\right)x^2-2\left(a^2+b^2\right)x+\left(a^2-b\right)=0\Rightarrow$$

$$\Rightarrow x=\frac{2\left(a^2+b^2\right)\pm\sqrt{\left[2\left(a^2+b^2\right)\right]^2-4\left(a^2-b^2\right)^2}}{2\left(a^2-b^2\right)}\Rightarrow$$

$$\Rightarrow x=\frac{2\left(a^2+b^2\right)\pm\sqrt{4\left(a^2+b^2\right)^2-4\left(a^2-b^2\right)^2}}{2\left(a^2-b^2\right)}\Rightarrow$$

$$\Rightarrow x=\frac{2\left(a^2+b^2\right)\pm4ab}{2\left(a^2-b^2\right)}=\frac{\left(a^2+b^2\right)\pm2ab}{\left(a^2-b^2\right)}\Rightarrow$$

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

27.- $\left(a+b\right)bx^2+a^2=a\left(a+2b\right)x$

Solución:

$$(a+b)bx^2 + a^2 = a(a+2b)x \Rightarrow (a+b)bx^2 - a(a+2b)x + a^2 = 0 \Rightarrow$$

$$\Rightarrow x = \frac{a(a+2b) \pm \sqrt{[a(a+2b)]^2 - 4[(a+b)b(a^2)]}}{2(a+b)b} \Rightarrow$$

$$\Rightarrow x = \frac{a(a+2b) \pm \sqrt{a^2(a^2 + 4ab + 4b^2) - 4(a^3b + a^2b^2)}}{2(a+b)b} \Rightarrow$$

$$\Rightarrow x = \frac{a(a+2b) \pm a^2}{2(a+b)b} \Rightarrow x_1 = \frac{2ab}{2(a+b)b} = \frac{a}{a+b}; x_2 = \frac{2a^2 + 2ab}{2(a+b)b} = \frac{a(a+b)}{(a+b)b} = \frac{a}{b}$$

28.- $a^2 - x^2 = 4b(b-x)$

Solución:

$$a^2 - x^2 = 4b(b-x) \Rightarrow x^2 + 4b^2 - 4bx - a^2 = 0 \Rightarrow$$

$$\Rightarrow x^2 - 4bx - (a^2 - 4b^2) = 0 \Rightarrow x = \frac{4b \pm \sqrt{(4b)^2 + 4(a^2 - 4b^2)}}{2} \Rightarrow$$

$$\Rightarrow x = \frac{4b \pm \sqrt{4a^2}}{2} = \frac{4b \pm 2a}{2} \Rightarrow x_1 = 2b + a; x_2 = 2b - a$$

29.- $x^2 - 4bx = a^2 + 2ab - 3b^2$

Solución:

$$x^2 - 4bx = a^2 + 2ab - 3b^2 \Rightarrow x^2 - 4bx = a^2 + 2ab + b^2 - 4b^2 \Rightarrow$$

$$\Rightarrow x^2 - 4bx = (a+b)^2 - 4b^2 \Rightarrow x^2 - 4bx - [(a+b)^2 - 4b^2] = 0 \Rightarrow$$

$$\Rightarrow x = \frac{4b \pm \sqrt{(4b)^2 + 4[(a+b)^2 - 4b^2]}}{2} = \frac{4b \pm \sqrt{4(a+b)^2}}{2} = \frac{4b \pm 2(a+b)}{2} \Rightarrow$$

$$\Rightarrow x = 2b \pm (a+b) \Rightarrow x_1 = a + 3b; x_2 = b - a$$

30.- $x^2 + 8a^2 = b^2 - 2ab + 6ax$

Solución:

$$x^2 + 8a^2 = b^2 - 2ab + 6ax \Rightarrow x^2 - 6ax = b^2 - 2ax + a^2 - 9a^2 \Rightarrow$$

$$\Rightarrow x^2 - 6ax = (b-a)^2 - 9a^2 \Rightarrow x^2 - 6ax - [(b-a)^2 - 9a^2] \Rightarrow$$

$$\Rightarrow x = \frac{6a \pm \sqrt{(6a)^2 + 4[(b-a)^2 - 9a^2]}}{2} = \frac{6a \pm \sqrt{4(b-a)^2}}{2} = 3a \pm (b-a) \Rightarrow$$

$$\Rightarrow x = 3a \pm (b-a) \Rightarrow x_1 = 2a + b; x_2 = 4a - b$$

31.- $ab\left(x^2 - c^2\right) = \left(a^2 - b^2\right)cx$

Solución:

$$ab\left(x^2 - c^2\right) = \left(a^2 - b^2\right)cx \Rightarrow abx^2 - \left(a^2 - b^2\right)cx - abc^2 = 0 \Rightarrow$$

$$\Rightarrow x = \frac{\left(a^2 - b^2\right)c \pm \sqrt{\left[\left(a^2 - b^2\right)c\right]^2 + 4\left(ab\right)\left(abc^2\right)}}{2ab} \Rightarrow$$

$$\Rightarrow x = \frac{\left(a^2 - b^2\right)c \pm \sqrt{\left(a^4 - 2a^2b^2 + b^4\right)c^2 + 4a^2b^2c^2}}{2ab} \Rightarrow$$

$$\Rightarrow x = \frac{\left(a^2 - b^2\right)c \pm \sqrt{\left(a^2 + b^2\right)^2 c^2}}{2ab} = \frac{\left(a^2 - b^2\right)c \pm \left(a^2 + b^2\right)c}{2ab} \Rightarrow$$

$$\Rightarrow x_1 = \frac{2a^2c}{2ab} = \frac{ac}{b} ; x_2 = -\frac{2b^2c}{2ab} = -\frac{bc}{a}$$

32.- $a^2c^2x^2 - 2ab^2cx + b^4 = 0$

Solución:

$$a^2c^2x^2 - 2ab^2cx + b^4 = 0 \Rightarrow x = \frac{2ab^2c \pm \sqrt{\left(2ab^2c\right)^2 - 4\left(a^2c^2\right)\left(b^4\right)}}{2\left(a^2c^2\right)} \Rightarrow$$

$$\Rightarrow x_{1,2} = \frac{2ab^2c}{2a^2c^2} = \frac{b^2}{ac}$$

33.- $\dfrac{x-a}{x-b} + \dfrac{x-b}{x-a} + 2 = 0$

Solución:

$$\frac{x-a}{x-b} + \frac{x-b}{x-a} + 2 = 0 \Rightarrow (x-a)(x-b)\left[\frac{x-a}{x-b} + \frac{x-b}{x-a} + 2\right] = 0 \Rightarrow$$

$$\Rightarrow (x-a)^2 + (x-b)^2 + 2(x-a)(x-b) = 0 \Rightarrow$$

$$\Rightarrow \left[(x-a)+(x-b)\right]^2 = 0 \Rightarrow 2x - (a+b) = 0 \Rightarrow x_{1,2} = \frac{a+b}{2}\left(doble\right)$$

34.- $\dfrac{x+a}{x} + \dfrac{x}{x+a} = \dfrac{5}{2}$

Solución:

$$\frac{x+a}{x}+\frac{x}{x+a}=\frac{5}{2} \Rightarrow 2x(x+a)\left[\frac{x+a}{x}+\frac{x}{x+a}\right]=2x(x+a)\left(\frac{5}{2}\right) \Rightarrow$$

$$\Rightarrow 2(x+a)^2+2x^2=5x(x+a) \Rightarrow 2\left(x^2+2ax+a^2\right)+2x^2=5x^2+5ax \Rightarrow$$

$$\Rightarrow x^2+ax-2a^2=0 \Rightarrow x=\frac{-a\pm\sqrt{a^2+4\left(2a^2\right)}}{2}=\frac{-a\pm 3a}{2} \Rightarrow x_1=\frac{2a}{2}=a; x_2=-\frac{4a}{2}=-2a$$

35.- $\dfrac{x+a+2b}{x+a-2b}=\dfrac{b-2a+2x}{b+2a-2x}$

Solución:

$$\frac{x+a+2b}{x+a-2b}=\frac{b-2a+2x}{b+2a-2x} \Rightarrow (x+a+2b)(b+2a-2x)=(x+a-2b)(b-2a+2x) \Rightarrow$$

$$\Rightarrow \left(bx+2ax-2x^2\right)+\left(ab+2a^2-2ax\right)+\left(2b^2+4ab-4bx\right)=$$

$$=\left(xb-2ax+2x^2\right)+\left(ab-2a^2+2ax\right)+\left(-2b^2+4ab-4bx\right) \Rightarrow$$

$$\Rightarrow -2x^2-3bx+5ab+2\left(a^2+b^2\right)=2x^2-3bx+5ab-2\left(a^2+b^2\right) \Rightarrow$$

$$\Rightarrow 4x^2-4\left(a^2+b^2\right)=0 \Rightarrow x^2=a^2+b^2 \Rightarrow x_{1,2}=\pm\sqrt{a^2+b^2}$$

36.- $\left(x+a^2-b^2\right)^2=4a^2x$

Solución:

$$\left(x+a^2-b^2\right)^2=4a^2x \Rightarrow \left[x+\left(a^2-b^2\right)\right]^2=4a^2x \Rightarrow$$

$$\Rightarrow x^2+2(x)\left(a^2-b^2\right)+\left(a^2-b^2\right)^2=4a^2x \Rightarrow$$

$$\Rightarrow x^2-2x\left(a^2+b^2\right)+\left(a^2-b^2\right)^2=0 \Rightarrow$$

$$\Rightarrow x=\frac{2\left(a^2+b^2\right)\pm\sqrt{4\left(a^2+b^2\right)^2-4\left(a^2-b^2\right)^2}}{2} \Rightarrow$$

$$\Rightarrow x=\frac{2\left(a^2+b^2\right)\pm\sqrt{16a^2b^2}}{2}=\left(a^2+b^2\right)\pm 2ab \Rightarrow$$

$$\Rightarrow x_1=(a+b)^2; x_2=(a-b)^2$$

37.- $\dfrac{x-a}{a-1}-\dfrac{x+a}{a+1}=\dfrac{x^2-1}{1-a^2}$

Solución:

$$\frac{x-a}{a-1} - \frac{x+a}{a+1} = \frac{x^2-1}{1-a^2} \Rightarrow (a^2-1)\left[\frac{x-a}{a-1} - \frac{x+a}{a+1}\right] = (a^2-1)\left(\frac{x^2-1}{1-a^2}\right) \Rightarrow$$

$$\Rightarrow (a+1)(x-a) - (a-1)(x+a) = 1-x^2 \Rightarrow$$

$$\Rightarrow ax - a^2 + x - a - (ax + a^2 - x - a) = 1-x^2 \Rightarrow$$

$$\Rightarrow x^2 + 2x - (2a^2+1) = 0 \Rightarrow x = \frac{-2 \pm \sqrt{(2)^2 + 4(2a^2+1)}}{2} = \frac{-2 \pm 2\sqrt{1+2a^2+1}}{2} \Rightarrow$$

$$\Rightarrow x = -1 \pm \sqrt{2a^2+2}$$

38.- $\dfrac{x+\sqrt{a}}{x-2\sqrt{a}} + \dfrac{x+2\sqrt{a}}{x-\sqrt{a}} = \dfrac{4ax}{x^2 - 3\sqrt{a}x + 2a}$

Solución:

$$\frac{x+\sqrt{a}}{x-2\sqrt{a}} + \frac{x+2\sqrt{a}}{x-\sqrt{a}} = \frac{4ax}{x^2 - 3\sqrt{a}x + 2a} \Rightarrow$$

$$\frac{x+\sqrt{a}}{x-2\sqrt{a}} + \frac{x+2\sqrt{a}}{x-\sqrt{a}} = \frac{4ax}{(x-\sqrt{a})(x-2\sqrt{a})} \Rightarrow$$

$$(x-\sqrt{a})(x-2\sqrt{a})\left[\frac{x+\sqrt{a}}{x-2\sqrt{a}} - \frac{x+2\sqrt{a}}{x-\sqrt{a}}\right] = (x-\sqrt{a})(x-2\sqrt{a})\left[\frac{4ax}{(x-\sqrt{a})(x-2\sqrt{a})}\right] \Rightarrow$$

$$\Rightarrow (x-\sqrt{a})(x+\sqrt{a}) - (x-2\sqrt{a})(x+2\sqrt{a}) = 4ax \Rightarrow (x^2-a) + (x^2-4a) = 4ax \Rightarrow$$

$$\Rightarrow 2x^2 - 4ax - 5a = 0 \Rightarrow x = \frac{4a \pm \sqrt{16a^2 + 4(2)(5a)}}{4} \Rightarrow x = \frac{2a \pm \sqrt{4a^2 + 10a}}{2}$$

39.- $9x^2 - 6\sqrt{a}x + a + 3b^2 = 0$

Solución:

$$9x^2 - 6\sqrt{a}x + a + 3b^2 = 0 \Rightarrow x = \frac{6\sqrt{a} \pm \sqrt{36a - 4(9)(a+3b^2)}}{18} \Rightarrow$$

$$\Rightarrow x = \frac{6\sqrt{a} \pm \sqrt{-108b^2}}{18}$$

NO TIENE RAICES REALES.

