1 ÜBUNGSAUFGABEN MESK 2BKI1

Die Grundmenge ist G = R. Bestimmen Sie die Definitionsmenge D und die Lösungsmenge L der Gleichungen

1) $x^2 = 121$

2) $y^2 = \frac{4}{9}$

3) $4x^2 + 1 = 0$

4) $(2x-3)^2 = (x-6)^2 + 21$

5) $(3x+1)^2 = 6x + 37$

6) $(x-4)^2 = 25 - 8x$

7) $(2x-5)^2 = 45 - 20x$

8) $(5x-1{,}4)^2 = 3{,}4 - 14x$

9) $(3x-5)(3x+5) = 2$

10) $(x+6)(x-6) = (2+x)(2-x)$

11) $(2x+3)^2 = (3+x)(15-x)$

12) $\frac{4x^2-5}{6} - \frac{2x^2-3}{4} = 3$

13) $\frac{6x^2+7}{12} - \frac{x^2+4}{16} = x^2$

14) $\frac{5x^2+3}{4} + \frac{1}{2} = \frac{4(x^2+1)}{3}$

15) $\frac{5-x^2}{10} + \frac{3}{2} = \frac{x^2+10}{5}$

16) $(x-1)^2 = 16$

17) $(x+2)^2 = 9$

18) $(2x-1)^2 = 25$

19) $(6x-9)^2 = 9$

20) $(7x-2{,}1)^2 = 1{,}96$

21) $(x+1{,}5)^2 = 2{,}25$

22) $x^2 + 6x + 9 = 25$

23) $x^2 + 10x + 25 = 0$

24) $x^2 - 3x + 2{,}25 = 0$

25) $\frac{3x}{x-2} = \frac{2x+7}{x+3} + \frac{6}{x-2}$

26) $\frac{x-3}{x} + \frac{2x}{3} = 1$

27) $\frac{x-2}{x+2} + \frac{x+2}{x-2} = 5$

28) $\frac{36}{x+6} - 36 = \frac{36}{x-6}$

29) $\frac{3x+2}{x-2} = \frac{x+2}{3x-2}$

30) $\frac{2x+3}{5x-8} = \frac{x}{2x-7}$

31) $\frac{3x+2}{x+2} = \frac{7x+2}{2x+4}$

32) $\frac{x+5}{x-5} + \frac{x-5}{x+5} - 2 = \frac{100}{x^2-25}$

33) $\frac{9}{x+3} - \frac{x}{x-3} = 2 - \frac{3}{x-3} - \frac{3x}{x+3}$

34) $\frac{3}{x-4} - \frac{24}{x^2-16} = \frac{3}{x+4} - x^2 + 16$

35) $\frac{x}{x-4} - \frac{16}{x+4} + \frac{12x}{x^2-16} + 3 = \frac{4(x^2+4)}{x^2-16}$

36) $x^2 = 9a^2$

37) $x^2 - 4a^2 = 0$

38) $4x^2 - 25b^2 = 0$

39) $2x^2 - 9c^2 = 0$

40) $x^2 - a^2 = 1 - 2a$

41)
Prüfen Sie nach (durch Einsetzen in die Gleichung $ax^2 + bx + c = 0$), daß

$$x_1 = \frac{-b + \sqrt{(b^2 - 4ac)}}{2a}$$

$$x_2 = \frac{-b - \sqrt{(b^2 - 4ac)}}{2a}$$

Lösungen der Gleichung
$ax^2 + bx + c = 0$ sind.

2 ÜBUNGSAUFGABEN MESK 2BKI1

Eine Frau bricht um neun Uhr zu einer Tageswanderung auf und ist um 18 Uhr wieder am Startpunkt angekommen. Sie macht beim Wandern keine Pausen - auch nicht, als sie auf dem Gipfel des Bergs ankommt, dem Ziel der Wanderung. Dort macht sie sofort kehrt und geht auf demselben Weg wieder zum Startpunkt der Wanderung zurück.
Die Frau wandert mit drei verschiedenen Geschwindigkeiten: In der Ebene sind es 4 km/h, bergauf 3 km/h und bergab 6 km/h. Die Wanderstrecke besteht nur aus Stücken, die eben sind, bergauf gehen oder bergab.
Welche Strecke hat die Frau bei ihrer Tageswanderung zurückgelegt?

Lösung:
s_H sei die Strecke, wo die Frau vom Startpunkt aus den Berg hoch geht.
s_R sei die Strecke, wo die Frau vom Startpunkt aus den Berg reunter geht.
s_E sei die Strecke, wo die Frau vom Startpunkt aus auf der Ebene läuft.
Die Gesamtstrecke sei $s = s_H + s_E + s_R$
Jede Strecke wird in 2 Richtungen durchlaufen. Also beträgt die Gesamtzeit:

$$\frac{s_H}{3} + \frac{s_H}{6} + \frac{s_E}{4} + \frac{s_E}{4} + \frac{s_R}{3} + \frac{s_R}{6} = 9 \quad <==>$$

$$\frac{s_H}{2} + \frac{s_E}{2} + \frac{s_R}{2} = 9 \quad <==> \quad \frac{s_H + s_E + s_R}{2} = 9 \quad <==> \quad s_H + s_E + s_R = 18 \quad <==> \quad s = 18$$

Lösungen:

1)
$x^2 = 121$
$D = R$
$L = \{-11;11\}$

2)
$y^2 = \frac{4}{9}$
$D = R$
$L = \{-\frac{2}{3};\frac{2}{3}\}$

3)
$4x^2 + 1 = 0$
$D = R$
$x^2 = -\frac{1}{4}$
$L = \{\}$

4)
$(2x-3)^2 = (x-6)^2 + 21$
$D = R$
$4x^2 - 12x + 9 = x^2 - 12x + 36 + 21$
$3x^2 - 48 = 0$
$x^2 = 16$
$L = \{4;-4\}$

5)
$(3x+1)^2 = 6x + 37$
$D = R$
$9x^2 + 6x + 1 = 6x + 37$
$9x^2 = 36$
$x^2 = 4$
$L = \{2;-2\}$

6)
$(x-4)^2 = 25 - 8x$
$D = R$
$x^2 - 8x + 16 = 25 - 8x$
$x^2 = 9$
$L = \{3;-3\}$

7)
$(2x-5)^2 = 45 - 20x$
$D = R$
$4x^2 - 20x + 25 = 45 - 20x$
$4x^2 = 20$
$x^2 = 5$
$L = \{-\sqrt{5};\sqrt{5}\}$

8)
$(5x-1{,}4)^2 = 3{,}4 - 14x$
$D = R$
$25x^2 - 14x + 1{,}96 = 3{,}4 - 14x$
$25x^2 = 1{,}44$
$x^2 = \frac{1{,}44}{25}$
$L = R \setminus \{2{,}4;-2{,}4\}$

9)
$(3x-5)(3x+5) = 2$
$D = R$
$9x^2 - 25 = 2$
$9x^2 = 27$
$x^2 = 3$
$L = \{-\sqrt{3};\sqrt{3}\}$

10)
$(x+6)(x-6) = (2+x)(2-x)$
$D = R$
$x^2 - 36 = 4 - x^2$
$2x^2 = 40$
$x^2 = 20$
$L = \{\sqrt{20};-\sqrt{20}\}$

11)
$(2x+3)^2 = (3+x)(15-x)$
$D = R$
$4x^2 + 12x + 9 = 45 + 15x - 3x -$
$5x^2 = 36$
$x^2 = 7{,}2$
$L = \{\sqrt{7{,}2};-\sqrt{7{,}2}\}$

12)

$\frac{4x^2-5}{6}-\frac{2x^2-3}{4}=3 \quad |\cdot 12$

$D=R$

$2(4x^2-5)-3(2x^2-3)=36$

$8x^2-10-6x^2+9=36$

$2x^2=37$

$x^2=\sqrt{\frac{37}{2}}$

$L=\{\sqrt{\frac{37}{2}};-\sqrt{\frac{37}{2}}\}$

13)

$\frac{6x^2+7}{12}-\frac{x^2+4}{16}=x^2 \quad |\cdot 48$

$D=R$

$4(6x^2+7)-3(x^2+4)=48x^2$

$-27x^2=-16$

$L=\{-\sqrt{\frac{16}{27}};\sqrt{\frac{16}{27}}\}$

14)

$\frac{5x^2+3}{4}+\frac{1}{2}=\frac{4(x^2+1)}{3} \quad |\cdot 12$

$D=R$

$3(5x^2+3)+6=16(x^2+1)$

$15x^2+9+6=16x^2+16$

$-x^2=1$

$x^2=-1$

$L=\{\}$

15)

$\frac{5-x^2}{10}+\frac{3}{2}=\frac{x^2+10}{5} \quad |\cdot 10$

$D=R$

$5-x^2+15=2(x^2+10)$

$20-x^2=2x+20$

$3x^2=0$

$x^2=0$

$L=\{0\}$

16)

$(x-1)^2=16 \quad |\sqrt{\ }$

$D=R$

$|x-1|=4$

$1.Fall: x-1=4$ $\qquad$ $2.Fall: x-1=-4$

$x_1=5$ $\qquad$ $x-1=-4$

$x_2=-3$

$L=\{-3;5\}$

17)

$(x+2)^2=9 \quad |\sqrt{\ }$

$D=R$

$|x+2|=3$

$1.Fall: x+2=3$ $\qquad$ $2.Fall: x+2=-3$

$x_1=1$ $\qquad$ $x=-5$

$x_2=-5$

$L=\{1;-5\}$

18)

$(2x-1)^2=25 \quad |\sqrt{\ }$

$D=R$

$|2x-1|=5$

$1.Fall: 2x-1=5$ $\qquad$ $2.Fall: 2x-1=-5$

$2x=6$ $\qquad$ $2x=-4$

$x_1=3$ $\qquad$ $x=-2$

$x_2=-2$

$L=\{3;-2\}$

19)

$(6x-9)^2=9 \quad |\sqrt{\ }$

$D=R$

$|6x-9|=3$

$1.Fall: 6x-9=3$ $\qquad$ $2.Fall: 6x-9=-3$

$6x=12$ $\qquad$ $6x=6$

$x_1=2$ $\qquad$ $x=1$

$x_2=1$

$L=\{1;2\}$

20)

$(7x-2{,}1)^2 = 1{,}96 \quad | \sqrt{\ }$

$D = R$

$|\,7x-2{,}1\,| = 1{,}4$

1.*Fall* : $7x-2{,}1 = 1{,}4$ | 2.*Fall* : $7x-2{,}1 = -1{,}4$

$7x = 3{,}5$ | $7x = 0{,}7$

$x_1 = 0{,}5$ | $x = 0{,}1$

$x_2 = -0{,}1$

$L = \{-0{,}1; 0{,}5\}$

21)

$(x+1{,}5)^2 = 2{,}25 \quad | \sqrt{\ }$

$D = R$

$|\,x+1{,}5\,| = 1{,}5$

1.*Fall* : $x+1{,}5 = 1{,}5$ | 2.*Fall* : $x+1{,}5 = -1{,}5$

$x_1 = 0$ | $x = -3$

$x_2 = -3$

$L = \{-3; 0\}$

22)

$x^2 + 6x + 9 = 25$

$D = R$

$(x+3)^2 = 25 \quad | \sqrt{\ }$

$|\,x+3\,| = 5$

1.*Fall* : $x+3 = 5$ | 2.*Fall* : $x+3 = -5$

$x_1 = 2$ | $x = -8$

$x_2 = -8$

$L = \{-8; 2\}$

23)

$x^2 + 10x + 25 = 0$

$D = R$

$(x+5)^2 = 0$

$(x+5)(x+5) = 0$

$x+5 = 0$

$x = -5$

$L = \{-5\}$

24)

$x^2 - 3x + 2{,}25 = 0$

$D = R$

$(x-1{,}5)^2 = 0$

$x-1{,}5 = 0$

$x = 1{,}5$

$L = \{1{,}5\}$

25)

$\frac{3x}{x-2} = \frac{2x+7}{x+3} + \frac{6}{x-2} \quad | \cdot (x-2)(x+3)$

$D = R \setminus \{2;-3\}$

$3x(x+3) = (2x+7)(x-2) + 6(x+3)$

$3x^2 + 9x = 2x^2 + 7x - 4x - 14 + 6x + 18$

$3x^2 = 2x^2 + 4$

$x^2 = 4$

$L = \{-2\}$

26)

$\frac{x-3}{x} + \frac{2x}{3} = 1 \quad | \cdot 3x$

$D = R \setminus \{0\}$

$3(x - 3) + 2x^2 = 3x$

$3x - 9 + 2x^2 = 3x$

$2x^2 = 9$

$L = \{-\sqrt{4{,}5}\,;\, \sqrt{4{,}5}\}$

27)