40.- $\dfrac{x^2}{a+b} + \dfrac{2ab}{a+b} = \sqrt{2}x$

Solución:

$$\frac{x^2}{a+b} + \frac{2ab}{a+b} = \sqrt{2}x \Rightarrow x^2 + 2ab = \sqrt{2}(a+b)x \Rightarrow x^2 - \sqrt{2}(a+b)x + 2ab = 0 \Rightarrow$$

$$\Rightarrow x = \frac{\sqrt{2}(a+b) \pm \sqrt{2(a+b)^2 - 4(2ab)}}{2} \Rightarrow$$

$$\Rightarrow x = \frac{\sqrt{2}(a+b) \pm \sqrt{2(a-b)^2}}{2} = \frac{\sqrt{2}(a+b) \pm \sqrt{2}(a-b)}{2} \Rightarrow$$

$$\Rightarrow x_1 = \frac{2\sqrt{2}a}{2} = \sqrt{2}a; x_2 = \frac{2\sqrt{2}b}{2} = \sqrt{2}b$$

41.- $\dfrac{1}{x} - \dfrac{3}{2a} = \dfrac{1}{a-x}$

Solución:

$$\frac{1}{x} - \frac{3}{2a} = \frac{1}{a-x} \Rightarrow 2ax(a-x)\left[\frac{1}{x} - \frac{3}{2a}\right] = 2ax(a-x)\left(\frac{1}{a-x}\right) \Rightarrow$$

$$\Rightarrow 2a(a-x) - 3x(a-x) = 2ax \Rightarrow 2a^2 - 2ax - 3ax + 3x^2 = 2ax \Rightarrow$$

$$\Rightarrow 3x^2 - 7ax + 2a^2 = 0 \Rightarrow x = \frac{7a \pm \sqrt{(7a)^2 - 4(3)(2a^2)}}{6} = \frac{7a \pm 5a}{6} \Rightarrow$$

$$\Rightarrow x_1 = \frac{12a}{6} = 2a; x_2 = \frac{2a}{6} = \frac{a}{3}$$

42.- $\dfrac{1}{x+a} - \dfrac{1}{2} = \dfrac{1}{a-x}$

Solución:

$$\frac{1}{x+a} - \frac{1}{2} = \frac{1}{a-x} \Rightarrow 2(a^2 - x^2)\left[\frac{1}{x+a} - \frac{1}{2}\right] = 2(a^2 - x^2)\left(\frac{1}{a-x}\right) \Rightarrow$$

$$\Rightarrow 2(a-x) - (a^2 - x^2) = 2(a+x) \Rightarrow 2a - 2x - a^2 + x^2 = 2a + 2x \Rightarrow$$

$$\Rightarrow x^2 - 4x - a^2 = 0 \Rightarrow x = \frac{4 \pm \sqrt{16 + 4a^2}}{2} = 2 \pm 2\sqrt{4 + a^2} \Rightarrow$$

$$\Rightarrow x_1 = 2 + \sqrt{4 + a^2}; x_2 = 2 - \sqrt{4 + a^2}$$

43.- $\dfrac{x^2 + x + 1}{3a^2 + b^2} = \dfrac{x^2 - x + 1}{a^2 + 3b^2}$

Solución:

$$\frac{x^2+x+1}{3a^2+b^2}=\frac{x^2-x+1}{a^2+3b^2}\Rightarrow (x^2+x+1)(3a^2+b^2)=(x^2-x+1)(a^2+3b^2)\Rightarrow 444$$

$$\Rightarrow (3a^2+b^2)x^2+(3a^2+b^2)x+(3a^2+b^2)=(a^2+3b^2)x^2-(a^2+3b^2)x+(a^2+3b^2)\Rightarrow$$

$$\Rightarrow 2(a^2-b^2)x^2+4(a^2+b^2)x+2(a^2-b^2)=0$$

$$\Rightarrow x=\frac{4(a^2+b^2)\pm\sqrt{[4(a^2+b^2)]^2-4[2(a^2-b^2)]^2}}{4(a^2-b^2)}\Rightarrow$$

$$\Rightarrow x=\frac{4(a^2+b^2)\pm\sqrt{64a^2b^2}}{4(a^2-b^2)}=\frac{4(a^2+b^2)\pm 8ab}{4(a^2-b^2)}=\frac{(a^2+b^2)\pm 2ab}{(a^2-b^2)}\Rightarrow$$

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

44.- $\dfrac{x^2-x+1}{a-1}=\dfrac{x^2+x+1}{a+1}$

Solución:

$$\frac{x^2-x+1}{a-1}=\frac{x^2+x+1}{a+1}\Rightarrow (x^2-x+1)(a+1)=(x^2+x+1)(a-1)\Rightarrow$$

$$\Rightarrow (a+1)x^2-(a+1)x+(a+1)=(a-1)x^2+(a-1)x+(a-1)\Rightarrow$$

$$\Rightarrow 2x^2-2ax+2=0\Rightarrow x^2-ax+1=0\Rightarrow x=\frac{a\pm\sqrt{a^2-4}}{2}$$

45.- $\dfrac{x+\sqrt{ab}}{(x-a)(x-b)}=\dfrac{\sqrt{ab}}{ab}$

Solución:

$$\frac{x+\sqrt{ab}}{(x-a)(x-b)}=\frac{\sqrt{ab}}{ab}\Rightarrow (x+\sqrt{ab})(ab)=(x-a)(x-b)(\sqrt{ab})\Rightarrow$$

$$\Rightarrow abx+ab\sqrt{ab}=[x^2-(a+b)x+ab]\sqrt{ab}\Rightarrow$$

$$\Rightarrow abx=[x^2-(a+b)x]\sqrt{ab}\Rightarrow \sqrt{ab}x=x^2-(a+b)x\Rightarrow$$

$$\Rightarrow x[x-(a+b+\sqrt{ab})]\Rightarrow x_1=0;x_2=a+b+\sqrt{ab}$$

GUIA DE TRABAJO
Materia: Matemáticas Guía #97.
Tema: Resolución de bicuadráticas y trinómicas, utilizando la resolvente. (Hoffmann 3r año, ejercicios #49 y #50).
Fecha: _____
Profesor: Fernando Viso
Nombre del

alumno:_____

Sección del

alumno:_____

CONDICIONES:

- **Trabajo individual.**
- **Sin libros, ni cuadernos, ni notas.**
- **Sin celulares.**
- **Es obligatorio mostrar explícitamente, el procedimiento empleado para resolver cada problema.**
- **No se contestarán preguntas ni consultas de ningún tipo.**
- **No pueden moverse de su asiento. ni pedir borras, ni lápices, ni calculadoras prestadas.**

Marco Teórico:

Resolvente de la ecuación $ax^2 + bx + c = 0 \Rightarrow x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Una ecuación tiene tantas raíces como el grado de la misma, o sea, como el exponente mayor de la ecuación. Ejemplo, una ecuación de cuarto grado tiene cuatro raíces.

PREGUNTAS:

EJERCICIO #49.

Resolver las siguientes ecuaciones:

1.- $x^4 - 5x^2 + 4 = 0$

Solución:

$$x^4 - 5x^2 + 4 = 0 \Rightarrow x^2 = \frac{5 \pm \sqrt{(5)^2 - 4(4)}}{2} = \frac{5 \pm 3}{2} \Rightarrow$$

$$\Rightarrow x_{1,2} = \pm \frac{8}{2} = \pm 4; x_{3,4} = \pm 1$$

2.- $x^4 - 10x^2 + 9 = 0$

Solución:

$$x^4 - 10x^2 + 9 = 0 \Rightarrow x^2 = \frac{10 \pm \sqrt{(10)^2 - 4(9)}}{2} \Rightarrow$$

$$\Rightarrow x^2 = \frac{10 \pm \sqrt{64}}{2} = \frac{10 \pm 8}{2} \Rightarrow x_{1,2} = \pm 9; x_{3,4} = \pm 1$$

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

Solución:

$$x^4 - 4x^2 + 3 = 0 \Rightarrow x^2 = \frac{4 \pm \sqrt{(4)^2 - 4(3)}}{2} = \frac{4 \pm 2}{2} \Rightarrow$$

$$\Rightarrow x_{1,2} = \pm \frac{6}{2} = \pm 3; x_{3,4} = \pm \frac{2}{2} = \pm 1$$

4.- $x^4 - 5x^2 + 6 = 0$

Solución:

$$x^4 - 5x^2 + 6 = 0 \Rightarrow x^2 = \frac{5 \pm \sqrt{(5)^2 - 4(6)}}{2} = \frac{5 \pm 1}{2} \Rightarrow$$

$$\Rightarrow x_{1,2} = \pm \frac{6}{2} = \pm 3; x_{3,4} = \pm \frac{4}{2} = \pm 2$$

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

Solución:

$$x^4 - 3x^2 - 4 = 0 \Rightarrow x^2 = \frac{3 \pm \sqrt{(3)^2 + 4(4)}}{2} = \frac{3 \pm 5}{2} \Rightarrow$$

$$\Rightarrow x_{1,2} = \pm \frac{8}{2} = \pm 4; x_{3,4} = \pm \sqrt{-1} \, (NO)$$

6.- $x^4 - 13x^2 + 36 = 0$

Solución:

$$x^4 - 13x^2 + 36 = 0 \Rightarrow x^2 = \frac{13 \pm \sqrt{(13)^2 - 4(36)}}{2} \Rightarrow$$

$$\Rightarrow x^2 = \frac{13 \pm \sqrt{25}}{2} = \frac{13 \pm 5}{2} \Rightarrow x_{1,2} = \pm \frac{18}{2} = \pm 9; x_{3,4} = \pm \frac{8}{2} = \pm 4$$

7.- $x^4 + 4x^2 + 4 = 0$

Solución:

$$x^4 + 4x^2 + 4 = 0 \Rightarrow x^2 = \frac{-4 \pm \sqrt{(4)^2 - 4(4)}}{2} \Rightarrow x^2 = \frac{-4}{2} = -2$$

NO TIENE RAICES REALES.

8.- $x^4 - 18x^2 + 81 = 0$

Solución:

$$x^4 - 18x^2 + 81 = 0 \Rightarrow x^2 = \frac{18 \pm \sqrt{(18)^2 - 4(81)}}{2} \Rightarrow$$

$$\Rightarrow x^2 = \frac{18 \pm \sqrt{324 - 324}}{2} = 9 \Rightarrow x_{1,2} = 3; x_{3,4} = -3$$

9.- $4x^4 - 5x^2 + 1 = 0$

Solución:

$$4x^4 - 5x^2 + 1 = 0 \Rightarrow x^2 = \frac{5 \pm \sqrt{(5)^2 - 4(4)}}{8} = \frac{5 \pm 3}{8} \Rightarrow x_{1,2} = \pm 1;$$

$$x_{3,4} = \pm \sqrt{\frac{2}{8}} = \pm \frac{1}{2}$$

10.- $12x^4 - 7x^2 + 1 = 0$

Solución:

$$12x^4 - 7x^2 + 1 = 0 \Rightarrow x^2 = \frac{7 \pm \sqrt{49 - 48}}{24} \Rightarrow x^2 = \frac{7 \pm 1}{24} \Rightarrow$$

$$\Rightarrow x_{1,2} = \pm \sqrt{\frac{8}{24}} = \pm \frac{\sqrt{3}}{3}; x_{3,4} = \pm \sqrt{\frac{6}{24}} = \pm \frac{1}{2}$$

11.- $6x^4 - 7x^2 + 2 = 0$

Solución:

$$6x^4 - 7x^2 + 2 = 0 \Rightarrow x^2 = \frac{7 \pm \sqrt{(7)^2 - 4(6)(2)}}{12} = \frac{7 \pm 1}{2} \Rightarrow$$

$$\Rightarrow x_{1,2} = \pm\sqrt{\frac{8}{12}} = \pm\sqrt{\frac{2}{3}} = \pm\frac{\sqrt{6}}{3}; x_{3,4} = \pm\sqrt{\frac{6}{12}} = \pm\frac{\sqrt{2}}{2}$$

12.- $x^4 + 8x^2 - 9 = 0$

Solución:

$$x^4 + 8x^2 - 9 = 0 \Rightarrow x^2 = \frac{-8 \pm \sqrt{(8)^2 + 4(9)}}{2} = \frac{-8 \pm 10}{2} \Rightarrow$$

$$\Rightarrow x_{1,2} = \pm 1; x_{3,4} = NO - REAL$$

13.- $9x^4 - 24x^2 + 16 = 0$

Solución:

$$9x^4 - 24x^2 + 16 = 0 \Rightarrow x^2 = \frac{24 \pm \sqrt{(24)^2 - 4(9)(16)}}{18} = \frac{24 \pm \sqrt{576 - 576}}{18} \Rightarrow$$

$$\Rightarrow x_{1,2,3,4} = \pm\sqrt{\frac{24}{18}} = \pm\frac{2\sqrt{3}}{3} \left(Dobles \right)$$

14.- $3x^4 - 5x^2 + 2 = 0$

Solución:

$$3x^4 - 5x^2 + 2 = 0 \Rightarrow x^2 = \frac{5 \pm \sqrt{25 - 24}}{6} = \frac{5 \pm 1}{6} \Rightarrow$$

$$\Rightarrow x_{1,2} = \pm\sqrt{\frac{6}{6}} = \pm 1; x_{3,4} = \pm\sqrt{\frac{4}{6}} = \pm\sqrt{\frac{2}{3}} = \pm\frac{\sqrt{6}}{3}$$

15.- $5x^4 - 4x^2 + 3 = 0$

Solución:

$$5x^4 - 4x^2 + 3 = 0 \Rightarrow x^2 = \frac{4 \pm \sqrt{16 - 60}}{10}$$

NO TIENE RAICES REALES.

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

Solución:

$$x^4 - 5x^2 + 3 = 0 \Rightarrow x^2 = \frac{5 \pm \sqrt{25-12}}{2} = \frac{5 \pm \sqrt{13}}{2} \Rightarrow$$

$$\Rightarrow x_{1,2} = \pm\sqrt{\frac{5+\sqrt{13}}{2}}; x_{3,4} = \pm\sqrt{\frac{5-\sqrt{13}}{2}}$$

17.- $3x^4 - 8x^2 + 1 = 0$

Solución:

$$3x^4 - 8x^2 + 1 = 0 \Rightarrow x^2 = \frac{8 \pm \sqrt{(8)^2 - 4(3)}}{6} = \frac{8 \pm 2\sqrt{13}}{6} = \frac{4 \pm \sqrt{13}}{3} \Rightarrow$$

$$\Rightarrow x_{1,2} = \pm\sqrt{\frac{4+\sqrt{13}}{3}}; x_{3,4} = \pm\sqrt{\frac{4-\sqrt{13}}{3}}$$

18.- $x^4 - 7x^2 - 5 = 0$

Solución:

$$x^4 - 7x^2 - 5 = 0 \Rightarrow x^2 = \frac{7 \pm \sqrt{49+20}}{2} = \frac{7 \pm \sqrt{69}}{2} \Rightarrow$$

$$\Rightarrow x_{1,2} = \pm\sqrt{\frac{7+\sqrt{69}}{2}}; x_{3,4} = \pm\sqrt{\frac{7-\sqrt{69}}{2}}$$

19.- $4x^4 - 9x^2 + 5 = 0$

Solución:

$$4x^4 - 9x^2 + 5 = 0 \Rightarrow x^2 = \frac{9 \pm \sqrt{81-80}}{8} = \frac{9 \pm 1}{8} \Rightarrow$$

$$\Rightarrow x_{1,2} = \pm\sqrt{\frac{10}{8}} = \pm\sqrt{\frac{5}{4}} = \pm\frac{\sqrt{5}}{2}; x_{3,4} = \pm\sqrt{\frac{8}{8}} = \pm 1$$

20.- $9x^4 - 82x^2 + 9 = 0$

Solución:

$$9x^4 - 82x^2 + 9 = 0 \Rightarrow x^2 = \frac{82 \pm \sqrt{(82)^2 - 4(9)(9)}}{18} = \frac{82 \pm \sqrt{6724 - 324}}{18} = \frac{82 \pm \sqrt{6400}}{18} \Rightarrow$$

$$\Rightarrow x^2 = \frac{82 \pm 80}{18} \Rightarrow x_{1,2} = \pm\sqrt{\frac{162}{18}} = \pm\sqrt{9} = \pm 3;$$

$$x_{3,4} = \pm\sqrt{\frac{2}{18}} = \pm\frac{1}{3}$$

21.- $5x^4 + 3x^2 - 2 = 0$

Solución:

$$5x^4 + 3x^2 - 2 = 0 \Rightarrow x^2 = \frac{-3 \pm \sqrt{(3)^2 + 4(5)(2)}}{10} = \frac{-3 \pm 7}{10} \Rightarrow$$

$$\Rightarrow x_{1,2} = \pm\sqrt{\frac{4}{10}} = \pm\sqrt{\frac{2}{5}} = \pm\frac{\sqrt{10}}{5} ; x_{3,4} = \pm\sqrt{-\frac{10}{10}} \left(NO-REAL\right)$$

22.- $x^4 - 14x^2 + 49 = 0$

Solución:

$$x^4 - 14x^2 + 49 = 0 \Rightarrow x^2 = \frac{14 \pm \sqrt{(14)^2 - 4(49)}}{2} = \frac{14 \pm \sqrt{196 - 196}}{2} \Rightarrow$$

$$\Rightarrow x_{1,2,3,4} = \pm\sqrt{7} \left(Dobles\right)$$

23.- $2x^4 + 7x^2 - 4 = 0$

Solución:

$$2x^4 + 7x^2 - 4 = 0 \Rightarrow x^2 = \frac{-7 \pm \sqrt{(7)^2 + 4(2)(4)}}{4} = \frac{-7 \pm \sqrt{81}}{4} = \frac{-7 \pm 9}{4} \Rightarrow$$

$$\Rightarrow x_{1,2} = \pm\sqrt{\frac{2}{4}} = \pm\frac{1}{\sqrt{2}} = \pm\frac{\sqrt{2}}{2} ; x_{3,4} = \pm\sqrt{-\frac{16}{4}} \left(NO-REAL\right)$$

24.- $4x^4 + 7x^2 - 4 = 0$

Solución:

$$4x^4 + 7x^2 - 4 = 0 \Rightarrow x^2 = \frac{-7 \pm \sqrt{(7)^2 + 4(4)(4)}}{8} = \frac{-7 \pm \sqrt{113}}{8} \Rightarrow$$

$$\Rightarrow x_{1,2} = \pm\sqrt{\frac{-7 + \sqrt{113}}{8}} \; ; \; x_{3,4} = \pm\sqrt{\frac{-7 - \sqrt{113}}{8}}$$

25.- $5x^4 - 3x^2 + 1 = 0$

Solución:

$$5x^4 - 3x^2 + 1 = 0 \Rightarrow x^2 = \frac{3 \pm \sqrt{9 - 20}}{10}$$

NO TIENE RAICES REALES.

26.- $7x^4 + x^2 - 8 = 0$

Solución:

$$7x^4 + x^2 - 8 = 0 \Rightarrow x^2 = \frac{-1 \pm \sqrt{1 + 4(7)(8)}}{14} = \frac{-1 \pm \sqrt{225}}{14} = \frac{-1 \pm 15}{14} \Rightarrow$$

$$\Rightarrow x_{1,2} = \pm\sqrt{\frac{14}{14}} = \pm 1 \; ; \; x_{3,4} = \pm\sqrt{-\frac{15}{14}} \; (NO - REAL)$$

27.- $3x^4 - 8x^2 + 2 = 0$

Solución:

$$3x^4 - 8x^2 + 2 = 0 \Rightarrow x^2 = \frac{8 \pm \sqrt{(8)^2 - 4(3)(2)}}{6} = \frac{8 \pm \sqrt{40}}{6} = \frac{8 \pm 2\sqrt{10}}{6} = \frac{4 \pm \sqrt{10}}{3} \Rightarrow$$

$$\Rightarrow x_{1,2} = \pm\sqrt{\frac{4 + \sqrt{10}}{3}} \; ; \; x_{3,4} = \pm\sqrt{\frac{4 - \sqrt{10}}{3}}$$

28.- $6x^4 - 5x^2 - 7 = 0$

Solución:

$$6x^4 - 5x^2 - 7 = 0 \Rightarrow x^2 = \frac{5 \pm \sqrt{(5)^2 + 4(6)(7)}}{12} = \frac{5 \pm \sqrt{193}}{12} \Rightarrow$$

$$\Rightarrow x_{1,2} = \pm\sqrt{\frac{5 + \sqrt{193}}{12}} \; ; \; x_{3,4} = \pm\sqrt{\frac{5 - \sqrt{193}}{12}}$$

29.- $x^4 - 50x^2 + 49 = 0$

Solución:

$$x^4 - 50x^2 + 49 = 0 \Rightarrow x^2 = \frac{50 \pm \sqrt{(50)^2 - 4(49)}}{2} = \frac{50 \pm \sqrt{2304}}{2} = \frac{50 \pm 48}{2} \Rightarrow$$

$$\Rightarrow x_{1,2} = \pm\sqrt{\frac{98}{2}} = \pm\sqrt{49} = \pm 7; x_{3,4} = \pm\sqrt{\frac{2}{2}} = \pm 1$$

30.- $2x^4 + 5x^2 - 3 = 0$

Solución:

$$2x^4 + 5x^2 - 3 = 0 \Rightarrow x^2 = \frac{-5 \pm \sqrt{(5)^2 + 4(2)(3)}}{4} = \frac{-5 \pm 7}{4} \Rightarrow$$

$$\Rightarrow x_{1,2} = \pm\sqrt{\frac{2}{4}} = \pm\frac{1}{\sqrt{2}} = \pm\frac{\sqrt{2}}{2}; x_{3,4} = \pm\sqrt{-\frac{12}{4}} \left(NO - REAL \right)$$

31.- $2x^4 - 9x^2 - 4 = 0$

Solución:

$$2x^4 - 9x^2 - 4 = 0 \Rightarrow x^2 = \frac{9 \pm \sqrt{(9)^2 + 4(2)(4)}}{4} = \frac{9 \pm \sqrt{81 + 32}}{4} = \frac{9 \pm \sqrt{113}}{4} \Rightarrow$$

$$\Rightarrow x_{1,1} = \pm\frac{1}{2}\sqrt{9 + \sqrt{113}}; x_{3,4} = \pm\frac{1}{2}\sqrt{9 - \sqrt{113}}$$

32.- $\left(x^2 - 10\right)\left(x^2 - 3\right) = 78$

Solución:

$$\left(x^2 - 10\right)\left(x^2 - 3\right) = 78 \Rightarrow x^4 - 13x^2 + 30 = 78 \Rightarrow x^4 - 13x^2 - 48 = 0 \Rightarrow$$

$$\Rightarrow x^2 = \frac{13 \pm \sqrt{(13)^2 + 4(48)}}{2} = \frac{13 \pm \sqrt{169 + 192}}{2} = \frac{13 \pm \sqrt{361}}{2} = \frac{13 \pm 19}{2} \Rightarrow$$

$$\Rightarrow x_{1,2} = \pm\sqrt{\frac{32}{2}} = \pm 4; x_{3,4} = \pm\sqrt{\frac{13 - 19}{2}} \left(NO - REAL \right)$$

33.- $\left(x^2 - 6\right)^2 - 7\left(x^2 - 6\right) = 30$

Solución:

$$(x^2-6)^2-7(x^2-6)=30 \Rightarrow x^4-12x^2+36-7x^2+42=30 \Rightarrow$$

$$\Rightarrow x^4-19x^2+48=0 \Rightarrow x^2=\frac{19\pm\sqrt{(19)^2-4(48)}}{2}=\frac{19\pm\sqrt{361-192}}{2}=\frac{19\pm13}{2}\Rightarrow$$

$$\Rightarrow x_{1,2}=\pm\sqrt{\frac{32}{2}}=\pm4; x_{3,4}=\pm\sqrt{\frac{19-13}{2}}=\pm\sqrt{3}$$

34.- $\dfrac{x^2}{5}+\dfrac{1}{2x^2}=\dfrac{7}{10}$

Solución:

$$\frac{x^2}{5}+\frac{1}{2x^2}=\frac{7}{10}\Rightarrow 10x^2\left[\frac{x^2}{5}+\frac{1}{2x^2}\right]=10x^2\left(\frac{7}{10}\right)\Rightarrow 2x^4+5=7x^2\Rightarrow$$

$$\Rightarrow 2x^4-7x^2+5=0 \Rightarrow x^2=\frac{7\pm\sqrt{(7)^2-4(2)(5)}}{4}=\frac{7\pm3}{4}\Rightarrow$$

$$\Rightarrow x_{1,2}=\pm\sqrt{\frac{10}{4}}=\pm\sqrt{\frac{5}{2}}=\pm\frac{\sqrt{10}}{2}; x_{3,4}=\pm\sqrt{\frac{4}{4}}=\pm1$$