$\frac{x-2}{x+2}+\frac{x+2}{x-2}=5 \quad |\cdot(x+2)(x-2)$

$D = R \setminus \{2;-2\}$

$(x - 2)^2 + (x + 2)^2 = 5(x + 2)(x - 2)$

$x^2 - 4x + 4 + x^2 + 4x + 4 = 5(x^2 - 4)$

$2x^2 + 8 = 5x^2 - 20$

$-3x^2 = -28$

$x^2 = \frac{28}{3}$

$L = \{-\sqrt{\frac{28}{3}}\ ;\ \sqrt{\frac{28}{3}}\}$

28)

$\frac{36}{x+6}-36=\frac{36}{x-6} \quad |\cdot(x+6)(x-6)$

$D = R \setminus \{-6;6\}$

$36(x - 6) - 36(x + 6)(x - 6) = 36(x + 6)$

$(x - 6) - (x + 6)(x - 6) = x + 6$

$x - 6 - (x^2 - 36) = x + 6$

$x - 6 - x^2 + 36 = x + 6$

$-x^2 = -24$

$L = \{-\sqrt{24}\ ;\ \sqrt{24}\}$

29)

$\frac{3x+2}{x-2}=\frac{x+2}{3x-2} \quad |\cdot(x-2)(3x-2)$

$D = R \setminus \{2;\frac{2}{3}\}$

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

$9x^2 - 4 = x^2 - 4$

$8x^2 = 0$

$x^2 = 0$

$L = \{0\}$

30)

$\frac{2x+3}{5x-8}=\frac{x}{2x-7} \quad |\cdot(5x-8)(2x-7)$

$D = R \setminus \{\frac{8}{5};\frac{7}{2}\}$

$(2x+3)(2x-7) = x(5x-8)$

$4x^2 + 6x - 14x - 21 = 5x^2 - 8x$

$-21 = x^2$

$L = \{\}$

31)

$\frac{3x+2}{x+2}=\frac{7x+2}{2x+4} \quad |\cdot 2(x+2)$

$D = R \setminus \{-2\}$

$\frac{3x+2}{x+2}=\frac{7x+2}{2(x+2)}$

$2(3x+2) = 7x+2$

$6x + 4 = 7x + 2$

$2 = x$

$L = \{2\}$

32)

$\frac{x+5}{x-5}+\frac{x-5}{x+5}-2=\frac{100}{x^2-25}$

$D = R \setminus \{5;-5\}$

$\frac{x+5}{x-5}+\frac{x-5}{x+5}-2=\frac{100}{(x-5)(x+5)} \quad |\cdot(x-5)(x+5)$

$(x+5)^2 + (x-5)^2 - 2(x-5)(x+5) = 100$

$x^2 + 10x + 25 + x^2 - 10x + 25 - 2x^2 + 50 = 100$

$2x^2 - 2x^2 + 100 = 100$

$2x^2 - 2x^2 = 0$

$L = R \setminus \{5;-5\}$

33)

$$\frac{9}{x+3}-\frac{x}{x-3}=2-\frac{3}{x-3}-\frac{3x}{x+3} \quad |\cdot(x+3)(x-3)$$

$D = R \setminus \{-3; 3\}$

$9(x - 3) - x(x + 3) = 2(x - 3)(x + 3) - 3(x + 3) - 3x(x - 3)$

$9x - 27 - x^2 - 3x = 2x^2 - 18 - 3x - 9 - 3x^2 + 9x$

$-x^2 + 6x - 27 = -x^2 + 6x - 27$

$L = R \setminus \{-3; 3\}$

34)

$$\frac{3}{x-4}-\frac{24}{x^2-16}=\frac{3}{x+4}-x^2+16 \quad |\cdot(x-4)(x+4)$$

$D = R \setminus \{-4; +4\}$

$3(x + 4) - 24 = 3(x - 4) - x^2(x^2 - 16) + 16(x^2 - 16)$

$3x + 12 - 24 = 3x - 12 - x4 + 16x^2 + 16x^2 - 256$

$(x^2)^2 - 32x^2 + 256 = 0$

$(x^2)^2 - 2 \cdot 16 \cdot x^2 + 16^2 = 0$

$(x^2 - 16)^2 = 0$

$(x^2 - 16)(x^2 - 16) = 0$

$(x - 4) \cdot (x + 4) \cdot (x - 4) \cdot (x + 4) = 0$

$x_1 = 4;\ x_2 = -4$

$L = \{\}$

35)

$$\frac{x}{x-4}-\frac{16}{x+4}+\frac{12x}{x^2-16}+3=\frac{4(x^2+4)}{x^2-16} \quad |\cdot(x-4)(x+4)$$

$D = R \setminus \{-4; 4\}$

$x(x + 4) - 16(x - 4) + 12x + 3(x^2 - 16) = 4(x^2 + 4)$

$x^2 + 4x - 16x + 64 + 12x + 3x^2 - 48 = 4x^2 + 16$

$4x^2 + 16 = 4x^2 + 16$

$L = R \setminus \{-4 ; 4\}$

36)

$x^2 = 9a^2$

$D = R$

$x^2 - 9a^2 = 0$

$(x - 3a)(x + 3a) = 0$

$x_1 = 3a \quad x_2 = -3a$

$L = \{3a\,; -3a\}$

37)

$x^2 - 4a^2 = 0$

$(x - 2a)(x + 2a) = 0$

$x_1 = 2a \quad x_2 = -2a$

$L = \{2a\,; -2a\}$

38)

$4x^2 - 25b^2 = 0$

$(2x - 5b)(2x + 5b) = 0$

$1.Fall: 2x = 5b \quad 2.Fall: 2x + 5b = 0$

$x_1 = \frac{5}{2}b \quad x_2 = -\frac{5}{2}b$

39)

$2x^2 - 9c^2 = 0$

$(\sqrt{2}x)^2 - (3c)^2 = 0$

$(\sqrt{2}x - 3c)(\sqrt{2}x + 3c) = 0$

$1.Fall: \sqrt{2}x - 3c = 0 \quad 2.Fall: \sqrt{2}x + 3c = 0$

$x_1 = \frac{3c}{\sqrt{2}} \quad x_2 = -\frac{3c}{\sqrt{2}}$

40)

$x^2 - a^2 = 1 - 2a$

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

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

$x^2 - (a - 1)^2 = 0$

$(x - (a - 1))(x + (a - 1)) = 0$

$1.Fall: x - (a - 1) = 0$

$x_1 = a - 1$

$2.Fall: x + (a - 1) = 0$

$x_2 = 1 - a$

Proben:

1)

a)

$(-11)^2 = 121$

$121 = 121 \quad (w)$

b)

$11^2 = 121$

$121 = 121 \quad (w)$

2)

a)

$\left(-\frac{2}{3}\right)^2 = \frac{4}{9}$

$\frac{4}{9} = \frac{4}{9} \quad (w)$

b)

$\left(\frac{2}{3}\right)^2 = \frac{4}{9}$

$\frac{4}{9} = \frac{4}{9} \quad (w)$

4)

a)

$(2 \cdot 4 - 3)^2 = (4 - 6)^2 + 21$

$25 = 25 \quad (w)$

b)

$(2 \cdot (-4) - 3)^2 = (-4 - 6)^2 + 21$

$121 = 121 \quad (w)$

5)

a)

$(3 \cdot 2 + 1)^2 = 6 \cdot 2 + 37$

$49 = 49 \quad (w)$

b)

$(3 \cdot (-2) + 1)^2 = 6 \cdot (-2) + 37$

$25 = 25 \quad (w)$

6)

a)

$(3 - 4)^2 = 25 - 8 \cdot 3$

$1 = 1 \quad (w)$

b)

$(-3 - 4)^2 = 25 - 8 \cdot (-3)$

$49 = 49 \quad (w)$

7)

a)

$(2\sqrt{5} - 5)^2 = 45 - 20\sqrt{5}$

$(2\sqrt{5})^2 - 2 \cdot 2\sqrt{5} \cdot 5 + 5^2 = 45 - 20\sqrt{5}$

$2^2 \sqrt{5}^2 - 20\sqrt{5} + 25 = 45 - 20\sqrt{5}$

$20 - 20\sqrt{5} + 25 = 45 - 20\sqrt{5}$

$45 - 20\sqrt{5} = 45 - 20\sqrt{5} \quad (w)$

b)

$(2 \cdot (-\sqrt{5}) - 5)^2 = 45 - 20 \cdot (-\sqrt{5})$

$(2 \cdot (-\sqrt{5}))^2 - 2 \cdot 2 \cdot (-\sqrt{5}) \cdot 5 + 5^2 = 45 - 20 \cdot (-\sqrt{5})$

$2^2 \sqrt{5}^2 - 20\sqrt{5} + 25 = 45 - 20\sqrt{5}$

$20 - 20\sqrt{5} + 25 = 45 - 20\sqrt{5}$

$45 - 20\sqrt{5} = 45 - 20\sqrt{5} \quad (w)$

8)

a

$(5 \cdot 0{,}24 - 1{,}4)^2 = 3{,}4 - 14 \cdot 0{,}24$

$0{,}04 = 0{,}04 \quad (w)$

b)

$(5 \cdot (-0{,}24) - 1{,}4)^2 = 3{,}4 - 14 \cdot (-0{,}24)$

$6{,}76 = 6{,}76 \quad (w)$

9)

a)

$(3\cdot\sqrt{3}-5)(3\cdot\sqrt{3}+5)=2$

$(3\cdot\sqrt{3})^2-5^2=2$

$9\cdot\sqrt{3}^2-25=2$

$9\cdot 3-25=2$

$2=2\quad(w)$

b)

$(3\cdot(-\sqrt{3})-5)(3\cdot(-\sqrt{3})+5)=2$

$(3\cdot(-\sqrt{3}))^2-5^2=2$

$9\cdot(-\sqrt{3})^2-25=2$

$9\cdot 3-25=2$

$2=2\quad(w)$

10)

a)

$(\sqrt{20}+6)(\sqrt{20}-6)=(2+\sqrt{20})(2-\sqrt{20})$

$\sqrt{20}^2-6^2=2^2-\sqrt{20}^2$

$\sqrt{20}^2-36=4-\sqrt{20}^2$

$20-36=4-20$

$-4=-4\quad(w)$

b)

$((-\sqrt{20})+6)((-\sqrt{20})-6)=(2+(-\sqrt{20}))(2-(-\sqrt{20}))$

$(-\sqrt{20})^2-6^2=2^2-(-\sqrt{20})^2$

$(-\sqrt{20})^2-36=4-(-\sqrt{20})^2$

$20-36=4-20$

$-4=-4\quad(w)$

11)

a)

$(2\sqrt{7.2}+3)^2=(3+\sqrt{7.2})(15-\sqrt{7.2})$

$(2\sqrt{7.2})^2+2\cdot 2\sqrt{7.2}\cdot 3)+3^2=45+15\sqrt{7.2}-3\sqrt{7.2}-\sqrt{7.2}^2$

$4\cdot\sqrt{7.2}^2+12\sqrt{7.2}+9=45+15\sqrt{7.2}-3\sqrt{7.2}-\sqrt{7.2}^2$

$4\cdot 7{,}2+12\sqrt{7.2}+9=45+12\sqrt{7.2}-7{,}2$

$4\cdot 7{,}2+9=45-7{,}2$

$37{,}8=37{,}8\quad(w)$

b)

$(2\cdot(-\sqrt{7.2})+3)^2=(3+(-\sqrt{7.2}))(15-\cdot(-\sqrt{7.2}))$

$(-2\sqrt{7.2}+3)^2=(3-\sqrt{7.2})(15+\sqrt{7.2})$

$(-2\sqrt{7.2})^2-2\cdot 2\sqrt{7.2}\cdot 3)+3^2=45-15\sqrt{7.2}+3\sqrt{7.2}-\sqrt{7.2}\cdot\sqrt{7.2}$

$4\cdot\sqrt{7.2}^2-12\sqrt{7.2}+9=45-15\sqrt{7.2}+3\sqrt{7.2}-\sqrt{7.2}^2$

$4\cdot 7{,}2-12\sqrt{7.2}+9=45-12\sqrt{7.2}-7{,}2$

$4\cdot 7{,}2+9=45-7{,}2$

$37{,}8=37{,}8\quad(w)$

12)

a)

$$\frac{4\sqrt{\frac{37}{2}}^2-5}{6}-\frac{2\sqrt{\frac{37}{2}}^2-3}{4}=3$$

$$\frac{4\cdot\frac{37}{2}-5}{6}-\frac{2\cdot\frac{37}{2}-3}{4}=3$$

$$\frac{2\cdot 37-5}{6}-\frac{37-3}{4}=3$$

$$\frac{69}{6}-\frac{34}{4}=3 \quad |\cdot 12$$

$$2\cdot 69-3\cdot 34=36$$

$$36=36 \quad (w)$$

b)

$$\frac{4\cdot(-\sqrt{\frac{37}{2}})^2-5}{6}-\frac{2(-\sqrt{\frac{37}{2}})^2-3}{4}=3$$

$$\frac{4\cdot\frac{37}{2}-5}{6}-\frac{2\cdot\frac{37}{2}-3}{4}=3$$

$$\frac{2\cdot 37-5}{6}-\frac{37-3}{4}=3$$

$$\frac{69}{6}-\frac{34}{4}=3 \quad |\cdot 12$$

$$2\cdot 69-3\cdot 34=36$$

$$36=36 \quad (w)$$

13)

a)

$$\frac{6\sqrt{\frac{16}{27}}^2+7}{12}-\frac{\sqrt{\frac{16}{27}}^2+4}{16}=\sqrt{\frac{16}{27}}^2$$

$$\frac{6\cdot\frac{16}{27}+7}{12}-\frac{\frac{16}{27}+4}{16}=\frac{16}{27}$$

$$\frac{\frac{96}{27}+7}{12}-\frac{\frac{124}{27}}{16}=\frac{16}{27}$$

$$\frac{\frac{285}{27}}{12}-\frac{\frac{124}{27}}{16}=\frac{16}{27}$$

$$\frac{\frac{285}{27}}{12}-\frac{\frac{124}{27}}{16}=\frac{16}{27} \quad |\cdot 27\cdot 16$$

$$\frac{285}{27}\cdot 36-\frac{124}{27}\cdot 27=256$$

$$380-124=256$$

$$256=256 \quad (w)$$

b)

$$\frac{6\cdot\left(-\sqrt{\frac{16}{27}}\right)^2+7}{12}-\frac{\left(-\sqrt{\frac{16}{27}}\right)^2+4}{16}=\left(-\sqrt{\frac{16}{27}}\right)^2$$

$$\frac{6\cdot\frac{16}{27}+7}{12}-\frac{\frac{16}{27}+4}{16}=\frac{16}{27}$$

$$\frac{\frac{96}{27}+7}{12}-\frac{\frac{124}{27}}{16}=\frac{16}{27}$$

$$\frac{\frac{285}{27}}{12}-\frac{\frac{124}{27}}{16}=\frac{16}{27}$$

$$\frac{\frac{285}{27}}{12}-\frac{\frac{124}{27}}{16}=\frac{16}{27} \quad |\cdot 27\cdot 16$$

$$\frac{285}{27}\cdot 36-\frac{124}{27}\cdot 27=256$$

$$380-124=256$$

$$256=256 \quad (w)$$

15)

$$\frac{5-0^2}{10}+\frac{3}{2}=\frac{0^2+10}{5}$$

$2=2 \quad (w)$

16)

a)

$(-3-1)^2=16$

$16=16 \quad (w)$

b)

$(5-1)^2=16$

$16=16 \quad (w)$

17)

a)

$(1+2)^2=9$

$9=9 \quad (w)$

b)

$(-5+2)^2=9$

$9=9 \quad (w)$

18)

a)

$(2\cdot 3-1)^2=25$

$25=25 \quad (w)$

b)

$(2\cdot(-2)-1)^2=25$

$25=25 \quad (w)$

19)

a)

$(6\cdot 1-9)^2=9$

$9=9 \quad (w)$

b)

$(6\cdot 2-9)^2=9$

$9=9 \quad (w)$

20)

a)

$(7\cdot 0{,}1-2{,}1)^2=1{,}96$

$1{,}96=1{,}96 \quad (w)$

b)

$(7\cdot 0{,}5-2{,}1)^2=1{,}96$

$1{,}96=1{,}96 \quad (w)$

21)

a)

$(-3+1{,}5)^2=2{,}25$

$2{,}25=2{,}25 \quad (w)$

b)

$(0+1{,}5)^2=2{,}25$

$2{,}25=2{,}25 \quad (w)$

22)

a)

$(-8)^2+6\cdot(-8)+9=25$

$25=25 \quad (w)$

b)

$2^2+6\cdot 2+9=25$

$25=25 \quad (w)$

23)

$(-5)^2+10\cdot(-5)+25=0$

$25-50+25=0$

$0=0 \quad (w)$

24)

$1{,}5^2-3\cdot 1{,}5+2{,}25=0$

$2{,}25-3\cdot 1{,}5+2{,}25=0$

$0=0 \quad (w)$

25)

$$\frac{3\cdot(-2)}{-2-2}=\frac{2\cdot(-2)+7}{-2+3}+\frac{6}{-2-2}$$

$$\frac{3\cdot(-2)}{-2-2}=\frac{2\cdot(-2)+7}{-2+3}+\frac{6}{-2-2}$$

$$\frac{-6}{-4}=\frac{3}{1}-\frac{6}{4}$$

$$\frac{3}{2}=3-\frac{3}{2}$$

$$\frac{3}{2}=\frac{3}{2} \quad (w)$$

26)

a)

$$\frac{\sqrt{4,5}-3}{\sqrt{4,5}}+\frac{2\sqrt{4,5}}{3}=1 \quad |\cdot 3\sqrt{4,5}$$

$$3(\sqrt{4,5}-3)+2\sqrt{4,5}^2=3\sqrt{4,5}$$

$$3\sqrt{4,5}-9+2\cdot 4,5=3\sqrt{4,5}$$

$$3\sqrt{4,5}=3\sqrt{4,5} \quad (w)$$

b)

$$\frac{(-\sqrt{4,5})-3}{-\sqrt{4,5}}+\frac{2\cdot(-\sqrt{4,5})}{3}=1 \quad |\cdot 3\cdot(-\sqrt{4,5})$$

$$3(-\sqrt{4,5}-3)+2\cdot(-\sqrt{4,5})^2=-3\sqrt{4,5}$$

$$-3\sqrt{4,5}-9+2\cdot 4,5=-3\sqrt{4,5}$$

$$-3\sqrt{4,5}=-3\sqrt{4,5} \quad (w)$$

27)

a)

$$\frac{\sqrt{\frac{28}{3}}-2}{\sqrt{\frac{28}{3}}+2}+\frac{\sqrt{\frac{28}{3}}+2}{\sqrt{\frac{28}{3}}-2}=5 \quad |\cdot\left(\sqrt{\frac{28}{3}}+2\right)\left(\sqrt{\frac{28}{3}}-2\right)$$

$$\left(\sqrt{\frac{28}{3}}-2\right)^2+\left(\sqrt{\frac{28}{3}}+2\right)^2=5\left(\sqrt{\frac{28}{3}}+2\right)\left(\sqrt{\frac{28}{3}}-2\right)$$

$$\sqrt{\frac{28}{3}}^2-2\cdot 2\sqrt{\frac{28}{3}}+2^2+\sqrt{\frac{28}{3}}^2+2\cdot 2\sqrt{\frac{28}{3}}+2^2=5\left(\sqrt{\frac{28}{3}}^2-2^2\right)$$

$$\frac{28}{3}-4\sqrt{\frac{28}{3}}+4+\frac{28}{3}+4\sqrt{\frac{28}{3}}+4=5\left(\frac{28}{3}-4\right)$$

$$\frac{56}{3}+8=\frac{140}{3}-20 \quad |\cdot 3$$

$$56+24=140-60$$

$$80=80 \quad \text{(w)}$$

b)

$$\frac{\left(-\sqrt{\frac{28}{3}}\right)-2}{\left(-\sqrt{\frac{28}{3}}\right)+2}+\frac{\left(-\sqrt{\frac{28}{3}}\right)+2}{\left(-\sqrt{\frac{28}{3}}\right)-2}=5$$

$$\frac{-\sqrt{\frac{28}{3}}-2}{-\sqrt{\frac{28}{3}}+2}+\frac{-\sqrt{\frac{28}{3}}+2}{-\sqrt{\frac{28}{3}}-2}=5 \quad |\cdot\left(-\sqrt{\frac{28}{3}}+2\right)\left(-\sqrt{\frac{28}{3}}-2\right)$$

$$\left(-\sqrt{\frac{28}{3}}-2\right)^2+(-\sqrt{\frac{28}{3}}+2)^2=5\left(\left(-\sqrt{\frac{28}{3}}+2\right)\left(-\sqrt{\frac{28}{3}}-2\right)\right)$$

$$\left(-\sqrt{\frac{28}{3}}\right)^2-2\cdot 2\left(-\sqrt{\frac{28}{3}}\right)+2^2+\left(-\sqrt{\frac{28}{3}}\right)^2+2\cdot 2\left(-\sqrt{\frac{28}{3}}\right)+2^2=5\left(\left(-\sqrt{\frac{28}{3}}\right)^2-2^2\right)$$

$$\frac{28}{3}+4\sqrt{\frac{28}{3}}+4+\frac{28}{3}-4\sqrt{\frac{28}{3}}+4=5\left(\frac{28}{3}-4\right)$$

$$\frac{56}{3}+8=\frac{140}{3}-20 \quad |\cdot 3$$

$$56+24=140-60$$

$$80=80 \quad \text{(w)}$$

28)

a)

$$\frac{36}{\sqrt{24}+6}-36=\frac{36}{\sqrt{24}-6} \qquad |\cdot(\sqrt{24}+6)(\sqrt{24}-6)$$

$36(\sqrt{24}-6)-36(\sqrt{24}+6)(\sqrt{24}-6)=36(\sqrt{24}+6)$

$36\sqrt{24}-216-36(\sqrt{24}^{2}-6^{2})=36\sqrt{24}+216$

$36\sqrt{24}-216-36(24-36)=36\sqrt{24}+216$

$36\sqrt{24}-216-864+1296=36\sqrt{24}+216$

$36\sqrt{24}+216=36\sqrt{24}+216 \quad (w)$

b)

$$\frac{36}{-\sqrt{24}+6}-36=\frac{36}{-\sqrt{24}-6} \quad |\cdot(-\sqrt{24}+6)(-\sqrt{24}-6)$$

$36(-\sqrt{24}-6)-36(-\sqrt{24}+6)(-\sqrt{24}-6)=36(-\sqrt{24}+6)$

$-36\sqrt{24}-216-36((-\sqrt{24})^{2}-6^{2})=-36\sqrt{24}+216$

$-36\sqrt{24}-216-36(24-36)=-36\sqrt{24}+216$

$-36\sqrt{24}-216-864+1296=-36\sqrt{24}+216$

$-36\sqrt{24}+216=-36\sqrt{24}+216 \quad (w)$

29)

$$\frac{3\cdot 0+2}{0-2}=\frac{0+2}{3\cdot 0-2}$$

$$\frac{2}{-2}=\frac{2}{-2}$$

$-1=-1 \quad (w)$

31)

$$\frac{3\cdot 2+2}{2+2}=\frac{7\cdot 2+2}{2\cdot 2+4}$$

$$\frac{8}{4}=\frac{16}{8}$$

$2=2 \quad (w)$

36)

a)

$(3a)^2=9a^2$

$9a^2=9a^2 \quad (w)$

b)

$(-3a)^2=9a^2$

$9a^2=9a^2 \quad (w)$

37)

a)

$(2a)^2-4a^2=0$

$4a^2-4a^2=0$

$0=0 \quad (w)$

b)

$(-2a)^2-4a^2=0$

$4a^2-4a^2=0$

$0=0 \quad (w)$

38)

a)

$$4\cdot\left(\frac{5}{2}b\right)^2-25b^2=0$$

$$4\cdot\frac{25}{4}b^2-25b^2=0$$

$25b^2-25b^2=0$

$0=0 \quad (w)$

b)

$$4\cdot\left(-\frac{5}{2}b\right)^2-25b^2=0$$

$$4\cdot\frac{25}{4}b^2-25b^2=0$$

$25b^2-25b^2=0$

$0=0 \quad (w)$

39)

a)

$$2\cdot\left(\frac{3c}{\sqrt{2}}\right)^2-9c^2=0$$

$$2\cdot\frac{9c^2}{2}-9c^2=0$$

$$9c^2-9c^2=0$$

$$0=0\quad(w)$$

b)

$$2\cdot\left(-\frac{3c}{\sqrt{2}}\right)^2-9c^2=0$$

$$2\cdot\frac{9c^2}{2}-9c^2=0$$

$$9c^2-9c^2=0$$

$$0=0\quad(w)$$

40)

a)

$$(a-1)^2-a^2=1-2a$$

$$a^2-2a+1-a^2=1-2a$$

$$-2a+1=1-2a\quad(w)$$

b)

$$(1-a)^2-a^2=1-2a$$

$$1-2a+a^2-a^2=1-2a$$

$$1-2a=1-2a\quad(w)$$

41)

a)