35.- $\left(x^2+1\right)^2=5x^2-1$

Solución:

$$\left(x^2+1\right)^2=5x^2-1 \Rightarrow x^4+2x^2+1=5x^2-1 \Rightarrow x^4-3x^2+2=0\Rightarrow$$

$$\Rightarrow x^2=\frac{3\pm\sqrt{(3)^2-4(2)}}{2}=\frac{3\pm1}{2}\Rightarrow x_{1,2}=\pm\sqrt{\frac{2}{2}}=\pm1; x_{3,4}=\pm\sqrt{\frac{4}{2}}=\pm\sqrt{2}$$

36.- $\left(x^2-2\right)^2+x^2=2$

Solución:

$$\left(x^2-2\right)^2+x^2=2 \Rightarrow x^4-4x^2+4+x^2=2 \Rightarrow x^4-3x^2+2=0\Rightarrow$$

$$\Rightarrow x^2=\frac{3\pm\sqrt{(3)^2-4(2)}}{2}=\frac{3\pm1}{2}\Rightarrow x_{1,2}=\pm\sqrt{\frac{2}{2}}=\pm1; x_{3,4}=\pm\sqrt{\frac{4}{2}}=\pm\sqrt{2}$$

37.- $x^2+\dfrac{36}{x^2}=13$

Solución:

$$x^2 + \frac{36}{x^2} = 13 \Rightarrow x^4 - 13x^2 + 36 = 0 \Rightarrow x^2 = \frac{13 \pm \sqrt{(13)^2 - 4(36)}}{2} = \frac{13 \pm 5}{2} \Rightarrow$$

$$\Rightarrow x_{1,2} = \pm\sqrt{9} = \pm 3; \quad x_{3,4} = \pm\sqrt{\frac{13-5}{2}} = \pm 2$$

38.- $\left(x^2 - 4\right)^2 = 2x^2 - 9$

Solución:

$$\left(x^2 - 4\right)^2 = 2x^2 - 9 \Rightarrow x^4 - 8x^2 + 16 = 2x^2 - 9 \Rightarrow x^4 - 10x^2 + 25 = 0 \Rightarrow$$

$$\Rightarrow x^2 = \frac{10 \pm \sqrt{100 - 100}}{2} = 5 \Rightarrow x_{1,2} = \pm\sqrt{5} \, (Dobles)$$

39.- $\left(x^2 - 3\right)^2 = 2x^2 + 2$

Solución:

$$\left(x^2 - 3\right)^2 = 2x^2 + 2 \Rightarrow x^4 - 6x^2 + 9 = 2x^2 + 2 \Rightarrow x^4 - 8x^2 + 7 = 0 \Rightarrow$$

$$\Rightarrow x^2 = \frac{8 \pm \sqrt{(8)^2 - 4(7)}}{2} = \frac{8 \pm \sqrt{64 - 28}}{2} = \frac{8 \pm 6}{2} \Rightarrow$$

$$\Rightarrow x_{1,2} = \pm\sqrt{\frac{14}{2}} = \pm\sqrt{7}; \quad x_{3,4} = \pm\sqrt{\frac{2}{2}} = \pm 1$$

40.- $\left(x^2 - 2\right)^2 + x^2\left(x^2 - 1\right) = 2$

Solución:

$$\left(x^2 - 2\right)^2 + x^2\left(x^2 - 1\right) = 2 \Rightarrow x^4 - 4x^2 + 4 + x^4 - x^2 = 2 \Rightarrow$$

$$\Rightarrow 2x^4 - 5x^2 + 2 = 0 \Rightarrow x^2 = \frac{5 \pm \sqrt{(5)^2 - 4(2)(2)}}{4} = \frac{5 \pm 3}{4} \Rightarrow$$

$$\Rightarrow x_{1,2} = \pm\sqrt{\frac{8}{4}} = \pm\sqrt{2}; \quad x_{3,4} = \pm\sqrt{\frac{2}{4}} = \pm\frac{1}{\sqrt{2}} = \pm\frac{\sqrt{2}}{2}$$

41.- $\dfrac{x+1}{x^2} + \dfrac{1}{x-1} - 2x = 2$

Solución:

$$\frac{x+1}{x^2}+\frac{1}{x-1}-2x=2 \Rightarrow x^2(x-1)\left[\frac{x+1}{x^2}+\frac{1}{x-1}\right]-2x^3(x-1)=2x^2(x-1)\Rightarrow$$

$$\Rightarrow (x^2-1)+x^2-2x^4+2x^3=2x^3-2x^2 \Rightarrow 2x^4-4x^2+1=0 \Rightarrow x^2=\frac{4\pm\sqrt{(4)^2-4(2)}}{4}\Rightarrow$$

$$\Rightarrow x^2=\frac{4\pm2\sqrt{2}}{4}=\frac{2\pm\sqrt{2}}{2}\Rightarrow x_{1,2}=\pm\sqrt{\frac{2+\sqrt{2}}{2}};x_{3,4}=\pm\sqrt{\frac{2-\sqrt{2}}{2}}$$

42.- $\dfrac{1}{x^2-4}+\dfrac{1}{x^2-9}+\dfrac{1}{x^2}=0$

Solución:

$$\frac{1}{x^2-4}+\frac{1}{x^2-9}+\frac{1}{x^2}=0 \Rightarrow x^2(x^2-9)+x^2(x^2-4)+(x^2-4)(x^2-9)=0 \Rightarrow$$

$$\Rightarrow x^4-9x^2+x^4-4x^2+x^4-13x^2+36=0 \Rightarrow 3x^4-26x^2+36=0 \Rightarrow$$

$$\Rightarrow x^2=\frac{26\pm\sqrt{(26)^2-4(3)(36)}}{6}=\frac{26\pm\sqrt{676-432}}{6}=\frac{26\pm\sqrt{244}}{6}=\frac{26\pm2\sqrt{61}}{6}\Rightarrow$$

$$\Rightarrow x^2=\frac{13\pm\sqrt{61}}{3}\Rightarrow x_{1,2}=\pm\sqrt{\frac{13+\sqrt{61}}{3}};x_{3,4}=\pm\sqrt{\frac{13-\sqrt{61}}{3}}$$

43.- $\dfrac{1}{x^2-1}+\dfrac{1}{x^2-2}=\dfrac{1}{x^2-3}$

Solución:

$$\frac{1}{x^2-1}+\frac{1}{x^2-2}=\frac{1}{x^2-3} \Rightarrow (x^2-2)(x^2-3)+(x^2-1)(x^2-3)=(x^2-1)(x^2-2)\Rightarrow$$

$$\Rightarrow x^4-5x^2+6+x^4-4x^2+3=x^4-3x^2+2 \Rightarrow x^4-6x^2+7=0 \Rightarrow$$

$$\Rightarrow x^2=\frac{6\pm\sqrt{(6)^2-4(7)}}{2}=\frac{6\pm2\sqrt{2}}{2}=3\pm\sqrt{2}\Rightarrow$$

$$\Rightarrow x_{1,2}=\pm\sqrt{3+\sqrt{2}};x_{3,4}=\pm\sqrt{3-\sqrt{2}}$$

44.- $2(x^2-10)=\dfrac{15x^2}{(x^2-9)}$

Solución:

$$2\left(x^2-10\right)=\frac{15x^2}{\left(x^2-9\right)}\Rightarrow 2\left(x^2-10\right)\left(x^2-9\right)=15x^2\Rightarrow$$

$$\Rightarrow 2x^4-38x^2+180=15x^2\Rightarrow 2x^4-53x^2+180=0\Rightarrow$$

$$\Rightarrow x^2=\frac{53\pm\sqrt{\left(53\right)^2-4\left(2\right)\left(180\right)}}{4}=\frac{53\pm\sqrt{2809-1440}}{4}=\frac{53\pm\sqrt{1369}}{4}=\frac{53\pm 37}{4}\Rightarrow$$

$$\Rightarrow x_{1,2}=\pm\sqrt{\frac{90}{2}}=\pm 3\sqrt{5};x_{3,4}=\pm 2\sqrt{2}$$

45.- $\dfrac{3x^2-17}{x^2+5}=\left(x+2\sqrt{5}\right)\left(x-2\sqrt{5}\right)$

Solución:

$$\frac{3x^2-17}{x^2+5}=\left(x+2\sqrt{5}\right)\left(x-2\sqrt{5}\right)\Rightarrow 3x^2-17=\left(x^2+5\right)\left(x^2-20\right)\Rightarrow$$

$$\Rightarrow 3x^2-17=x^4-15x^2-100=0\Rightarrow x^2=\frac{15\pm\sqrt{\left(15\right)^2+4\left(100\right)}}{2}=\frac{15\pm\sqrt{625}}{2}=\frac{15\pm 25}{2}\Rightarrow$$

$$\Rightarrow x_{1,2}=\pm\sqrt{\frac{40}{2}}=\pm 2\sqrt{5};x_{3,4}=\pm\sqrt{\frac{15-25}{2}}\left(NO-REAL\right)$$

46.- $\left(x^2-10\right)\left(x^2-3\right)=38$

Solución:

$$\left(x^2-10\right)\left(x^2-3\right)=38\Rightarrow x^4-13x^2+30=38\Rightarrow x^4-13x^2-8=0\Rightarrow$$

$$\Rightarrow x^2=\frac{13\pm\sqrt{\left(13\right)^2+4\left(8\right)}}{2}=\frac{13\pm\sqrt{201}}{2}\Rightarrow$$

$$\Rightarrow x_{1,2}=\pm\sqrt{\frac{13+\sqrt{201}}{2}};x_{3,4}=\pm\sqrt{\frac{13-\sqrt{201}}{2}}$$

47.- $\dfrac{x^2+7x+2}{5+2x-x^2}=\dfrac{19x^2+4x-4}{5x^2-x+2}$

Solución:

$$A=\left(x^2+7x+2\right)\left(5x^2-x+2\right)\Rightarrow$$

$$\Rightarrow A=5x^4-x^3+2x^2+35x^3-7x^2+14x+10x^2-2x+4\Rightarrow$$

$$\Rightarrow A=5x^4+34x^3+5x^2+12x+4$$

$$B = \left(5 + 2x - x^2\right)\left(19x^2 + 4x - 4\right) \Rightarrow$$

$$B = 95x^2 + 20x - 20 + 38x^3 + 8x^2 - 8x - 19x^4 - 4x^3 + 4x^2 \Rightarrow$$

$$\Rightarrow B = -19x^4 + 34x^3 + 107x^2 + 12x - 20$$

Luego:

$$A = B \Rightarrow 5x^4 + 34x^3 + 5x^2 + 12x + 4 = -19x^4 + 34x^3 + 107x^2 + 12x - 20 \Rightarrow$$

$$\Rightarrow 24x^4 - 102x^2 + 24 = 0 \Rightarrow x^2 = \frac{102 \pm \sqrt{(102)^2 - 4(24)(24)}}{48} = \frac{102 \pm \sqrt{8100}}{48} \Rightarrow$$

$$\Rightarrow \frac{102 \pm 90}{48} \Rightarrow x_{1,2} = \pm\sqrt{\frac{102+90}{48}} = \pm\sqrt{4} = \pm 2; x_{3,4} = \pm\sqrt{\frac{102-90}{48}} = \pm\sqrt{\frac{12}{48}} = \pm\sqrt{\frac{1}{4}} = \pm\frac{1}{\sqrt{2}} = \pm\frac{\sqrt{2}}{2}$$

48.- $\left(x^2 - 1\right)^2 = 40 - \left(x^2 - 5\right)^2$

Solución:

$$\left(x^2 - 1\right)^2 = 40 - \left(x^2 - 5\right)^2 \Rightarrow x^4 - 2x^2 + 1 = 40 - \left(x^4 - 10x^2 + 25\right) \Rightarrow$$

$$\Rightarrow x^4 - 2x^2 + 1 = 15 - x^4 + 10x^2 \Rightarrow 2x^4 - 12x^2 - 14 = 0 \Rightarrow x^2 = \frac{12 \pm \sqrt{(12)^2 + 4(2)(14)}}{4} \Rightarrow$$

$$\Rightarrow x^2 = \frac{12 \pm \sqrt{144 + 112}}{4} = \frac{12 \pm \sqrt{256}}{4} = \frac{12 \pm 16}{4} \Rightarrow$$

$$\Rightarrow x_{1,2} = \pm\sqrt{\frac{28}{4}} = \pm 7; x_{3,4} = \pm\sqrt{\frac{-4}{4}} \left(NO - REAL\right)$$