$ax^2+bx+c=0$

$$a\cdot\left(\frac{-b+\sqrt{(b^2-4ac)}}{2a}\right)^2+b\frac{-b+\sqrt{(b^2-4ac)}}{2a}+c=$$

$$a\cdot\frac{(-b+\sqrt{(b^2-4ac)})^2}{(2a)^2}+\frac{b(-b+\sqrt{(b^2-4ac)})}{2a}+c=$$

$$a\cdot\frac{(-b)^2+2(-b)(\sqrt{(b^2-4ac)})+(\sqrt{(b^2-4ac)})^2}{4a^2}+\frac{-b^2+b\sqrt{(b^2-4ac)})}{2a}+c=$$

$$\frac{b^2-2b\sqrt{(b^2-4ac)}+b^2-4ac}{4a}+\frac{-b^2+b\sqrt{(b^2-4ac)}}{2a}+c=$$

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

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

$$\frac{b^2-2b\sqrt{(b^2-4ac)}+b^2-4ac-2b^2+2b\sqrt{(b^2-4ac)}+4ac}{4a}=0$$

b)

$ax^2 + bx + c = 0$

$$a \cdot \left(\frac{-b - \sqrt{(b^2 - 4ac)}}{2a} \right)^2 + b \frac{-b - \sqrt{(b^2 - 4ac)}}{2a} + c =$$

$$a \cdot \frac{(-b - \sqrt{(b^2 - 4ac)})^2}{(2a)^2} + \frac{b(-b - \sqrt{(b^2 - 4ac)})}{2a} + c =$$

$$a \cdot \frac{(-b)^2 - 2(-b)(\sqrt{(b^2 - 4ac)}) + (\sqrt{(b^2 - 4ac)})^2}{4a^2} + \frac{-b^2 - b\sqrt{(b^2 - 4ac)})}{2a} + c =$$

$$\frac{b^2 + 2b\sqrt{(b^2 - 4ac)} + b^2 - 4ac}{4a} + \frac{-b^2 - b\sqrt{(b^2 - 4ac)}}{2a} + c =$$

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

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

$$\frac{b^2 + 2b\sqrt{(b^2 - 4ac)} + b^2 - 4ac - 2b^2 - 2b\sqrt{(b^2 - 4ac)} + 4ac}{4a} = 0$$

3 ÜBUNGSAUFGABEN MESK 2BKI1

Die Grundmenge ist G = R. Bestimmen Sie die Definitionsmenge D und die Lösungsmenge L der Gleichungen. Bitte machen Sie die Probe !!

Lösen Sie durch quadratische Ergänzung :

1) $x^2 - 6x + 5 = 0$

2) $x^2 + 6x + 8 = 0$

3) $x^2 - 10x + 21 = 0$

4) $x^2 + 6x + 5 = 0$

5) $x^2 - 4x - 5 = 0$

6) $x^2 + 11x + 24 = 0$

7) $2x^2 + 11x + 5 = 0$

8) $2x^2 + 9x + 7 = 0$

9) $3x^2 - 11x + 10 = 0$

Berechnen Sie die Lösungen :

10) $x^2 - 4x + 1 = 0$

11) $x^2 + 6x + 7 = 0$

12) $x^2 - 8x + 11 = 0$

13) $4x^2 - 12x + 9 = 0$

14) $3x^2 - 10x + 6 = 0$

15) $x^2 + 7x + 16 = 0$

16) $7x^2 + 33x + 36 = 0$

17) $35x^2 - 137x + 132 = 0$

18) $80x^2 - 166x + 51 = 0$

19) $108x^2 + 249x + 136 = 0$

20) $85x^2 + 239x - 170 = 0$

21) $36x^2 + 167x + 187 = 0$

22) $x^2 - 1{,}6x + 0{,}63 = 0$

23) $x^2 - 6{,}3x - 204{,}7 = 0$

24) $x^2 + \frac{1}{2}x - \frac{1}{2} = 0$

25) $x^2 - \frac{x}{3} - 8 = 0$

26) $x^2 + \frac{1}{2}x + \frac{1}{8} = 0$

27) $x^2 - \frac{3}{2}x - \frac{9}{16} = 0$

28) $x^2 - \frac{22}{3}x + \frac{35}{3} = 0$

29) $3x^2 + 15x - 72 = 0$

30) $36x^2 - 36x + 9 = 0$

31) $21x^2 + 28x - 84 = 0$

32) $\frac{1}{6}x^2 - \frac{1}{6}x - 5 = 0$

33) $\frac{2}{3}x^2 + x + \frac{1}{3} = 0$

34) $\frac{9}{10}x^2 + \frac{2}{5}x - \frac{1}{2} = 0$

35) $x^2 - 3{,}5x + 4 = 0$

36) $x^2 + 2{,}4x + 0{,}8 = 0$

37) $0{,}75x^2 + 0{,}5x - 1{,}25 = 0$

38) $(x+2)^2 = -5$

39) $\frac{2x+1}{3} + \frac{9}{2x+1} = 4$

40) $2 \cdot \frac{x-2}{5} + \frac{5}{x-2} = 3$

41) $\frac{2x+1}{2} + \frac{10}{3-2x} = 2$

42) $\frac{3x+4}{3} + \frac{18}{2-3x} = 2$

43) $\frac{x+3}{x} + \frac{x}{x-2} = 5$

44) $\frac{7-x}{x} - \frac{x}{x+8} = 5$

45) $\frac{x}{2x-3} - \frac{1}{2x} = \frac{3}{4x-6}$

46) $\frac{2x}{x-4} + \frac{3x}{x+4} = \frac{4(x^2-x+4)}{x^2-16}$

47) $\frac{3x^2+25}{x^2-25} + \frac{5-x}{5+x} = \frac{2x}{x-5}$

48) $\frac{9+2x}{9-x^2} = \frac{5}{3-x} - \frac{4+x}{6+2x}$

49) $\frac{4x-3}{x-1} - \frac{10}{x+2} = \frac{5x}{x+2}$

Lösungen:

1)

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

$D = / R$

$x^2 - 6x = -5$

$x^2 - 6x + 9 = -5 + 9$

$(x-3)^2 = 4$

$x - 3 = \sqrt{4} \vee x - 3 = -\sqrt{4}$

$x = 5 \vee x = 1$

$L = \{1;5\}$

2)

$x^2 + 6x + 8 = 0$

$D = R$

$x^2 + 6x = -8$

$x^2 + 6x + 9 = -8 + 9$

$(x+3)^2 = 1$

$x + 3 = 1 \vee x + 3 = -1$

$x = -2 \vee x = -4$

$L = \{-2; -4\}$

3)

$x^2 - 10x + 21 = 0$

$D = R$

$x^2 - 10x = -21$

$x^2 - 10x + 25 = -21 + 25$

$(x-5)^2 = 4$

$x - 5 = \sqrt{4} \vee x - 5 = -\sqrt{4}$

$x = 7 \vee x = 3$

$L = \{3; 7\}$

4)

$x^2 + 6x + 5 = 0$

$D = R$

$x^2 + 6x = -5$

$x^2 + 6x + 9 = -5 + 9$

$(x+3)^2 = 4$

$x + 3 = \sqrt{4} \vee x + 3 = -\sqrt{4}$

$x = -1 \vee x = -5$

$L = \{-1; -5\}$

5)

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

$D = R$

$x^2 - 4x = 5$

$x^2 - 4x + 4 = 5 + 4$

$(x-2)^2 = 9$

$x - 2 = \sqrt{9} \vee x - 2 = -\sqrt{9}$

$x = 2 + 3 \vee x = 2 - 3$

$L = \{5; -1\}$

5) Probe

a)

$5^2 - 4 \cdot 5 - 5 = 0$

$0 = 0 \quad (wahr)$

b)

$(-1)^2 - 4 \cdot (-1) - 5 = 0$

$0 = 0 \quad (wahr)$

6)

$x^2+11x+24=0$

$D=R$

$x^2+11x=-24$

$x^2+2\cdot\frac{11}{2}\cdot x+\left(\frac{11}{2}\right)^2=-24+\left(\frac{11}{2}\right)^2$

$\left(x+\frac{11}{2}\right)^2=-24+\frac{121}{4}$

$\left(x+\frac{11}{2}\right)^2=\frac{-96+121}{4}$

$\left(x+\frac{11}{2}\right)^2=\frac{25}{4}$

$x+\frac{11}{2}=\sqrt{\frac{25}{4}}\vee x+\frac{11}{2}=-\sqrt{\frac{25}{4}}$

$x+\frac{11}{2}=\frac{5}{2}\vee x+\frac{11}{2}=-\frac{5}{2}$

$x=-3\vee x=-8$

$L=\{-3;-8\}$

7)

$2x^2+11x+5=0$

$D=R$

$x^2+\frac{11}{2}x+\frac{5}{2}=0$

$x^2+\frac{11}{2}x+\left(\frac{11}{4}\right)^2=-\frac{5}{2}+\left(\frac{11}{4}\right)^2$

$\left(x+\frac{11}{4}\right)^2=-\frac{5}{2}+\frac{121}{16}$

$\left(x+\frac{11}{4}\right)^2=\frac{-40+121}{16}$

$\left(x+\frac{11}{4}\right)^2=\frac{81}{16}$

$x+\frac{11}{4}=\sqrt{\frac{81}{16}}\vee x+\frac{11}{4}=-\sqrt{\frac{81}{16}}$

$x+\frac{11}{4}=\frac{9}{4}\vee x+\frac{11}{4}=-\frac{9}{4}$

$x=-\frac{1}{2}\vee x=-5$

$L=\left\{-\frac{1}{2};-\frac{5}{1}\right\}$

8)

$2x^2+9x+7=0$

$D=R$

$x^2+\frac{9}{2}x+\frac{7}{2}=0$

$x^2+\frac{9}{2}x=-\frac{7}{2}$

$x^2+\frac{9}{2}x+\left(\frac{9}{4}\right)^2=-\frac{7}{2}+\left(\frac{9}{4}\right)^2$

$\left(x+\frac{9}{4}\right)^2=-\frac{7}{2}+\frac{81}{16}$

$\left(x+\frac{9}{4}\right)^2=\frac{-56+81}{16}$

$\left(x+\frac{9}{4}\right)^2=\frac{25}{16}$

$x+\frac{9}{4}=\sqrt{\frac{25}{16}}\vee x+\frac{9}{4}=-\sqrt{\frac{25}{16}}$

$x+\frac{9}{4}=\frac{5}{4}\vee x+\frac{9}{4}=-\frac{5}{4}$

$x=-1\vee x=-\frac{7}{2}$

$L=\left\{-1;\frac{7}{2}\right\}$

9)

$3x^2-11x+10=0$

$D=R$

$x^2-\frac{11}{3}x+\frac{10}{3}=0$

$x^2-\frac{11}{3}x=-\frac{10}{3}$

$x^2-\frac{11}{3}x+\left(\frac{11}{6}\right)^2=-\frac{10}{3}+\left(\frac{11}{6}\right)^2$

$\left(x-\frac{11}{6}\right)^2=-\frac{10}{3}+\frac{121}{36}$

$\left(x-\frac{11}{6}\right)^2=\frac{-120+121}{36}$

$\left(x-\frac{11}{6}\right)^2=\frac{1}{36}$

$x-\frac{11}{6}=\sqrt{\frac{1}{36}}\vee x-\frac{11}{6}=-\sqrt{\frac{1}{36}}$

$x-\frac{11}{6}=\frac{1}{6}\vee x-\frac{11}{6}=-\frac{1}{6}$

$x=2\vee x=\frac{5}{3}$

$L=\left\{2;\frac{5}{3}\right\}$

10)

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

$D=R$

$x_{1/2}=\frac{4\pm\sqrt{16-4\cdot1\cdot1}}{2}=\frac{4\pm\sqrt{12}}{2}=\frac{4\pm\sqrt{4\cdot3}}{2}=\frac{4\pm2\sqrt{3}}{2}=2\pm\sqrt{3}$

$L=\left\{2+\sqrt{3};2-\sqrt{3}\right\}$

Probe:

$a)\left(2+\sqrt{3}\right)^2-4\left(2+\sqrt{3}\right)+1=4+4\sqrt{3}+3-8-4\sqrt{3}+1=0\quad(wahr)$

$b)\left(2-\sqrt{3}\right)^2-4\left(2-\sqrt{3}\right)+1=4-4\sqrt{3}+3-8+4\sqrt{3}+1=0\quad(wahr)$

11)

$x^2 + 6x + 7 = 0$

$D = R$

$$x1/2 = \frac{-6 \pm \sqrt{36 - 4 \cdot 1 \cdot 7}}{2} = \frac{-6 \pm \sqrt{8}}{2} = \frac{-6 \pm 2\sqrt{2}}{2} = -3 \pm \sqrt{2}$$

$$L = \left\{-3 + \sqrt{2}\,; -3 - \sqrt{2}\right\}$$

12)

$x^2 - 8x + 11 = 0$

$D = R$

$$x_{1/2} = \frac{8 \pm \sqrt{64 - 4 \cdot 1 \cdot 11}}{2} = \frac{8 \pm \sqrt{20}}{2} = \frac{8 \pm 2\sqrt{5}}{2} = 4 \pm \sqrt{5}$$

$$L = \left\{4 + \sqrt{5}\,; 4 - \sqrt{5}\right\}$$

13)

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

$D = R$

$$x_{1/2} = \frac{12 \pm \sqrt{144 - 4 \cdot 4 \cdot 9}}{8} = \frac{12}{8} = \frac{3}{2}$$

$$L = \left\{\frac{3}{2}\right\}$$

14)

$3x^2 - 10x + 6 = 0$

$D = R$

$$x_{1/2} = \frac{10 \pm \sqrt{100 - 4 \cdot 3 \cdot 6}}{6} = \frac{10 \pm \sqrt{28}}{6} = \frac{10 \pm 2\sqrt{7}}{6} = \frac{5}{3} \pm \frac{\sqrt{7}}{3}$$

$$L = \left\{\frac{5}{3} + \frac{\sqrt{7}}{3}; \frac{5}{3} - \frac{\sqrt{7}}{3}\right\}$$

15)

$x^2 + 7x + 16 = 0$

$D = R$

$$x_{1/2} = \frac{-7 \pm \sqrt{49 - 4 \cdot 1 \cdot 16}}{2} = \frac{-7 \pm \sqrt{-15}}{2}$$

$L = \{\ \}$

16)

$7x^2+33x+36=0$

$D=R$

$x_{1/2}=\frac{-33\pm\sqrt{33^2-4\cdot7\cdot36}}{14}=\frac{-33\pm9}{2}$

$x_1=-3 \quad x_2=-\frac{24}{14}=-\frac{12}{7}$

$L\left\{-3;-\frac{12}{7}\right\}$

17)

$35x^2-137x+132=0$

$D=R$

$x_{1/2}=\frac{137\pm\sqrt{137^2-4\cdot35\cdot132}}{2\cdot35}=\frac{137\pm17}{70}$

$x_1=\frac{154}{70}=\frac{11}{5} \quad x_2=\frac{120}{70}=\frac{12}{7}$

$L=\left\{\frac{11}{5};\frac{12}{7}\right\}$

18)

$80x^2-166x+51=0$

$D=R$

$x_{1/2}=\frac{166\pm\sqrt{166^2-4\cdot80\cdot51}}{160}=\frac{166\pm106}{160}$

$x_1=\frac{272}{160}=\frac{17}{10} \quad x_2=\frac{60}{160}=\frac{3}{8}$

$L=\left\{\frac{17}{10};\frac{3}{8}\right\}$

19)

$108x^2+249x+136=0$

$D=R$

$x_{1/2}=\frac{-249\pm\sqrt{249^2-4\cdot108\cdot136}}{216}=\frac{-167\pm31}{72}$

$x_1=-\frac{306}{216}=\frac{-153}{108}=-\frac{17}{12} \quad x_2=-\frac{192}{216}=-\frac{24}{27}=-\frac{8}{9}$

20)

$85x^2+239x-170=0$

$D=R$

$x_{1/2}=\frac{-239\pm\sqrt{239^2-4\cdot85\cdot-170}}{170}=\frac{-239\pm339}{170}$

$x_1=-\frac{578}{170}=-3{,}4 \quad x_2=\frac{100}{170}=\frac{10}{17}$

$L=\{-3{,}4;\frac{10}{17}\}$

21)

$36x^2+167x+187=0$

$D=R$

$$x_{1/2}=\frac{-167\pm\sqrt{167^2-4\cdot 36\cdot 187}}{2\cdot 36}=\frac{-167\pm 31}{72}$$

$$x_1=\frac{-136}{72}=-\frac{17}{9}\quad x_2=\frac{-198}{72}=-\frac{99}{36}=-\frac{11}{4}$$

$$L=\{-\frac{17}{9};-\frac{11}{4}\}$$

22)

$x^2-1{,}6x+0{,}63=0\,|\cdot 100$

$D=R$

$100x^2-160x+63=0$

$$x_{1/2}=\frac{160\pm\sqrt{160^2-4\cdot 100\cdot 63}}{200}=\frac{160\pm 20}{200}$$

$$x_1=\frac{180}{200}=\frac{9}{10}\quad x_2=\frac{140}{200}=\frac{7}{10}$$

$$L=\{\frac{9}{10};\frac{7}{10}\}$$

23)

$x^2-6{,}3x-204{,}7=0\,|\cdot 10$

$D=R$

$10x^2-63x-2047=0$

$$x_{1/2}=\frac{63\pm\sqrt{63^2-4\cdot 10\cdot -2047}}{20}=\frac{63\pm 293}{20}$$

$$x_1=\frac{-230}{20}=-11{,}5\quad x_2=\frac{356}{20}=17{,}8$$

$L=\{-11{,}5;17{,}8\}$

24)

$$x^2+\frac{1}{2}x-\frac{1}{2}=0\,|\cdot 2$$

$D=R$

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

$$x_{1/2}=\frac{-1\pm\sqrt{1-4\cdot 2\cdot(-1)}}{4}=\frac{-1\pm 3}{4}$$

$$x_1=-1\quad x_2=\frac{1}{2}$$

$$L=\{-1;\frac{1}{2}\}$$

25)

$$x^2-\frac{x}{3}-8=0\,|\cdot 3$$

$D=R$

$3x^2-x-24=0$

$$x_{1/2}=\frac{1\pm\sqrt{1-4\cdot 3\cdot(-42)}}{6}=\frac{1\pm 17}{6}$$

$$x_2=3\quad x_2=-\frac{16}{6}=-\frac{8}{3}$$

$$L=\{3;-\frac{8}{3}\}$$

26)

$$x^2+\frac{1}{2}x+\frac{1}{8}=0\,|\cdot 8$$

$D=R$

$8x^2+4x+1=0$

$$x_{1/2}=\frac{-4\pm\sqrt{16-4\cdot 8\cdot 1}}{16}=\frac{-4\pm\sqrt{-16}}{16}$$

$L=\{\}$

27)

$$x^2 - \frac{3}{2}x - \frac{9}{16} = 0 \mid \cdot 16$$

$$D = R$$

$$16x^2 - 24x - 9 = 0$$

$$x_{1/2} = \frac{24 \pm \sqrt{24^2 - 4 \cdot 16 \cdot (-9)}}{32} = \frac{24 \pm \sqrt{1152}}{32} = \frac{24 \pm \sqrt{18 \cdot 64}}{32} = \frac{24 \pm \sqrt{18} \cdot \sqrt{64}}{32}$$

$$= \frac{24 \pm \sqrt{2 \cdot 9} \cdot 8}{32} = \frac{24 \pm \sqrt{2} \cdot 3 \cdot 8}{32} = \frac{3 \pm \sqrt{2} \cdot 3}{4}$$

$$L = \{\frac{3 - \sqrt{2} \cdot 3}{4}; \frac{3 + \sqrt{2} \cdot 3}{4}\}$$

28)

$$x^2 - \frac{22}{3}x + \frac{35}{3} = 0 \mid \cdot 3$$

$$D = R$$

$$3x^2 - 22x + 35 = 0$$

$$x_{1/2} = \frac{22 \pm \sqrt{22^2 - 4 \cdot 3 \cdot 35}}{6} = \frac{22 \pm 8}{6} = \frac{11 \pm 4}{3}$$

$$x_1 = 5 \quad x_2 = \frac{7}{3}$$

$$L = \{5; \frac{7}{3}\}$$

29)

$$3x^2 + 15x - 72 = 0 \mid : 3$$

$$D = R$$

$$x^2 + 5x - 24 = 0$$

$$x_{1/2} = \frac{-5 \pm \sqrt{25 - 4 \cdot 1 \cdot (-24)}}{2} = \frac{-5 \pm 11}{2}$$

$$x_1 = -8 \quad x_2 = 3$$

$$L = \{-8; 3\}$$

30)

$$36x^2 - 36x + 9 = 0 \mid : 9$$

$$D = R$$

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

$$x_{1/2} = \frac{4 \pm \sqrt{4^2 - 4 \cdot 4 \cdot 1}}{2 \cdot 4} = \frac{4}{8} = \frac{1}{2}$$

$$x_1 = \frac{1}{2} \quad x_2 = \frac{1}{2}$$

$$L = \{\frac{1}{2}\}$$

31)

$21x^2 + 28x - 84 = 0 \,|: 7$

$D = R$

$3x^2 + 4x - 12 = 0$

$$x_{1/2} = \frac{-4 \pm \sqrt{16 - 4 \cdot 3 \cdot (-12)}}{6} = \frac{-4 \pm \sqrt{160}}{6} = \frac{-4 \pm 4\sqrt{10}}{6} = \frac{-2 \pm 2\sqrt{10}}{3}$$

$$x_1 = \frac{-2 - 2\sqrt{10}}{3} \quad x_2 = \frac{-2 + 2\sqrt{10}}{3}$$

$$L = \{\frac{-2 - 2\sqrt{10}}{3}; \frac{-2 + 2\sqrt{10}}{3}\}$$

32)

$\frac{1}{6}x^2 - \frac{1}{6}x - 5 = 0 \,| \cdot 6$

$D = R$

$x^2 - x - 30 = 0$

$$x_{1/2} = \frac{1 \pm \sqrt{1 - 4 \cdot 1 \cdot (-30)}}{2} = \frac{1 \pm 11}{2}$$

$x_1 = 6 \quad x_2 = -5$

$L = \{6; -5\}$

33)

$\frac{2}{3}x^2 + x + \frac{1}{3} = 0 \,| \cdot 3$

$D = R$

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

$$x_{1/2} = \frac{-3 \pm \sqrt{9 - 4 \cdot 2 \cdot 1}}{4} = \frac{-3 \pm 1}{4}$$

$x_1 = -1 \quad x_2 = -\frac{1}{2}$

$L = \{-1; -\frac{1}{2}\}$

34)

$\frac{9}{10}x^2 + \frac{2}{5}x - \frac{1}{2} = 0 \,| \cdot 10$

$D = R$

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

$$x_{1/2} = \frac{-4 \pm \sqrt{16 - 4 \cdot 9 \cdot (-5)}}{18} = \frac{-4 \pm 14}{18} = \frac{-2 \pm 7}{9}$$

$x_1 = -1 \quad x_2 = -\frac{1}{2}$

$L = \{-1; -\frac{1}{2}\}$

35)

$x2 - 3{,}5x + 4 = 0$

$D = R$

$$x_{1/2} = \frac{3{,}5 \pm \sqrt{3{,}5^2 - 4 \cdot 1 \cdot 4}}{2}$$

$L = \{\}$

36)

$x^2 + 2{,}4x + 0{,}8 = 0 \mid \cdot 10$

$D = R$

$10x^2 + 24x + 8 = 0 \mid : 2$

$5x^2 + 12x + 4 = 0$

$x_{1/2} = \frac{12 \pm \sqrt{12^2 - 4 \cdot 5 \cdot 4}}{10} = \frac{-12 \pm 8}{10}$

$x_1 = -2 \quad x_2 = -\frac{4}{10}$

$L = \{-2; -\frac{4}{10}\}$

37)

$0{,}75x^2 + 0{,}5x - 1{,}25 = 0 \mid \cdot 100$

$D = R$

$75x^2 + 50 - 125 = 0 \mid : 25$

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

$x_{1/2} = \frac{-2 \pm \sqrt{4 - 4 \cdot 3 \cdot (-5)}}{6} = \frac{-2 \pm 8}{6} = \frac{-1 \pm 4}{3}$

$x_1 = -\frac{5}{3} \quad x_2 = 1$

$L = \{-\frac{5}{3}; 1\}$

38)

$(x+2)^2 = -5$

$D = R$

$Da - 5 < 0, gilt:$

$L = \{\}$

39)

$\frac{2x+1}{3} + \frac{9}{2x+1} = 4 \mid \cdot 3(2x+1)$

$D = R \setminus \left\{-\frac{1}{2}\right\}$

$(2x+1)^2 + 27 = 12(2x+1)$

$4x^2 + 4x + 1 + 27 = 24x + 12$

$4x^2 - 20x + 16 = 0 \mid : 4$

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

$x_{1/2} = \frac{5 \pm \sqrt{25 - 4 \cdot 1 \cdot 4}}{2} = \frac{5 \pm 3}{2}$

$x_1 = 4 \quad x_2 = 1$

$L = \{4; 1\}$

40)