49.- $\left(x^2 + x + 1\right)^2 = \left(2x + 1\right)\left(x^2 + 1\right)$

Solución:

$$\left(x^2 + x + 1\right)^2 = \left(2x + 1\right)\left(x^2 + 1\right) \Rightarrow \left(x^2 + x + 1\right)\left(x^2 + x + 1\right) = 2x^3 + 2x + x^2 + 1 \Rightarrow$$

$$\Rightarrow x^4 + x^3 + x^2 + x^3 + x^2 + x + x^2 + x + 1 = 2x^3 + x^2 + 2x + 1 \Rightarrow$$

$$\Rightarrow x^4 + 2x^2 = 0 \Rightarrow\Rightarrow x^2\left(x^2 + 2\right) = 0 \Rightarrow x_1 = x_2 = 0$$

50.- $\left(x - 3\right)\left(x + 4\right)\left(x - 5\right)\left(x + 6\right) = 2x\left(x^2 - 21\right) + 180$

Solución:

$$(x-3)(x+4)(x-5)(x+6) = 2x(x^2-21) + 180 \Rightarrow$$

$$A = (x-3)(x+4)(x-5)(x+6) = (x^2+x-12)(x^2+x-30) \Rightarrow$$

$$\Rightarrow A = x^4 + x^3 - 30x^2 + x^3 + x^2 - 30x - 12x^2 - 12x + 360;$$

$$B = 2x^3 - 42x + 180 \Rightarrow$$

$$\Rightarrow A = B \Rightarrow x^4 - 41x^2 + 180 = 0 \Rightarrow x^2 = \frac{41 \pm \sqrt{(41)^2 - 4(180)}}{2} = \frac{41 \pm \sqrt{1681 - 720}}{2} = \frac{41 \pm \sqrt{961}}{2} \Rightarrow$$

$$\Rightarrow x^2 = \frac{41 \pm 31}{2} \Rightarrow x_1 = \pm\sqrt{\frac{10}{2}} = \pm\sqrt{5}; x_2 = \pm\sqrt{\frac{72}{2}} = \pm\sqrt{36} = \pm 6$$

EJERCICIO #50. Ecuaciones trinómicas.

1.- $x^6 + 7x^3 - 8 = 0$

Solución:

$$x^6 + 7x^3 - 8 = 0 \Rightarrow x^3 = \frac{-7 \pm \sqrt{(7)^2 + 4(8)}}{2} = \frac{-7 \pm \sqrt{81}}{2} = \frac{-7 \pm 9}{2} \Rightarrow$$

$$\Rightarrow x_{1,2,3} = \sqrt[3]{\frac{2}{2}} = 1; x_{4,5,6} = \sqrt[3]{\frac{-16}{2}} = \sqrt[3]{-8} = -2$$

2.- $x^6 + 19x^3 - 216 = 0$

Solución:

$$x^6 + 19x^3 - 216 = 0 \Rightarrow x^3 = \frac{-19 \pm \sqrt{(19)^2 + 4(216)}}{2} = \frac{-19 \pm \sqrt{361 + 864}}{2} = \frac{-19 \pm \sqrt{1225}}{2} = \frac{-19 \pm 35}{2} \Rightarrow$$

$$\Rightarrow x_{1,2,3} = \sqrt[3]{\frac{16}{2}} = 2; x_{4,5,6} = \sqrt[3]{-\frac{54}{2}} = \sqrt[3]{-27} = -3$$

3.- $x^6 + 26x^3 - 27 = 0$
Solución:

$$x^6 + 26x^3 - 27 = 0 \Rightarrow x^3 = \frac{-26 \pm \sqrt{(26)^2 + 4(27)}}{2} = \frac{-26 \pm \sqrt{676 + 108}}{2} = \frac{-26 \pm \sqrt{784}}{2} = \frac{-26 \pm 28}{2} \Rightarrow$$

$$\Rightarrow x_{1,2,3} = \sqrt[3]{\frac{2}{2}} = 1; x_{4,5,6} = \sqrt[3]{-\frac{54}{2}} = \sqrt[3]{-27} = -3$$

4.- $x^6 - 15x^3 - 16 = 0$

Solución:

$$x^6 - 15x^3 - 16 = 0 \Rightarrow x^3 = \frac{15 \pm \sqrt{(15)^2 + 4(16)}}{2} = \frac{15 \pm \sqrt{225 + 64}}{2} = \frac{15 \pm 17}{2} \Rightarrow$$

$$\Rightarrow x_{1,2,3} = \sqrt[3]{\frac{32}{2}} = \sqrt[3]{16} = 2\sqrt[3]{2}; x_{4,5,6} = \sqrt[3]{-\frac{2}{2}} = -1$$

5.- $x^8 - 17x^4 + 16 = 0$

Solución:

$$x^8 - 17x^4 + 16 = 0 \Rightarrow x^4 = \frac{17 \pm \sqrt{(17)^2 - 4(16)}}{2} = \frac{17 \pm \sqrt{289 - 64}}{2} = \frac{17 \pm 15}{2} \Rightarrow$$

$$\Rightarrow x_{1,2,3,4} = \pm\sqrt[4]{\frac{2}{2}} = \pm 1; x_{5,6,7,8} = \pm\sqrt[4]{\frac{32}{2}} = \sqrt[4]{16} = 2$$

6.- $x^8 + x^4 - 2 = 0$

Solución:

$$x^8 + x^4 - 2 = 0 \Rightarrow x^4 = \frac{-1 \pm \sqrt{1 + 4(2)}}{2} = \frac{-1 \pm 3}{2} \Rightarrow$$

$$\Rightarrow x_{1,2,3,4} = \pm\sqrt[4]{\frac{2}{2}} = \pm 1;$$

$$x_{5,6,7,8} = \pm\sqrt[4]{-\frac{4}{2}} \left(NO - REAL\right)$$

7.- $x^{10} - 31x^5 - 32 = 0$

Solución:

$$x^{10} - 31x^5 - 32 = 0 \Rightarrow x^5 = \frac{31 \pm \sqrt{(31)^2 + 4(32)}}{2} = \frac{31 \pm \sqrt{961 + 128}}{2} = \frac{31 \pm \sqrt{1089}}{2} = \frac{31 \pm 33}{2} \Rightarrow$$

$$\Rightarrow x_{1,2,3,4,5} = \sqrt[5]{\frac{64}{2}} = \sqrt[5]{32} = 2; x_{6,7,8,9,10} = \sqrt[5]{-\frac{2}{2}} = -1$$

8.- $x^{10} + 24x^5 - 256 = 0$

Solución:

$$x^{10} + 24x^5 - 256 = 0 \Rightarrow x^5 =$$

$$= \frac{-24 \pm \sqrt{(24)^2 + 4(256)}}{2} = \frac{-24 \pm \sqrt{576 + 1024}}{2} = \frac{-24 \pm \sqrt{1600}}{2} = \frac{-24 \pm 40}{2} \Rightarrow$$

$$\Rightarrow x_{1,2,3,4,5} = \sqrt[5]{\frac{-64}{2}} = -2; x_{6,7,8,9,10} = \sqrt[5]{\frac{16}{2}} = \sqrt[5]{8}$$

9.- $x^{14} - 2x^7 - 3 = 0$

Solución:

$$x^{14} - 2x^7 - 3 = 0 \Rightarrow x^7 = \frac{2 \pm \sqrt{(2)^2 + 4(3)}}{2} = \frac{2 \pm 4}{3} \Rightarrow$$

$$\Rightarrow x_{1,2,3,4,5,6,7} = \sqrt[7]{2}; x_{8,9,10,11,12,13,14} = \sqrt[7]{-\frac{2}{3}}$$

10.- $x^8 + 4x^4 - 12 = 0$

Solución:

$$x^8 + 4x^4 - 12 = 0 \Rightarrow x^4 = \frac{-4 \pm \sqrt{(4)^2 + 4(12)}}{2} = \frac{-4 \pm 8}{2} \Rightarrow$$

$$\Rightarrow x_{1,2,3,4} = \pm\sqrt[4]{\frac{4}{2}} = \pm\sqrt[4]{2};$$

$$x_{5,6,7,8} = \pm\sqrt[4]{-\frac{12}{2}} \left(NO - REAL\right)$$

11.- $x^{22} - 2x^{11} + 1 = 0$

Solución:

$$x^{22} - 2x^{11} + 1 = 0 \Rightarrow x^{11} = \frac{2 \pm \sqrt{(2)^2 - 4}}{2} = 1 \Rightarrow x = \sqrt[11]{1} = 1$$

12.- $x^8 - 6x^4 + 8 = 0$

Solución:

$$x^8 - 6x^4 + 8 = 0 \Rightarrow x^4 = \frac{6 \pm \sqrt{(6)^2 - 4(8)}}{2} = \frac{6 \pm 2}{2} = 3 \pm 1 \Rightarrow$$

$$x_{1,2,3,4} = \pm\sqrt[4]{4} = \pm\sqrt{2}; x_{5,6,7,8} = \pm\sqrt{\frac{4}{2}} = \pm\sqrt[4]{2}$$

13.- $x^6 + 5x^3 - 1 = 0$

Solución:

$$x^6 + 5x^3 - 1 = 0 \Rightarrow x^3 = \frac{-5 \pm \sqrt{(5)^2 + 4}}{2} = \frac{-5 \pm \sqrt{29}}{2} \Rightarrow$$

$$\Rightarrow x_{1,2,3} = \sqrt[3]{\frac{-5 + \sqrt{29}}{2}}; x_{4,5,6} = \sqrt[3]{\frac{-5 - \sqrt{29}}{2}}$$

14.- $2x^6 - 3x^3 - 7 = 0$

Solución:

$$2x^6 - 3x^3 - 7 = 0 \Rightarrow x^3 = \frac{3 \pm \sqrt{(3)^2 + 4(2)(7)}}{4} = \frac{3 \pm \sqrt{65}}{4} \Rightarrow$$

$$\Rightarrow x_{1,2,3} = \sqrt[3]{\frac{3 + \sqrt{65}}{4}}; x_{4,5,6} = \sqrt[3]{\frac{3 - \sqrt{65}}{4}}$$

15.- $x^8 - 2x^4 - 5 = 0$

Solución:

$$x^8 - 2x^4 - 5 = 0 \Rightarrow x^4 = \frac{2 \pm \sqrt{(2)^2 + 4(5)}}{2} = \frac{2 \pm 2\sqrt{6}}{2} = 1 \pm \sqrt{6} \Rightarrow$$

$$\Rightarrow x_{1,2,3,4} = \pm\sqrt[4]{1 + \sqrt{6}};$$
$$x_{5,6,7,8} = \pm\sqrt{1 - \sqrt{6}} \left(NO - REAL \right)$$

16.- $2x^8 - 3x^4 - 7 = 0$

Solución:

$$2x^8 - 3x^4 - 7 = 0 \Rightarrow x^4 = \frac{3 \pm \sqrt{(3)^2 + 4(2)(7)}}{4} = \frac{3 \pm \sqrt{65}}{4} \Rightarrow$$

$$\Rightarrow x_{1,2,3,4} = \pm\sqrt[4]{\frac{3 + \sqrt{65}}{4}};$$
$$x_{5,6,7,8} = \pm\sqrt[4]{\frac{3 - \sqrt{65}}{4}} \left(NO - REAL \right)$$

17.- $x^8 - 7x^4 + 2 = 0$

Solución:

$$x^8 - 7x^4 + 2 = 0 \Rightarrow x^4 = \frac{7 \pm \sqrt{(7)^2 - 4(2)}}{2} = \frac{7 \pm \sqrt{41}}{2} \Rightarrow$$

$$\Rightarrow x_{1,2,3,4} = \pm\sqrt[4]{\frac{7 + \sqrt{41}}{2}} \; ; \; x_{5.6.7.8} = \pm\sqrt[4]{\frac{7 - \sqrt{41}}{4}}$$

18.- $3x^8 - 8x^4 + 4 = 0$

Solución:

$$3x^8 - 8x^4 + 4 = 0 \Rightarrow x^4 = \frac{8 \pm \sqrt{(8)^2 - 4(3)(4)}}{6} = \frac{8 \pm 4}{6} = \frac{4 \pm 2}{3} \Rightarrow$$

$$\Rightarrow x_{1,2,3,4} = \pm\sqrt[4]{\frac{6}{3}} = \pm\sqrt[4]{2} \; ; \; x_{5,6,7,8} = \pm\sqrt[4]{\frac{2}{3}}$$