$2 \cdot \frac{x-2}{5} + \frac{5}{x-2} = 3 \mid \cdot 5(x-2)$

$D = R \setminus \{2\}$

$2 \cdot (x-2)^2 + 25 = 15(x-2)$

$2(x^2 - 4x + 4) + 25 = 15x - 30$

$2x^2 - 8x + 8 + 25 = 15x - 30$

$2x^2 - 23x + 63 = 0$

$x_{1/2} = \frac{23 \pm \sqrt{23^2 - 4 \cdot 2 \cdot 63}}{4} = \frac{23 \pm 5}{4}$

$x_1 = 7 \quad x_2 = 4{,}5$

$L = \{4{,}5; 7\}$

41)

$$\frac{2x+1}{2}+\frac{10}{3-2x}=2\mid\cdot 2(3-2x)$$

$$D=R\setminus\{1{,}5\}$$

$$(2x+1)(3-2x)+20=4(3-2x)$$

$$6x+3-4x^2-2x+20=12-8x$$

$$-4x^2+12x+11=0\mid\cdot(-1)$$

$$4x2-12x-11=0$$

$$x_{1/2}=\frac{12\pm\sqrt{144-4\cdot 4\cdot(-11)}}{8}=$$

$$\frac{12\pm\sqrt{320}}{8}=\frac{12\pm\sqrt{64\cdot 5}}{8}=\frac{12\pm\sqrt{64}\cdot\sqrt{5}}{8}$$

$$=\frac{12\pm 8\cdot\sqrt{5}}{8}=\frac{3\pm 2\cdot\sqrt{5}}{2}$$

$$L=\{\frac{3-2\cdot\sqrt{5}}{2};\frac{3+2\cdot\sqrt{5}}{2}\}$$

42)

$$\frac{3x+4}{3}+\frac{18}{2-3x}=2\mid\cdot 3(2-3x)$$

$$D=R\setminus\left\{\frac{2}{3}\right\}$$

$$(3x+4)(2-3x)+54=6(2-3x)$$

$$6x+8-9x^2-12x+54=12-18x$$

$$-9x^2+12x+50=0\mid\cdot(-1)$$

$$9x^2-12x-50=0$$

$$x_{1/2}=\frac{12\pm\sqrt{144-4\cdot 9\cdot(-50)}}{18}=$$

$$\frac{12\pm\sqrt{1944}}{18}=\frac{12\pm\sqrt{3\cdot 81+2\cdot 4}}{18}=$$

$$\frac{12\pm\sqrt{3}\cdot\sqrt{81}+\sqrt{2}\cdot\sqrt{4}}{18}=\frac{12\pm\sqrt{3}\cdot 9+\sqrt{2}\cdot 2}{18}=$$

$$\frac{12\pm\sqrt{6}\cdot 18}{18}=\frac{2\pm\sqrt{6}\cdot 3}{3}$$

$$L=\{\frac{2-\sqrt{6}\cdot 3}{3};\frac{2+\sqrt{6}\cdot 3}{3}\}$$

43)

$$\frac{x+3}{x}+\frac{x}{x-2}=5\mid\cdot x(x-2)$$

$$D=R\setminus\{2\}$$

$$(x+3)(x-2)+x^2=5x(x-2)$$

$$x^2+3x-2x-6+x^2=5x^2-10x$$

$$-3x^2+11x-6=0\mid\cdot(-1)$$

$$3x^2-11x+6=0$$

$$x_{1/2}=\frac{11\pm\sqrt{121-4\cdot 3\cdot 6}}{6}=\frac{11\pm 7}{6}$$

$$x_1=3\quad x_2=\frac{2}{3}$$

$$L=\left\{3;\frac{2}{3}\right\}$$

44)

$$\frac{7-x}{x}-\frac{x}{x+8}=5\mid\cdot x(x+8)$$

$$D=R\setminus\{0;-8\}$$

$$(7-x)(x+8)-x^2=5x(x+8)$$

$$7x-x^2+56-8x-x^2=5x^2+40x$$

$$-7x^2-41x+56=0$$

$$x_{1/2}=\frac{41\pm\sqrt{41^2-4\cdot(-7)\cdot 56}}{-14}=\frac{41\pm 57}{-14}$$

$$x_1=-7\quad x_2=\frac{16}{14}=\frac{8}{7}$$

$$L=\left\{-7;\frac{8}{7}\right\}$$

45)

$$\frac{x}{2x-3}-\frac{1}{2x}=\frac{3}{4x-6}\mid\cdot HN=2x(2x-3)$$

$$D=R\setminus\left\{0;\frac{3}{2}\right\}$$

$$2x^2-(2x-3)=3x$$

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

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

$$x_{1/2}=\frac{5\pm\sqrt{25-4\cdot2\cdot3}}{4}=\frac{5\pm1}{4}$$

$$x_1=\frac{3}{2}\quad x_2=1$$

$$L=\{1\}$$

46)

$$\frac{2x}{x-4}+\frac{3x}{x+4}=\frac{4(x^2-x+4)}{x^2-16}\mid\cdot HN=(x-4)(x+4)$$

$$D=R\setminus\{4;-4\}$$

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

$$2x^2+8x+3x^2-12x=4x^2-4x+16$$

$$x^2=16$$

$$x_1=4\quad x_2=-4$$

$$L=\{\}$$

47)

$$\frac{3x^2+25}{x^2-25}+\frac{5-x}{5+x}=\frac{2x}{x-5}\mid\cdot HN=2(x-5)(x+5)$$

$$D=R\setminus\{5;-5\}$$

$$3x^2+25+(5-x)(x-5)=2x(x+5)$$

$$3x^2+25-(x-5)(x-5)=2x^2+10x$$

$$3x^2+25-(x^2-10x+25)=2x^2+10x$$

$$3x^2+25-x^2+10x-25=2x^2+10x$$

$$0=0$$

$$L=R\setminus\{5;-5\}$$

48)

$$\frac{9+2x}{9-x^2}=\frac{5}{3-x}-\frac{4+x}{6+2x}\mid\cdot HN=2(3-x)(3+x)$$

$$D=R\setminus\{3;-3\}$$

$$2(9+2x)=10(3+x)-(4+x)(3-x)$$

$$18+4x=30+10x-(12+3x-4x-x^2)$$

$$18+4x=30+10x-12+x+x2$$

$$-x^2-7x=0$$

$$-x(x+7)=0$$

$$x=0\vee x=-7$$

$$L=\{0;-7\}$$

49)

$$\frac{4x-3}{x-1}-\frac{10}{x+2}=\frac{5x}{x+2} \quad |\cdot(x-1)(x+2)$$

$D = R \setminus \{1; -2\}$

$(4x - 3)(x + 2) - 10(x - 1) = 5x(x - 1)$

$4x^2 - 3x + 8x - 6 - 10x + 10 = 5x^2 - 5x$

$-x^2 + 4 = 0$

$x^2 = 4$

$|x| = 2$

$L = \{2\}$

Proben:

1)

a)

$(-11)^2 = 121$

$121 = 121 \quad (w)$

b)

$11^2 = 121$

$121 = 121 \quad (w)$

2)

a)

$\left(-\frac{2}{3}\right)^2 = \frac{4}{9}$

$\frac{4}{9} = \frac{4}{9} \quad (w)$

b)

$\left(\frac{2}{3}\right)^2 = \frac{4}{9}$

$\frac{4}{9} = \frac{4}{9} \quad (w)$

4)

a)

$(2 \cdot 4 - 3)^2 = (4 - 6)^2 + 21$

$25 = 25 \quad (w)$

b)

$(2 \cdot (-4) - 3)^2 = (-4 - 6)^2 + 21$

$121 = 121 \quad (w)$

5)

a)

$(3 \cdot 2 + 1)^2 = 6 \cdot 2 + 37$

$49 = 49 \quad (w)$

b)

$(3 \cdot (-2) + 1)^2 = 6 \cdot (-2) + 37$

$25 = 25 \quad (w)$

6)

a)

$(3 - 4)^2 = 25 - 8 \cdot 3$

$1 = 1 \quad (w)$

b)

$(-3 - 4)^2 = 25 - 8 \cdot (-3)$

$49 = 49 \quad (w)$

7)

a)

$(2\sqrt{5} - 5)^2 = 45 - 20\sqrt{5}$

$(2\sqrt{5})^2 - 2 \cdot 2\sqrt{5} \cdot 5 + 5^2 = 45 - 20\sqrt{5}$

$2^2 \sqrt{5}^2 - 20\sqrt{5} + 25 = 45 - 20\sqrt{5}$

$20 - 20\sqrt{5} + 25 = 45 - 20\sqrt{5}$

$45 - 20\sqrt{5} = 45 - 20\sqrt{5} \quad (w)$

b)

$(2 \cdot (-\sqrt{5}) - 5)^2 = 45 - 20 \cdot (-\sqrt{5})$

$(2 \cdot (-\sqrt{5}))^2 - 2 \cdot 2 \cdot (-\sqrt{5}) \cdot 5 + 5^2 = 45 - 20 \cdot (-\sqrt{5})$

$2^2 \sqrt{5}^2 - 20\sqrt{5} + 25 = 45 - 20\sqrt{5}$

$20 - 20\sqrt{5} + 25 = 45 - 20\sqrt{5}$

$45 - 20\sqrt{5} = 45 - 20\sqrt{5} \quad (w)$

Proben:

1) $x^2 - 6x + 5 = 0$

$L = \{1;5\}$

$a)\ \text{Pr}obe: x = 1$

$1^2 - 6 \cdot 1 + 5 = 0$

$1 - 6 + 5 = 0$

$0 = 0 \quad (w)$

$b)\ \text{Pr}obe: x = (-5)$

$(-5)^2 + 6 \cdot (-5) + 5 = 0$

$25 - 30 + 5 = 0$

$0 = 0 \quad (w)$

2) $x^2 + 6x + 8 = 0$

$L = \{-2;-4\}$

$a)\ \text{Pr}obe: x = (-2)$

$(-2)^2 + 6 \cdot (-2) + 8 = 0$

$4 - 12 + 8 = 0$

$0 = 0 \quad (w)$

$b)\ \text{Pr}obe: x = (-4)$

$(-4)^2 + 6 \cdot (-4) + 8 = 0$

$16 - 24 + 8 = 0$

$0 = 0 \quad (w)$

3) $x^2 - 10x + 21 = 0$

$L = \{3;7\}$

$a)\ \text{Pr}obe: x = 3$

$3^2 - 10 \cdot 3 + 21 = 0$

$9 - 30 + 21 = 0$

$0 = 0 \quad (w)$

$b)\ \text{Pr}obe: x = 7$

$(7)^2 - 10 \cdot (7) + 21 = 0$

$49 - 70 + 21 = 0$

$0 = 0 \quad (w)$

4) $x^2 + 6x + 5 = 0$

$L = \{-1;-5\}$

$a)\ \text{Pr}obe: x = (-1)$

$(-1)^2 + 6 \cdot (-1) + 5 = 0$

$1 - 6 + 5 = 0$

$0 = 0 \quad (w)$

$b)\ \text{Pr}obe: x = (-5)$

$(-5)^2 + 6 \cdot (-5) + 5 = 0$

$25 - 30 + 5 = 0$

$0 = 0 \quad (w)$

5) $x^2 - 4x - 5 = 0$

$L = \{5;-1\}$

$a)\ \text{Pr}obe: x = 5$

$(5)^2 - 4 \cdot (5) - 5 = 0$

$25 - 20 - 5 = 0$

$0 = 0 \quad (w)$

$b)\ \text{Pr}obe: x = (-1)$

$(-1)^2 - 4 \cdot (-1) - 5 = 0$

$1 + 4 - 5 = 0$

$0 = 0 \quad (w)$

6) $x^2+11x+24=0$

$L=\{-3;-8\}$

$a)\ \text{Pr}obe: x=(-3)$

$(-3)^2+11\cdot(-3)+24=0$

$9-33+24=0$

$0=0 \quad (w)$

$b)\ \text{Pr}obe: x=-8$

$(-8)^2+11\cdot(-8)+24=0$

$64-88+24=0$

$0=0 \quad (w)$

7) $2x^2+11x+5=0$

$L=\left\{-\frac{1}{2};-5\right\}$

$a)\ \text{Pr}obe: x=\left(-\frac{1}{2}\right)$

$2\cdot\left(-\frac{1}{2}\right)^2+11\cdot\left(-\frac{1}{2}\right)+5=0$

$\frac{1}{2}-\frac{11}{2}+5=0$

$0=0 \quad (w)$

$b)\ \text{Pr}obe: x=(-5)$

$2\cdot(-5)^2+11\cdot(-5)+5=0$

$50-55+5=0$

$0=0 \quad (w)$

8) $2x^2+9x+7=0$

$L=\left\{-1;-\frac{7}{2}\right\}$

$a)\ \text{Pr}obe: x=(-1)$

$2\cdot(-1)^2+9\cdot(-1)+7=0$

$2-9+7=0$

$0=0 \quad (w)$

$b)\ \text{Pr}obe: x=(-\frac{7}{2})$

$2\cdot\left(-\frac{7}{2}\right)^2+9\cdot(-\frac{7}{2})+7=0$

$\frac{98}{4}-\frac{63}{2}+7=0$

$\frac{49}{2}-\frac{63}{2}+7=0$

$(-7)+7=0$

$0=0 \quad (w)$

9) $3x^2-11x+10=0$

$L=\left\{2;\frac{5}{3}\right\}$

$a)\ \text{Pr}obe: x=2$

$3\cdot(2)^2-11\cdot(2)+10=0$

$12-22+10=0$

$0=0 \quad (w)$

$b)\ \text{Pr}obe: x=\frac{5}{3}$

$3\cdot\left(\frac{5}{3}\right)^2-11\cdot\frac{5}{3}+10=0$

$\frac{75}{9}-\frac{55}{3}+10=0$

$\frac{25}{3}-\frac{55}{3}+10=0$

$-10+10=0$

$0=0 \quad (w)$

10) $x^2 - 4x + 1 = 0$

$L = \{2+\sqrt{3}; 2-\sqrt{3}\}$

$a)\ \text{Pr}obe: x = 2+\sqrt{3}$

$(2+\sqrt{3})^2 - 4\cdot(2+\sqrt{3}) + 1 = 0$

$(4+4\cdot\sqrt{3}+3) - (8+4\cdot\sqrt{3}) + 1 = 0$

$8 - 8 = 0$

$0 = 0 \quad (w)$

$b)\ \text{Pr}obe: x = 2-\sqrt{3}$

$(2-\sqrt{3})^2 - 4\cdot(2-\sqrt{3}) + 1 = 0$

$4 - 4\cdot\sqrt{3} + 3 - (8 - 4\cdot\sqrt{3}) + 1 = 0$

$4 + 3 - 8 + 1 = 0$

$0 = 0 \quad (w)$

11) $x^2 + 6x + 7 = 0$

$L = \{-3+\sqrt{2}; -3-\sqrt{2}\}$

$a)\ \text{Pr}obe: x = (-3+\sqrt{2})$

$(-3+\sqrt{2})^2 + 6\cdot(-3+\sqrt{2}) + 7 = 0$

$(9 - 6\cdot\sqrt{2} + 2) + (-18 + 6\cdot\sqrt{2}) + 7$

$11 - 18 + 7 = 0$

$0 = 0 \quad (w)$

$b)\ \text{Pr}obe: x = (-3-\sqrt{2})$

$(-3-\sqrt{2})^2 + 6\cdot(-3-\sqrt{2}) + 7 = 0$

$9 + 6\cdot\sqrt{2} + 2 - 18 - 6\cdot\sqrt{2} + 7 = 0$

$9 + 2 - 18 + 7 = 0$

$0 = 0 \quad (w)$

12) $x^2 - 8x + 11 = 0$

$L = \{4+\sqrt{5}; 4-\sqrt{5}\}$

$a)\ \text{Pr}obe: x = (4+\sqrt{5})$

$(4+\sqrt{5})^2 - 8\cdot(4+\sqrt{5}) + 11 = 0$

$(16 + 8\cdot\sqrt{5} + 5) - (32 + 8\cdot\sqrt{5}) + 11 = 0$

$21 - 32 + 11 = 0$

$0 = 0 \quad (w)$

$b)\ \text{Pr}obe: x = (4-\sqrt{5})$

$(4-\sqrt{5})^2 - 8\cdot(4-\sqrt{5}) + 11 = 0$

$16 - 8\cdot\sqrt{5} + 5 - 32 + 8\cdot\sqrt{5} + 11 = 0$

$16 + 5 - 32 + 11 = 0$

$0 = 0 \quad (w)$

13) $4x^2 - 12x + 9 = 0$

$L = \left\{\frac{3}{2}\right\}$

$a)\ \text{Pr}obe: x = \frac{3}{2}$

$4\cdot\left(\frac{3}{2}\right)^2 - 12\cdot\left(\frac{3}{2}\right) + 9 = 0$

$\frac{36}{4} - \frac{36}{2} + 9 = 0$

$-9 + 9 = 0$

$0 = 0 \quad (w)$

14) $3x^2-10x+6=0$

$L=\left\{\frac{5}{3}+\frac{\sqrt{7}}{3};\frac{5}{3}-\frac{\sqrt{7}}{3}\right\}$

$a)\ \text{Pr}obe: x=\left(\frac{5}{3}+\frac{\sqrt{7}}{3}\right)$

$3\cdot\left(\frac{5}{3}+\frac{\sqrt{7}}{3}\right)^2-10\cdot\left(\frac{5}{3}+\frac{\sqrt{7}}{3}\right)+6=0$

$3\cdot\left(\frac{25}{9}+2\cdot\frac{5\sqrt{7}}{9}+\frac{7}{9}\right)-\left(\frac{50}{3}+\frac{10\sqrt{7}}{3}\right)+6=0$

$\frac{75}{9}+\frac{30\sqrt{7}}{9}+\frac{21}{9}-\frac{50}{3}-\frac{10\sqrt{7}}{3}+6=0$

$\frac{75}{9}+\frac{30\sqrt{7}}{9}+\frac{21}{9}-\frac{150}{9}-\frac{30\sqrt{7}}{9}+6=0$

$\frac{75}{9}+\frac{21}{9}-\frac{150}{9}+\frac{54}{9}=0$

$\frac{150}{9}-\frac{150}{9}=0$

$0=0\quad (w)$

$b)\ \text{Pr}obe: x=\frac{5}{3}-\frac{\sqrt{7}}{3}$

$3\cdot\left(\frac{5}{3}-\frac{\sqrt{7}}{3}\right)^2-10\cdot\left(\frac{5}{3}-\frac{\sqrt{7}}{3}\right)+6=0$

$3\cdot\left(\frac{25}{9}-2\frac{5\sqrt{7}}{9}+\frac{7}{9}\right)-\frac{50}{3}+\frac{10\sqrt{7}}{3}+6=0$

$\frac{75}{9}-\frac{30\sqrt{7}}{9}+\frac{21}{9}-\frac{50}{3}+\frac{10\sqrt{7}}{3}+6=0$

$\frac{75}{9}-\frac{30\sqrt{7}}{9}+\frac{21}{9}-\frac{150}{9}+\frac{30\sqrt{7}}{9}+\frac{54}{9}=0$

$\frac{75}{9}+\frac{21}{9}-\frac{150}{9}+\frac{54}{9}=0$

$0=0\quad (w)$

15) $x^2+7x+16=0$

$L=\{\ \}$

16) $7x^2+33x+36=0$

$L=\left\{-3;-\frac{12}{7}\right\}$

$a)\ \text{Pr}obe: x=(-3)$

$7\cdot(-3)^2+33\cdot(-3)+36=0$

$63-99+36=0$

$0=0\quad (w)$

$b)\ \text{Pr}obe: x=\left(-\frac{12}{7}\right)$

$7\cdot\left(-\frac{12}{7}\right)^2+33\cdot\left(-\frac{12}{7}\right)+36=0$

$\frac{1008}{49}-\frac{2772}{49}+\frac{1764}{49}=0$

$0=0\quad (w)$

17) $35x^2-137x+132=0$

$L=\left\{\frac{11}{5};\frac{12}{7}\right\}$

$a)\ \text{Pr}obe: x=\frac{11}{5}$

$35\cdot\left(\frac{11}{5}\right)^2-137\cdot\left(\frac{11}{5}\right)+132=0$

$\frac{4235}{25}-\frac{7535}{25}+\frac{3300}{25}=0$

$0=0\quad (w)$

$b)\ \text{Pr}obe: x=\frac{12}{7}$

$35\cdot\left(\frac{12}{7}\right)^2-137\cdot\left(\frac{12}{7}\right)+132=0$

$\frac{5040}{49}-\frac{11508}{49}+\frac{6468}{49}=0$

$0=0\quad (w)$

18) $80x^2-166x+51=0$

$L=\left\{\frac{17}{10};\frac{3}{8}\right\}$

$a)\ \text{Pr}obe: x=\frac{17}{10}$

$80\cdot\left(\frac{17}{10}\right)^2-166\cdot\left(\frac{17}{10}\right)+51=0$

$\frac{23120}{100}-\frac{28220}{100}+\frac{5100}{100}=0$

$0=0\quad (w)$

$b)\ \text{Pr}obe: x=\frac{3}{8}$

$80\cdot\left(\frac{3}{8}\right)^2-166\cdot\frac{3}{8}+51=0$

$\frac{720}{64}-\frac{3984}{64}+\frac{3264}{64}=0$

$0=0\quad (w)$

19) $108x^2+249x+136=0$

$L=\left\{-\frac{17}{12};-\frac{8}{9}\right\}$

$a)\ \text{Pr}obe: x=\left(-\frac{17}{12}\right)$

$108\cdot\left(-\frac{17}{12}\right)^2+249\cdot\left(-\frac{17}{12}\right)+136=0$

$\frac{31212}{144}-\frac{50796}{144}+\frac{19584}{144}=0$

$0=0\quad (w)$

$b)\ \text{Pr}obe: x=\left(-\frac{8}{9}\right)$

$108\cdot\left(-\frac{8}{9}\right)^2+249\cdot\left(-\frac{8}{9}\right)+136=0$

$\frac{6912}{81}-\frac{17928}{81}+\frac{11016}{81}=0$

$0=0\quad (w)$

20) $85x^2+239x-170=0$

$L=\left\{-3{,}4;\frac{10}{17}\right\}$

$a)\ \text{Pr}obe: x=(-3{,}4)$

$85\cdot(-3{,}4)^2+239\cdot(-3{,}4)-170=0$

$982{,}6-812{,}6-170=0$

$0=0\quad (w)$

$b)\ \text{Pr}obe: x=\frac{10}{17}$

$85\cdot\left(\frac{10}{17}\right)^2+239\cdot\frac{10}{17}-170=0$

$\frac{8500}{289}+\frac{40630}{289}-\frac{49130}{289}=0$

$0=0\quad (w)$

21) $36x^2+167x+187=0$

$L=\left\{-\frac{17}{9};-\frac{11}{4}\right\}$

$a)\ \text{Pr}\,obe: x=\left(-\frac{17}{9}\right)$

$36\cdot\left(-\frac{17}{9}\right)^2+167\cdot\left(-\frac{17}{9}\right)+187=0$

$\frac{10404}{81}-\frac{25551}{81}+\frac{15147}{81}=0$

$0=0\quad (w)$

$b)\ \text{Pr}\,obe: x=\left(-\frac{11}{4}\right)$

$36\cdot\left(-\frac{11}{4}\right)^2+167\cdot\left(-\frac{11}{4}\right)+187=0$

$\frac{4356}{16}-\frac{7348}{16}+\frac{2992}{16}=0$

$0=0\quad (w)$

22) $x^2-1{,}6x+0{,}63=0$

$L=\left\{\frac{9}{10};\frac{7}{10}\right\}$

$a)\ \text{Pr}\,obe: x=\frac{9}{10}$

$\left(\frac{9}{10}\right)^2-1{,}6\cdot\left(\frac{9}{10}\right)+0{,}63=0$

$\frac{81}{100}-\frac{144}{100}+\frac{63}{100}=0$

$0=0\quad (w)$

$b)\ \text{Pr}\,obe: x=\frac{7}{10}$

$\left(\frac{7}{10}\right)^2-1{,}6\cdot\left(\frac{7}{10}\right)+0{,}63=0$

$\frac{49}{100}-\frac{112}{100}+\frac{63}{100}=0$

$0=0\quad (w)$

23) $x^2-6{,}3x-204{,}7=0$

$L=\{-11{,}5;17{,}8\}$

$a)\ \text{Pr}\,obe: x=(-11{,}5)$

$(-11{,}5)^2-6{,}3\cdot(-11{,}5)-204{,}7=0$

$132{,}25+72{,}45-204{,}7=0$

$0=0\quad (w)$

$b)\ \text{Pr}\,obe: x=17{,}8$

$17{,}8^2-6{,}3\cdot 17{,}8-204{,}7=0$

$316{,}84-112{,}14-204{,}7=0$

$0=0\quad (w)$

24) $x^2+\frac{1}{2}x-\frac{1}{2}=0$

$L=\left\{-1;\frac{1}{2}\right\}$

$a)\ \text{Pr}\,obe: x=(-1)$

$(-1)^2+\frac{1}{2}\cdot(-1)-\frac{1}{2}=0$

$\frac{2}{2}-\frac{1}{2}-\frac{1}{2}=0$

$0=0\quad (w)$

$b)\ \text{Pr}\,obe: x=\frac{1}{2}$

$\left(\frac{1}{2}\right)^2+\frac{1}{2}\cdot\frac{1}{2}-\frac{1}{2}=0$

$\frac{1}{4}+\frac{1}{4}-\frac{2}{4}=0$

$0=0\quad (w)$

25) $x^2-\frac{x}{3}-8=0$

$L=\left\{3;-\frac{8}{3}\right\}$

$a)\ \text{Pr}obe: x=3$

$3^2-\frac{3}{3}-8=0$

$9-1-8=0$

$0=0 \quad (w)$

$b)\ \text{Pr}obe: x=\left(-\frac{8}{3}\right)$

$\left(-\frac{8}{3}\right)^2-\frac{\left(-\frac{8}{3}\right)}{3}-8=0$

$\frac{64}{9}+\frac{8}{9}-\frac{72}{9}=0$

$0=0 \quad (w)$

27) $x^2-\frac{3}{2}x-\frac{9}{16}=0$

$L=\left\{\frac{3-\sqrt{2}\cdot 3}{4};\frac{3+\sqrt{2}\cdot 3}{4}\right\}$

$a)\ \text{Pr}obe: x=\frac{3-\sqrt{2}\cdot 3}{4}$

$\left(\frac{3-\sqrt{2}\cdot 3}{4}\right)^2-\frac{3}{2}\cdot\left(\frac{3-\sqrt{2}\cdot 3}{4}\right)-\frac{9}{16}=0$