19.- $3x^8 - 8x^4 + 5 = 0$

Solución:

$$3x^8 - 8x^4 + 5 = 0 \Rightarrow x^4 = \frac{8 \pm \sqrt{(8)^2 - 4(3)(5)}}{6} = \frac{8 \pm 2}{6} = \frac{4 \pm 1}{3} \Rightarrow$$

$$\Rightarrow x_{1,2,3,4} = \pm\sqrt[4]{\frac{5}{3}} \; ; \; x_{5,6,7,8} = \pm\sqrt[4]{\frac{3}{3}} = \pm 1$$

20.- $9x^8 - 37x^4 + 36 = 0$

Solución:

$$9x^8 - 37x^4 + 36 = 0 \Rightarrow x^4 = \frac{37 \pm \sqrt{(37)^2 - 4(9)(36)}}{18} = \frac{37 \pm \sqrt{1369 - 1296}}{18} = \frac{37 \pm \sqrt{73}}{18} \Rightarrow$$

$$\Rightarrow x_{1,2,3,4} = \pm\sqrt[4]{\frac{37 + \sqrt{73}}{18}} \; ; \; x_{5,6,7,8} = \pm\sqrt[4]{\frac{37 - \sqrt{73}}{18}}$$

GUIA DE TRABAJO
Materia: Matemáticas Guía #98.
Tema: Resolución de ecuaciones de segundo grado por factorización.
(Hoffmann 3r año, ejercicios #40, # 41 y #42) _____
Profesor: Fernando Viso
Nombre del

alumno:_____

Sección del

alumno:_____

CONDICIONES:

- **Trabajo individual.**
- **Sin libros, ni cuadernos, ni notas.**
- **Sin celulares.**
- **Es obligatorio mostrar explícitamente, el procedimiento empleado para resolver cada problema.**
- **No se contestarán preguntas ni consultas de ningún tipo.**
- **No pueden moverse de su asiento. ni pedir borras, ni lápices, ni calculadoras prestadas.**

Marco Teórico:

Una ecuación tiene tantas raíces como el grado de la misma, o sea, como el exponente mayor de la ecuación. Ejemplo, una ecuación de cuarto grado tiene cuatro raíces.

PREGUNTAS:

EJERCICIO #40.

Resolver las siguientes ecuaciones:

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

Solución:

$$x^2 + 3x = 0 \Rightarrow x(x+3) = 0 \Rightarrow x_1 = 0; x_2 = -3$$

2.- $x^2 - 8x = 0$

Solución:
$$x^2 - 8x = 0 \Rightarrow x(x-8) = 0 \Rightarrow x_1 = 0; x_2 = 8$$

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

Solución:

$x^2 + 4x = 0 \Rightarrow x(x+4) = 0 \Rightarrow x_1 = 0; x_2 = -4$

4.- $x^2 - 11x = 0$

Solución:

$x^2 - 11x = 0 \Rightarrow x(x-11) = 0 \Rightarrow x_1 = 0; x_2 = 11$

5.- $2x^2 + 7x = 0$

Solución:

$2x^2 + 7x = 0 \Rightarrow x(2x+7) = 0 \Rightarrow x_1 = 0; x_2 = -\dfrac{7}{2}$

6.- $5x^2 - 3x = 0$

Solución:

$5x^2 - 3x = 0 \Rightarrow x(5x-3) = 0 \Rightarrow x_1 = 0; x_2 = \dfrac{3}{5}$

7.- $6x^2 + 11x = 0$

Solución:

$6x^2 + 11x = 0 \Rightarrow x(6x+11) = 0 \Rightarrow x_1 = 0; x_2 = -\dfrac{11}{6}$

8.- $3x^2 + \sqrt{3}x = 0$

Solución:

$3x^2 + \sqrt{3}x = 0 \Rightarrow x\left(3x + \sqrt{3}\right) = 0 \Rightarrow x_1 = 0; x_2 = -\dfrac{\sqrt{3}}{3}$

9.- $\sqrt{3}x^2 - 3x = 0$

Solución:

$\sqrt{3}x^2 - 3x = 0 \Rightarrow x\left(\sqrt{3}x - 3\right) = 0 \Rightarrow x_1 = 0; x_2 = \dfrac{3}{\sqrt{3}} = \dfrac{3\sqrt{3}}{3} = \sqrt{3}$

10.- $5x^2 - 2\sqrt{2}x = 0$

Solución:

$$5x^2 - 2\sqrt{2}x = 0 \Rightarrow x\left(5x - 2\sqrt{2}\right) = 0 \Rightarrow x_1 = 0; x_2 = \frac{2\sqrt{2}}{5}$$

11.- $10x^2 + 9x = 0$

Solución:

$$10x^2 + 9x = 0 \Rightarrow x\left(10x + 9\right) = 0 \Rightarrow x_1 = 0; x_2 = -\frac{9}{10}$$

12.- $mx^2 + mx = 0$

Solución:

$$mx^2 + mx = 0 \Rightarrow x\left(mx + m\right) = 0 \Rightarrow x_1 = 0; x_2 = -\frac{m}{m} = -1$$

13.- $4ax^2 - 5bx = 0$

Solución:

$$4ax^2 - 5bx = 0 \Rightarrow x\left(4ax - 5b\right) = 0 \Rightarrow x_1 = 0; x_2 = \frac{5b}{4a}$$

14.- $25x^2 - 9 = 0$

Solución:

$$25x^2 - 9 = 0 \Rightarrow \left(5x + 3\right)\left(5x - 3\right) = 0 \Rightarrow x_1 = -\frac{3}{5}; x_2 = \frac{3}{5}$$

15.- $\sqrt{3}x^2 + \sqrt{2}x = 0$

Solución:

$$\sqrt{3}x^2 + \sqrt{2}x = 0 \Rightarrow x\left(\sqrt{3}x - \sqrt{2}\right) = 0 \Rightarrow x_1 = 0; x_2 = \frac{\sqrt{2}}{\sqrt{3}} = \frac{\sqrt{6}}{3}$$

16.- $5\sqrt{2}x^2 - \sqrt{7}x = 0$

Solución:

$$5\sqrt{2}x^2 - \sqrt{7}x = 0 \Rightarrow x\left(\sqrt{2}x - \sqrt{7}\right) = 0 \Rightarrow x_1 = 0; x_2 = \frac{\sqrt{7}}{\sqrt{2}} = \frac{\sqrt{14}}{2}$$

17.- $\sqrt{a}x^2 - ax = 0$

Solución:

$$\sqrt{a}x^2 - ax = 0 \Rightarrow x\left(\sqrt{a}x - a\right) = 0 \Rightarrow x_1 = 0; x_2 = \frac{a}{\sqrt{a}} = \sqrt{a}$$

18.- $x^2 + x = 0$

Solución:

$$x^2 + x = 0 \Rightarrow x(x+1) = 0 \Rightarrow x_1 = 0; x_2 = -1$$

19.- $(a+b)x^2 - (a-b)x = 0$

Solución:

$$(a+b)x^2 - (a-b)x = 0 \Rightarrow x\left[(a+b)x - (a-b)\right] = 0 \Rightarrow x_1 = 0; x_2 = \frac{a-b}{a+b}$$

20.- $(a+3)x^2 + (a-3)x = 0$

Solución:

$$(a+3)x^2 + (a-3)x = 0 \Rightarrow x\left[(a+3)x + (a-3)\right] = 0 \Rightarrow x_1 = 0; x_2 = -\frac{a-3}{a+3}$$

EJERCICIO # 41.

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

Solución:

$$x^2 - 3x + 2 = 0 \Rightarrow (x-1)(x-2) = 0 \Rightarrow x_1 = 1; x_2 = 2$$

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

Solución:

$$x^2 - 4x + 3 = 0 \Rightarrow (x-1)(x-3) = 0 \Rightarrow x_1 = 1; x_2 = 3$$

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

Solución:

$$x^2 - x - 2 = 0 \Rightarrow (x+1)(x-2) = 0 \Rightarrow x_1 = -1; x_2 = 2$$

4.- $x^2 - x - 6 = 0$

Solución:

$x^2 - x - 6 = 0 \Rightarrow (x+2)(x-3) = 0 \Rightarrow x_1 = -2; x_2 = 3$

5.- $x^2 + 3x - 10 = 0$

Solución:

$x^2 + 3x - 10 = 0 \Rightarrow (x+5)(x-2) = 0 \Rightarrow x_1 = -5; x_2 = 2$

6.- $m^2 + 2m - 8 = 0$

Solución:

$m^2 + 2m - 8 = 0 \Rightarrow (m+4)(m-2) = 0 \Rightarrow m_1 = -4; m_2 = 2$

7.- $x^2 + 7x + 10 = 0$

Solución:

$x^2 + 7x + 10 = 0 \Rightarrow (x+2)(x+5) = 0 \Rightarrow x_1 = -2; x_2 = -5$

8.- $a^2 + 8a + 15 = 0$

Solución:

$a^2 + 8a + 15 = 0 \Rightarrow (a+3)(a+5) = 0 \Rightarrow a_1 = -3; a_2 = -5$

9.- $x^2 - 2x + 1 = 0$
Solución:

$x^2 - 2x + 1 = 0 \Rightarrow (x-1)^2 \Rightarrow x_1 = x_2 = 1$

10.- $x^2 - 9x + 14 = 0$

Solución:

$x^2 - 9x + 14 = 0 \Rightarrow (x-2)(x-7) = 0 \Rightarrow x_1 = 2; x_2 = 7$

11.- $x^2 - x - 20 = 0$

Solución:

$x^2 - x - 20 = 0 \Rightarrow (x-5)(x+4) = 0 \Rightarrow x_1 = 5; x_2 = -4$

12.- $x^2 - 9x + 20 = 0$

Solución:

$x^2 - 9x + 20 = 0 \Rightarrow (x - 4)(x - 5) = 0 \Rightarrow x_1 = 4; x_2 = 5$

13.- $x^2 + 12x + 20 = 0$

Solución:

$x^2 + 12x + 20 = 0 \Rightarrow (x + 2)(x + 10) = 0 \Rightarrow x_1 = -2; x_2 = -10$

14.- $x^2 + 8x - 20 = 0$

Solución:

$x^2 + 8x - 20 = 0 \Rightarrow (x - 2)(x + 10) = 0 \Rightarrow x_1 = 2; x_2 = -10$

15.- $x^2 - 21x + 20 = 0$

Solución:

$x^2 - 21x + 20 = 0 \Rightarrow (x - 1)(x - 20) = 0 \Rightarrow x_1 = 1; x_2 = 20$

16.- $a^2 + 12a + 36 = 0$

Solución:

$a^2 + 12a + 36 = 0 \Rightarrow (a + 6)^2 \Rightarrow a_1 = a_2 = -6$

17.- $x^2 + 7x + 12 = 0$

Solución:
$x^2 + 7x + 12 = 0 \Rightarrow (x + 3)(x + 4) = 0 \Rightarrow x_1 = -3; x_2 = -4$

18.- $x^2 + 8x + 12 = 0$

Solución:

$x^2 + 8x + 12 = 0 \Rightarrow (x + 6)(x + 2) = 0 \Rightarrow x_1 = -6; x_2 = -2$

19.- $x^2 - 11x - 12 = 0$

Solución:

$$x^2 - 11x - 12 = 0 \Rightarrow (x+1)(x-12) = 0 \Rightarrow x_1 = -1; x_2 = 12$$

20.- $x^2 - 4x - 12 = 0$

Solución:

$$x^2 - 4x - 12 = 0 \Rightarrow (x+2)(x-6) = 0 \Rightarrow x_1 = -2; x_2 = 6$$

21.- $x^2 + 13x + 12 = 0$

Solución:

$$x^2 + 13x + 12 = 0 \Rightarrow (x+12)(x+1) = 0 \Rightarrow x_1 = -12; x_2 = -1$$

22.- $a^2 - 10a + 25 = 0$

Solución:

$$a^2 - 10a + 25 = 0 \Rightarrow (a-5)^2 \Rightarrow a_1 = a_2 = 5$$

23.- $x^2 - 8x + 15 = 0$

Solución:
$$x^2 - 8x + 15 = 0 \Rightarrow (x-3)(x-5) = 0 \Rightarrow x_1 = 3; x_2 = 5$$

24.- $x^2 - 2x - 35 = 0$

Solución:

$$x^2 - 2x - 35 = 0 \Rightarrow (x+5)(x-7) = 0 \Rightarrow x_1 = -5; x_2 = 7$$

25.- $x^2 + 11x + 30 = 0$

Solución:

$$x^2 + 11x + 30 = 0 \Rightarrow (x+6)(x+5) = 0 \Rightarrow x_1 = -6; x_2 = -5$$

26.- $x^2 - 10x + 21 = 0$

Solución:

$$x^2 - 10x + 21 = 0 \Rightarrow (x-3)(x-7) = 0 \Rightarrow x_1 = 3; x_2 = 7$$

27.- $x^2 + 14x + 49 = 0$

Solución:

$$x^2 + 14x + 49 = 0 \Rightarrow (x+7)^2 = 0 \Rightarrow x_1 = x_2 = -7$$

28.- $x^2 - 3x - 28 = 0$

Solución:

$$x^2 - 3x - 28 = 0 \Rightarrow (x+4)(x-7) = 0 \Rightarrow x_1 = -4; x_2 = 7$$

29.- $x^2 - 16x + 28 = 0$

Solución:

$$x^2 - 16x + 28 = 0 \Rightarrow (x-14)(x-2) = 0 \Rightarrow x_1 = 14; x_2 = 2$$

30.- $m^2 + 9m - 10 = 0$

Solución:

$$m^2 + 9m - 10 = 0 \Rightarrow (m+10)(m-1) = 0 \Rightarrow m_1 = -10; m_2 = 1$$

31.- $x^2 - 5x - 36 = 0$

Solución:

$$x^2 - 5x - 36 = 0 \Rightarrow (x+4)(x-9) = 0 \Rightarrow x_1 = -4; x_2 = 9$$

32.- $a^2 + 10a + 16 = 0$

Solución:

$$a^2 + 10a + 16 = 0 \Rightarrow (a+8)(a+2) = 0 \Rightarrow a_1 = -8; a_2 = -2$$

33.- $x^2 + 8x + 16 = 0$

Solución:

$$x^2 + 8x + 16 = 0 \Rightarrow (x+4)^2 = 0 \Rightarrow x_1 = x_2 = -4$$

34.- $x^2 - 10x + 24 = 0$

Solución:

$$x^2 - 10x + 24 = 0 \Rightarrow (x-4)(x-6) = 0 \Rightarrow x_1 = 4; x_2 = 6$$

35.- $x^2 + 11x + 24 = 0$

Solución:

$x^2 + 11x + 24 = 0 \Rightarrow (x+8)(x+3) = 0 \Rightarrow x_1 = -8; x_2 = -3$

36.- $x^2 - 10x - 24 = 0$

Solución:

$x^2 - 10x - 24 = 0 \Rightarrow (x-12)(x+2) = 0 \Rightarrow x_1 = 12; x_2 = -2$

37.- $x^2 - 23x - 24 = 0$

Solución:

$x^2 - 23x - 24 = 0 \Rightarrow (x-24)(x+1) = 0 \Rightarrow x_1 = 24; x_2 = -1$

38.- $x^2 + 2x - 24 = 0$

Solución:

$x^2 + 2x - 24 = 0 \Rightarrow (x+6)(x-4) = 0 \Rightarrow x_1 = -6; x_2 = 4$

39.- $x^2 + 25x + 24 = 0$

Solución:

$x^2 + 25x + 24 = 0 \Rightarrow (x+24)(x+1) = 0 \Rightarrow x_1 = -24; x_2 = -1$

40.- $x^2 - 5x - 24 = 0$

Solución:

$x^2 - 5x - 24 = 0 \Rightarrow (x+3)(x-8) = 0 \Rightarrow x_1 = -3; x_2 = 8$

41.- $a^2 - 18a + 81 = 0$

Solución:

$a^2 - 18a + 81 = 0 \Rightarrow (a-9)^2 = 0 \Rightarrow a_1 = a_2 = 9$

42.- $m^2 + 6m - 40 = 0$

Solución:

$$m^2 + 6m - 40 = 0 \Rightarrow (m+10)(m-4) = 0 \Rightarrow m_1 = -10; m_2 = 4$$

43.- $a^2 + 13a + 40 = 0$

Solución:

$$a^2 + 13a + 40 = 0 \Rightarrow (a+8)(a+5) = 0 \Rightarrow m_1 = -8; m_2 = -5$$

44.- $x^2 + 16x + 64 = 0$

Solución:

$$x^2 + 16x + 64 = 0 \Rightarrow (x+8)^2 = 0 \Rightarrow x_1 = x_2 = -8$$

45.- $x^2 - 13x + 22 = 0$

Solución:

$$x^2 - 13x + 22 = 0 \Rightarrow (x-11)(x-2) = 0 \Rightarrow x_1 = 11; x_2 = 2$$

46.- $a^2 + 12a + 27 = 0$

Solución:

$$a^2 + 12a + 27 = 0 \Rightarrow (a+9)(a+3) = 0 \Rightarrow a_1 = -9; a_2 = -3$$

47.- $x^2 + 10x - 56 = 0$

Solución:

$$x^2 + 10x - 56 = 0 \Rightarrow (x+14)(x-4) = 0 \Rightarrow x_1 = -14; x_2 = 4$$

48.- $x^2 - x - 56 = 0$

Solución:

$$x^2 - x - 56 = 0 \Rightarrow (x-8)(x+7) = 0 \Rightarrow x_1 = 8; x_2 = -7$$

49.- $x^2 + x - 42 = 0$

Solución:

$$x^2 + x - 42 = 0 \Rightarrow (x+7)(x-6) = 0 \Rightarrow x_1 = -7; x_2 = 6$$

50.- $x^2 - 34x + 64 = 0$

Solución:

$$x^2 - 34x + 64 = 0 \Rightarrow (x - 32)(x - 2) = 0 \Rightarrow x_1 = 32; x_2 = 2$$

51.- $x^2 - 14x + 48 = 0$

Solución:

$$x^2 - 14x + 48 = 0 \Rightarrow (x - 8)(x - 6) = 0 \Rightarrow x_1 = 8; x_2 = 6$$

52.- $x^2 + 22x - 48 = 0$

Solución:

$$x^2 + 22x - 48 = 0 \Rightarrow (x + 24)(x - 2) = 0 \Rightarrow x_1 = -24; x_2 = 2$$

53.- $x^2 + 16x + 48 = 0$

Solución:

$$x^2 + 16x + 48 = 0 \Rightarrow (x + 12)(x + 4) = 0 \Rightarrow x_1 = -12; x_2 = -4$$

54.- $x^2 - 47x - 48 = 0$

Solución:

$$x^2 - 47x - 48 = 0 \Rightarrow (x - 48)(x + 1) = 0 \Rightarrow x_1 = 48; x_2 = -1$$

55.- $x^2 + 19x + 48 = 0$

Solución:

$$x^2 + 19x + 48 = 0 \Rightarrow (x + 16)(x + 3) = 0 \Rightarrow x_1 = -16; x_2 = -3$$

56.- $x^2 - 2x - 48 = 0$

Solución:

$$x^2 - 2x - 48 = 0 \Rightarrow (x - 8)(x + 6) = 0 \Rightarrow x_1 = 8; x_2 = -6$$

57.- $x^2 - 8x - 48 = 0$

Solución:

$$x^2 - 8x - 48 = 0 \Rightarrow (x-12)(x+4) = 0 \Rightarrow x_1 = 12; x_2 = -4$$

58.- $x^2 + 49x + 48 = 0$

Solución:

$$x^2 + 49x + 48 = 0 \Rightarrow (x+48)(x+1) = 0 \Rightarrow x_1 = -48; x_2 = -1$$

59.- $x^2 - 13x - 48 = 0$

Solución:

$$x^2 - 13x - 48 = 0 \Rightarrow (x-16)(x+3) = 0 \Rightarrow x_1 = 16; x_2 = -3$$

60.- $x^2 + 26x + 48 = 0$

Solución:

$$x^2 + 26x + 48 = 0 \Rightarrow (x+24)(x+2) = 0 \Rightarrow x_1 = -24; x_2 = -2$$

61.- $a^2 - 20a + 36 = 0$

Solución:

$$a^2 - 20a + 36 = 0 \Rightarrow (a-18)(a-2) = 0 \Rightarrow a_1 = 18; a_2 = 2$$

62.- $x^2 + 2x - 99 = 0$

Solución:

$$x^2 + 2x - 99 = 0 \Rightarrow (x+11)(x-9) = 0 \Rightarrow x_1 = -11; x_2 = 9$$

63.- $x^2 - 11x - 26 = 0$

Solución:
$$x^2 - 11x - 26 = 0 \Rightarrow (x-13)(x+2) = 0 \Rightarrow x_1 = 13; x_2 = -2$$

64.- $x^2 + 17x + 60 = 0$

Solución:

$$x^2 + 17x + 60 = 0 \Rightarrow (x+12)(x+5) = 0 \Rightarrow x_1 = -12; x_2 = -5$$

65.- $x^2 - 20x + 100 = 0$

Solución:

$$x^2 - 20x + 100 = 0 \Rightarrow (x - 10)^2 = 0 \Rightarrow x_1 = x_2 = 10$$

66.- $a^2 - 23a + 132 = 0$

Solución:

$$a^2 - 23a + 132 = 0 \Rightarrow (a - 11)(a - 12) = 0 \Rightarrow a_1 = 11; a_2 = 12$$

67.- $x^2 + 5x - 84 = 0$

Solución:

$$x^2 + 5x - 84 = 0 \Rightarrow (x + 12)(x - 7) = 0 \Rightarrow x_1 = -12; x_2 = 7$$

68.- $m^2 + 4m - 60 = 0$

Solución:

$$m^2 + 4m - 60 = 0 \Rightarrow (m + 10)(m - 6) = 0 \Rightarrow m_1 = -10; m_2 = 6$$

69.- $x^2 - 2x - 168 = 0$

Solución:

$$x^2 - 2x - 168 = 0 \Rightarrow (x - 14)(x + 12) = 0 \Rightarrow x_1 = 14; x_2 = -12$$

70.- $x^2 + 21x + 90 = 0$

Solución:

$$x^2 + 21x + 90 = 0 \Rightarrow (x + 15)(x + 6) = 0 \Rightarrow x_1 = -15; x_2 = -6$$

EJERCICIO #42.

1.- $6x^2 - 13x + 6 = 0$

Solución:

$$6x^2 - 13x + 6 = 0 \Rightarrow \frac{6}{6}(6x^2 - 13x + 6) = 0 \Rightarrow \frac{(6x)^2 - 13(6x) + 36}{6} = 0 \Rightarrow$$

$$\Rightarrow \frac{(6x - 9)(6x - 4)}{6} = (2x - 3)(3x - 2) = 0 \Rightarrow x_1 = \frac{3}{2}; x_2 = \frac{2}{3}$$

2.- $6x^2 - 7x - 5 = 0$

Solución:

$$6x^2 - 7x - 5 = 0 \Rightarrow \frac{6}{6}\left(6x^2 - 7x - 5\right) = 0 \Rightarrow \frac{(6x)^2 - 7(6x) - 30}{6} = 0 \Rightarrow$$

$$\Rightarrow \frac{(6x - 10)(6x + 3)}{6} = (3x - 5)(2x + 1) = 0 \Rightarrow x_1 = \frac{5}{3}; x_2 = -\frac{1}{2}$$

3.- $10x^2 - 13x - 3 = 0$

Solución:

$$10x^2 - 13x - 3 = 0 \Rightarrow \frac{10}{10}\left(10x^2 - 13x - 3\right) = 0 \Rightarrow \frac{(10x)^2 - 13(10x) - 30}{10} = 0 \Rightarrow$$

$$\Rightarrow \frac{(10x - 15)(10x + 2)}{10} = (2x - 3)(5x + 1) = 0 \Rightarrow x_1 = \frac{3}{2}; x_2 = -\frac{1}{5}$$

4.- $4x^2 - 4x + 1 = 0$

Solución:

$$4x^2 - 4x + 1 = 0 \Rightarrow \frac{4}{4}\left(4x^2 - 4x + 1\right) = 0 \Rightarrow \frac{(4x)^2 - 4(4x) + 4}{4} \Rightarrow$$

$$\frac{(4x - 2)^2}{4} = \left(x - \frac{1}{2}\right)^2 = 0 \Rightarrow x_1 = x_2 = \frac{1}{2}$$

5.- $9x^2 + 6x + 1 = 0$

Solución:

$$9x^2 + 6x + 1 = 0 \Rightarrow \frac{9}{9}\left(9x^2 + 6x + 1\right) = 0 \Rightarrow \frac{(9x)^2 + 6(9x) + 9}{9} = 0 \Rightarrow$$

$$\Rightarrow \frac{(9x + 3)^2}{9} = (3x + 1)^2 \Rightarrow x_1 = x_2 = -\frac{1}{3}$$

6.- $3x^2 + 4x - 7 = 0$

Solución:

$$3x^2 + 4x - 7 = 0 \Rightarrow \frac{3}{3}\left(3x^2 + 4x - 7\right) = 0 \Rightarrow \frac{(3x)^2 + 4(3x) - 21}{3} = 0 \Rightarrow$$

$$\Rightarrow \frac{(3x + 7)(3x - 3)}{3} = (3x + 7)(x - 1) = 0 \Rightarrow x_1 = -\frac{7}{3}; x_2 = 1$$

7.- $10x^2 + 19x + 6 = 0$

Solución:

$$10x^2 + 19x + 6 = 0 \Rightarrow \frac{10}{10}\left(10x^2 + 19x + 6\right) = 0 \Rightarrow \frac{(10x)^2 + 19(10x) + 60}{10} = 0 \Rightarrow$$

$$\Rightarrow \frac{(10x + 4)(10x + 15)}{10} = (5x + 2)(2x + 3) = 0 \Rightarrow x_1 = -\frac{2}{5}; x_2 = -\frac{3}{2}$$

8.- $7x^2 + 13x - 2 = 0$

Solución:

$$7x^2 + 13x - 2 = 0 \Rightarrow \frac{7}{7}\left(7x^2 + 13x - 2\right) = 0 \Rightarrow \frac{(7x)^2 + 13(7x) - 14}{7} = 0 \Rightarrow$$

$$\Rightarrow \frac{(7x + 14)(7x - 1)}{7} = 0 \Rightarrow (x + 2)(7x - 1) = 0 \Rightarrow x_1 = -2; x_2 = \frac{1}{7}$$

9.- $15x^2 + 34x + 15 = 0$

Solución:

$$15x^2 + 34x + 15 = 0 \Rightarrow \frac{15}{15}\left(15x^2 + 34x + 15\right) = 0 \Rightarrow \frac{(15x)^2 + 34(15x) + 225}{15} = 0 \Rightarrow$$

$$\Rightarrow \frac{(15x + 25)(15x + 9)}{15} = (3x + 5)(5x + 3) = 0 \Rightarrow x_1 = -\frac{5}{3}; x_2 = -\frac{3}{5}$$

10.- $6m^2 - 29m - 5 = 0$

Solución:

$$6m^2 - 29m - 5 = 0 \Rightarrow \frac{6}{6}\left(6m^2 - 29m - 5\right) = 0 \Rightarrow \frac{(6m)^2 - 29(6m) - 30}{6} = 0 \Rightarrow$$

$$\Rightarrow \frac{(6m - 30)(6m + 1)}{6} = (m - 5)(6m + 1) = 0 \Rightarrow m_1 = 5; m_2 = -\frac{1}{6}$$

11.- $3m^2 - 11m + 10 = 0$

Solución:

$$3m^2 - 11m + 10 = 0 \Rightarrow \frac{3}{3}\left(3m^2 - 11m + 10\right) = 0 \Rightarrow \frac{(3m)^2 - 11(3m) + 30}{3} = 0 \Rightarrow$$

$$\Rightarrow \frac{(3m - 5)(3m - 6)}{3} = (3m - 5)(m - 2) = 0 \Rightarrow m_1 = \frac{5}{3}; m_2 = 2$$

12.- $16x^2 - 24x + 9 = 0$

Solución:

$$16x^2 - 24x + 9 = 0 \Rightarrow \frac{16}{16}\left(16x^2 - 24x + 9\right) = 0 \Rightarrow \frac{(16x)^2 - 24(16x) + 144}{16} = 0 \Rightarrow$$

$$\Rightarrow \frac{(16x - 12)^2}{16} = 0 \Rightarrow (4x - 3)^2 \Rightarrow x_1 = x_2 = \frac{3}{4}$$

13.- $8x^2 - 6x + 1 = 0$

Solución:

$$8x^2 - 6x + 1 = 0 \Rightarrow \frac{8}{8}\left(8x^2 - 6x + 1\right) = 0 \Rightarrow \frac{(8x)^2 - 6(8x) + 8}{8} = 0 \Rightarrow$$

$$\Rightarrow \frac{(8x - 2)(8x - 4)}{8} = (4x - 1)(2x - 1) = 0 \Rightarrow x_1 = \frac{1}{4}; x_2 = \frac{1}{2}$$

14.- $10x^2 + x - 2 = 0$

Solución:

$$10x^2 + x - 2 = 0 \Rightarrow \frac{10}{10}\left(10x^2 + x - 2\right) = 0 \Rightarrow \frac{(10x)^2 + (10x) - 20}{10} = 0 \Rightarrow$$

$$\Rightarrow \frac{(10x + 5)(10x - 4)}{10} = (2x + 1)(5x - 2) = 0 \Rightarrow x_1 = -\frac{1}{2}; x_2 = \frac{2}{5}$$

15.- $6a^2 + 11a + 5 = 0$

Solución:

$$6a^2 + 11a + 5 = 0 \Rightarrow \frac{6}{6}\left(6a^2 + 11a + 5\right) = 0 \Rightarrow \frac{(6a)^2 + 11(6a) + 30}{6} = 0 \Rightarrow$$

$$\Rightarrow \frac{(6a + 5)(6a + 6)}{6} = (6a + 5)(a + 1) = 0 \Rightarrow a_1 = -\frac{5}{6}; a_2 = -1$$

16.- $16x^2 + 8x + 1 = 0$

Solución:

$$16x^2 + 8x + 1 = 0 \Rightarrow \frac{16}{16}\left(16x^2 + 8x + 1\right) = 0 \Rightarrow \frac{(16x)^2 + 8(16x) + 16}{8} = 0 \Rightarrow$$

$$\Rightarrow \frac{(16x + 4)^2}{16} \Rightarrow (4x + 1)^2 = 0 \Rightarrow x_1 = x_2 = -\frac{1}{4}$$

17.- $3x^2 - x - 14 = 0$

Solución:

$$3x^2 - x - 14 = 0 \Rightarrow \frac{3}{3}\left(3x^2 - x - 14\right) = 0 \Rightarrow \frac{(3x)^2 - (3x) - 42}{3} = 0 \Rightarrow$$

$$\Rightarrow \frac{(3x - 7)(3x + 6)}{3} = (3x - 7)(x + 2) = 0 \Rightarrow x_1 = \frac{7}{3}; x_2 = -2$$

18.- $20a^2 + 9a + 1 = 0$

Solución:

$$20a^2 + 9a + 1 = 0 \Rightarrow \frac{20}{20}\left(20a^2 + 9a + 1\right) = 0 \Rightarrow \frac{(20a)^2 + 9(20a) + 20}{20} = 0 \Rightarrow$$

$$\Rightarrow \frac{(20a + 4)(20a + 5)}{20} = (5a + 1)(4a + 1) = 0 \Rightarrow a_1 = -\frac{1}{5}; a_2 = -\frac{1}{4}$$

19.- $20m^2 - 8m - 1 = 0$

Solución:

$$20m^2 - 8m - 1 = 0 \Rightarrow \frac{20}{20}\left(20m^2 - 8m - 1\right) = 0 \Rightarrow \frac{(20m)^2 - 8(20m) - 20}{20} = 0 \Rightarrow$$

$$\Rightarrow \frac{(20m - 10)(20m + 2)}{20} = (2m - 1)(10m + 1) = 0 \Rightarrow m_1 = \frac{1}{2}; m_2 = -\frac{1}{10}$$

20.- $18a^2 + 9a - 2 = 0$

Solución:

$$18a^2 + 9a - 2 = 0 \Rightarrow \frac{18}{18}\left(18a^2 + 9a - 2\right) = 0 \Rightarrow \frac{(18a)^2 + 9(18a) - 36}{18} = 0 \Rightarrow$$

$$\Rightarrow \frac{(18a + 12)(18a - 3)}{18} = (3a + 2)(6a - 1) = 0 \Rightarrow a_1 = -\frac{2}{3}; a_2 = \frac{1}{6}$$

21.- $10m^2 + 23m + 12 = 0$

Solución:

$$10m^2 + 23m + 12 = 0 \Rightarrow \frac{10}{10}\left(10m^2 + 23m + 12\right) = 0 \Rightarrow \frac{(10m)^2 + 23(10m) + 120}{10} = 0 \Rightarrow$$

$$\Rightarrow \frac{(10m + 15)(10m + 8)}{10} = (2m + 3)(5m + 4) = 0 \Rightarrow m_1 = -\frac{3}{2}; m_2 = -\frac{4}{5}$$

22.- $4x^2 + 20x + 25 = 0$

Solución:

$$4x^2 + 20x + 25 = 0 \Rightarrow \frac{4}{4}\left(4x^2 + 20x + 25\right) = 0 \Rightarrow \frac{(4x)^2 + 20(4x) + 100}{4} = 0 \Rightarrow$$

$$\Rightarrow \frac{(4x + 10)^2}{4} = (2x + 5)^2 = 0 \Rightarrow x_1 = x_2 = -\frac{5}{2}$$

23.- $14x^2 - 15x - 9 = 0$

Solución:

$$14x^2 - 15x - 9 = 0 \Rightarrow \frac{14}{14}\left(14x^2 - 15x - 9\right) = 0 \Rightarrow \frac{(14x)^2 - 15(14x) - 126}{14} = 0 \Rightarrow$$

$$\Rightarrow \frac{(14x - 21)(14x + 6)}{14} = (2x - 3)(7x + 3) = 0 \Rightarrow x_1 = \frac{3}{2}; x_2 = -\frac{3}{7}$$

24.- $9x^2 - 12x + 4 = 0$

Solución:

$$9x^2 - 12x + 4 = 0 \Rightarrow \frac{9}{9}\left(9x^2 - 12x + 4\right) = 0 \Rightarrow \frac{(9x)^2 - 12(9x) + 36}{9} = 0 \Rightarrow$$

$$\Rightarrow \frac{(9x - 6)^2}{9} = (3x - 2)^2 = 0 \Rightarrow x_1 = x_2 = \frac{2}{3}$$

25.- $9x^2 - 10x + 1 = 0$

Solución:

$$9x^2 - 10x + 1 = 0 \Rightarrow \frac{9}{9}\left(9x^2 - 10x + 1\right) = 0 \Rightarrow \frac{(9x)^2 - 10(9x) + 9}{9} = 0 \Rightarrow$$

$$\Rightarrow \frac{(9x - 9)(9x - 1)}{9} = (x - 1)(9x - 1) = 0 \Rightarrow x_1 = 1; x_2 = \frac{1}{9}$$

26.- $9x^2 - 37x + 4 = 0$

Solución:

$$9x^2 - 37x + 4 = 0 \Rightarrow \frac{9}{9}\left(9x^2 - 37x + 4\right) = 0 \Rightarrow \frac{(9x)^2 - 37(9x) + 36}{9} = 0 \Rightarrow$$

$$\Rightarrow \frac{(9x - 36)(9x - 1)}{9} = (x - 4)(9x - 1) = 0 \Rightarrow x_1 = 4; x_2 = \frac{1}{9}$$

27.- $20m^2 + 31m + 12 = 0$

Solución:

$$20m^2 + 31m + 12 = 0 \Rightarrow \frac{20}{20}\left(20m^2 + 31m + 12\right) = 0 \Rightarrow \frac{(20m)^2 + 31(20m) + 240}{20} = 0 \Rightarrow$$

$$\Rightarrow \frac{(20m + 16)(20m + 15)}{20} = (5m + 4)(4m + 3) = 0 \Rightarrow m_1 = -\frac{4}{5}; m_2 = -\frac{3}{4}$$

28.- $12m^2 - 8m - 15 = 0$

Solución:

$$12m^2 - 8m - 15 = 0 \Rightarrow \frac{12}{12}\left(12m^2 - 8m - 15\right) = 0 \Rightarrow \frac{(12m)^2 - 8(12m) - 180}{12} = 0 \Rightarrow$$

$$\Rightarrow \frac{(12m - 18)(12m + 10)}{12} = (2m - 3)(6m + 5) = 0 \Rightarrow m_1 = \frac{3}{2}; m_2 = -\frac{5}{6}$$

29.- $15a^2 + a - 28 = 0$
Solución:

$$15a^2 + a - 28 = 0 \Rightarrow \frac{15}{15}\left(15a^2 + a - 28\right) = 0 \Rightarrow \frac{(15a)^2 + (15a) - 420}{15} = 0 \Rightarrow$$

$$\Rightarrow \frac{(15a + 21)(15a - 20)}{15} = (5a + 7)(3a - 4) = 0 \Rightarrow a_1 = -\frac{7}{5}; a_2 = \frac{4}{3}$$

30.- $24m^2 - 47m - 21 = 0$

Solución:

$$24m^2 - 47m - 21 = 0 \Rightarrow \frac{24}{24}\left(24m^2 - 47m - 21\right) = 0 \Rightarrow \frac{(24m)^2 - 47(24m) - 504}{24} = 0 \Rightarrow$$

$$\Rightarrow \frac{(24m - 56)(24m + 9)}{24} = (3m - 7)(8m + 3) = 0 \Rightarrow m_1 = \frac{7}{3}; m_2 = -\frac{3}{8}$$