$\left(\frac{9-18\cdot\sqrt{2}+18}{16}\right)-\left(\frac{9-9\cdot\sqrt{2}}{8}\right)-\frac{9}{16}=0$

$\left(\frac{27-18\cdot\sqrt{2}}{16}\right)-\left(\frac{18-18\cdot\sqrt{2}}{16}\right)-\frac{9}{16}=0$

$\frac{9}{16}-\frac{9}{16}=0$

$0=0 \quad (w)$

$b)\ \text{Pr}obe: x=\frac{3+\sqrt{2}\cdot 3}{4}$

$\left(\frac{3+\sqrt{2}\cdot 3}{4}\right)^2-\frac{3}{2}\cdot\left(\frac{3+\sqrt{2}\cdot 3}{4}\right)-\frac{9}{16}=0$

$\left(\frac{9+18\cdot\sqrt{2}+18}{16}\right)-\left(\frac{9+9\cdot\sqrt{2}}{8}\right)-\frac{9}{16}=0$

$\left(\frac{27+18\cdot\sqrt{2}}{16}\right)-\left(\frac{18+18\cdot\sqrt{2}}{16}\right)-\frac{9}{16}=0$

$\frac{9}{16}-\frac{9}{16}=0$

$0=0 \quad (w)$

28) $x^2-\frac{22}{3}x+\frac{35}{3}=0$

$L=\left\{5;\frac{7}{3}\right\}$

$a)\ \text{Pr}obe: x=5$

$5^2-\frac{22}{3}\cdot 5+\frac{35}{3}=0$

$25-\frac{110}{3}+\frac{35}{3}=0$

$\frac{75}{3}-\frac{110}{3}+\frac{35}{3}=0$

$0=0 \quad (w)$

$b)\ \text{Pr}obe: x=\frac{7}{3}$

$\left(\frac{7}{3}\right)^2-\frac{22}{3}\cdot\frac{7}{3}+\frac{35}{3}=0$

$\frac{49}{9}-\frac{154}{9}+\frac{105}{9}=0$

$0=0 \quad (w)$

29) $3x^2 - 15x - 72 = 0$

$L = \{-8; 33\}$

$a)\ \text{Pr}obe: x = -8$

$3 \cdot (-8)^2 + 15 \cdot (-8) - 72 = 0$

$192 - 120 - 72 = 0$

$0 = 0 \quad (w)$

$b)\ \text{Pr}obe\ x = 3$

$3 \cdot (3)^2 + 15 \cdot (3) - 72 = 0$

$27 + 45 - 72 = 0$

$0 = 0 \quad (w)$

30) $36x^2 - 36x + 9 = 0$

$L = \left\{\frac{1}{2}\right\}$

$a)\ \text{Pr}obe: x = \frac{1}{2}$

$36 \cdot \left(\frac{1}{2}\right)^2 - 36 \cdot \left(\frac{1}{2}\right) + 9 = 0$

$9 - 18 + 9 = 0(w)$

$0 = 0(w)$

31) $21x^2 + 28x - 84 = 0$

$L = \left\{\frac{-2 - 2\sqrt{10}}{3}; \frac{-2 + 2\sqrt{10}}{3}\right\}$

$a)\ \text{Pr}obe: x = \frac{-2 - 2\sqrt{10}}{3}$

$21 \cdot \left(\frac{-2 - 2\sqrt{10}}{3}\right)^2 + 28 \cdot \left(\frac{-2 - 2\sqrt{10}}{3}\right) - 84 = 0$

$21 \cdot \left(\frac{4 - 8 \cdot \sqrt{10} + 40}{9}\right) - \frac{56 - 56 \cdot \sqrt{10}}{3} - 84 = 0$

$\left(\frac{84 - 168 \cdot \sqrt{10} + 840}{9}\right) - \left(\frac{168 - 168 \cdot \sqrt{10}}{9}\right) - \frac{756}{9} = 0$

$\frac{84 + 840 - 168 - 756}{9} = 0$

$\frac{0}{9} = 0$

$0 = 0 \quad (w)$

$b)\,\mathrm{Pr}\,obe: x=\dfrac{-2+2\sqrt{10}}{3}$

$21\cdot\left(\dfrac{-2+2\sqrt{10}}{3}\right)^2+28\cdot\left(\dfrac{-2+2\sqrt{10}}{3}\right)-84=0$

$21\cdot\left(\dfrac{4-8\cdot\sqrt{10}+40}{9}\right)-\dfrac{56+56\cdot\sqrt{10}}{3}-84=0$

$\left(\dfrac{84-168\cdot\sqrt{10}+840}{9}\right)-\left(\dfrac{168-168\cdot\sqrt{10}}{9}\right)-\dfrac{756}{9}=0$

$\dfrac{84+840-168-756}{9}=0$

$\dfrac{0}{9}=0$

$0=0\quad(w)$

32) $\dfrac{1}{6}x^2-\dfrac{1}{6}x-5=0$

$L=\{6;-5\}$

$a)\,\mathrm{Pr}\,obe: x=6$

$\dfrac{1}{6}\cdot 6-\dfrac{1}{6}\cdot 6-5=0$

$6-1-5=0$

$0=0\quad(w)$

$b)\,\mathrm{Pr}\,obe: x=(-5)$

$\dfrac{1}{6}\cdot(-5)^2-\dfrac{1}{6}\cdot(-5)-5=0$

$\dfrac{25}{6}+\dfrac{5}{6}-\dfrac{30}{6}=0$

$0=0\quad(w)$

33) $\dfrac{2}{3}x^2+x+\dfrac{1}{3}=0$

$L=\left\{-1;-\dfrac{1}{2}\right\}$

$a)\,\mathrm{Pr}\,obe: x=(-1)$

$\dfrac{2}{3}\cdot(-1)^2+(-1)+\dfrac{1}{3}=0$

$\dfrac{2}{3}-\dfrac{3}{3}+\dfrac{1}{3}=0$

$0=0\quad(w)$

$b)\,\mathrm{Pr}\,obe: x=\left(-\dfrac{1}{2}\right)$

$\dfrac{2}{3}\cdot\left(-\dfrac{1}{2}\right)^2+\left(-\dfrac{1}{2}\right)+\dfrac{1}{3}=0$

$\dfrac{1}{6}-\dfrac{3}{6}+\dfrac{2}{6}=0$

$0=0\quad(w)$

34) $\frac{9}{10}x^2+\frac{2}{5}x-\frac{1}{2}=0$

$L=\left\{-1;-\frac{1}{2}\right\}$

$a)\ \text{Pr}obe: x=(-1)$

$\frac{9}{10}\cdot(-1)^2+\frac{2}{5}\cdot(-1)-\frac{1}{2}=0$

$\frac{9}{10}-\frac{4}{10}-\frac{5}{10}=0$

$0=0 \quad (w)$

$b)\ \text{Pr}obe\ x=\left(-\frac{1}{2}\right)$

$\frac{9}{10}\cdot\left(-\frac{1}{2}\right)^2+\frac{2}{5}\cdot\left(-\frac{1}{2}\right)-\frac{1}{2}=0$

$\frac{9}{40}-\frac{8}{40}-\frac{20}{40}=0$

$0=0 \quad (w)$

35) $x^2-3{,}5x+4=0$

$L=\{\ \}$

36) $x^2+2{,}4x+0{,}8=0$

$L=\left\{-2;\frac{4}{10}\right\}$

$a)\ \text{Pr}obe: x=(-2)$

$(-2)^2+2{,}4\cdot(-2)+0{,}8=0$

$4-4{,}8+0{,}8=0$

$0=0 \quad (w)$

$b)\ \text{Pr}obe: x=\left(-\frac{4}{10}\right)$

$\left(-\frac{4}{10}\right)^2+2{,}4\cdot\left(-\frac{4}{10}\right)+0{,}8=0$

$\frac{16}{100}-\frac{96}{100}+\frac{80}{100}=0$

$0=0 \quad (w)$

37) $0{,}75x^2+0{,}5x-1{,}25=0$

$L=\left\{-\frac{5}{3};1\right\}$

$a)\ \text{Pr}obe: x=\left(-\frac{5}{3}\right)$

$\frac{3}{4}\cdot\left(-\frac{5}{3}\right)^2+\frac{1}{2}\cdot\left(-\frac{5}{3}\right)-\frac{5}{4}=0$

$\frac{75}{36}-\frac{30}{36}-\frac{45}{36}=0$

$0=0 \quad (w)$

$b)\ \text{Pr}obe: x=1$

$0{,}75\cdot1^2+0{,}5\cdot1-1{,}25=0$

$0{,}75+0{,}5-1{,}25=0$

$0=0 \quad (w)$

38) $(x+2)^2 = -5$

$L = \{\ \}$

39) $\frac{2x+1}{3} + \frac{9}{2x+1} = 4$

$L = \{4;1\}$

$a)\ \text{Pr}obe: x = 4$

$\frac{2\cdot 4+1}{3} + \frac{9}{2\cdot 4+1} = 4$

$\frac{27}{9} + \frac{9}{9} = 4$

$4 = 4 \quad (w)$

$b)\ \text{Pr}obe: x = 1$

$\frac{2\cdot 1+1}{3} + \frac{9}{2\cdot 1+1} = 4$

$1 + 3 = 4$

$4 = 4 \quad (w)$

40) $2\cdot\frac{x-2}{5} + \frac{5}{x-2} = 3$

$L = \{4{,}5\,;7\}$

$a)\ \text{Pr}obe: x = 4{,}5$

$2\cdot\frac{4{,}5-2}{5} + \frac{5}{4{,}5-2} = 3$

$\frac{9-4}{5} + \frac{5}{2{,}5} = 3$

$1 + 2 = 3$

$3 = 3 \quad (w)$

$b)\ \text{Pr}obe: x = 7$

$2\cdot\frac{7-2}{5} + \frac{5}{7-2} = 3$

$2 + 1 = 3$

$3 = 3 \quad (w)$

41) $\frac{2x+1}{2}+\frac{10}{3-2x}=2$

$L=\{\frac{3-2\cdot\sqrt{5}}{2};\frac{3+2\cdot\sqrt{5}}{2}\}$

$a)\,\mathrm{Pr}\,obe: x=\frac{3-2\cdot\sqrt{5}}{2}$

$$\frac{2\cdot\frac{3-2\cdot\sqrt{5}}{2}+1}{2}+\frac{10}{3-2\cdot\frac{3-2\cdot\sqrt{5}}{2}}=2$$

$$\frac{3-2\cdot\sqrt{5}+1}{2}+\frac{10}{3-(3-2\cdot\sqrt{5})}=2$$

$$\frac{3-2\cdot\sqrt{5}+1}{2}+\frac{10}{3-(3-2\cdot\sqrt{5})}=2$$

$$\frac{4-2\cdot\sqrt{5}}{2}+\frac{10}{2\cdot\sqrt{5}}=2$$

$$\frac{2(2-\sqrt{5})}{2}+\frac{5}{\sqrt{5}}=2$$

$$2-\sqrt{5}+\sqrt{5}=2$$

$2=2\quad(w)$

$b)\,\mathrm{Pr}\,obe: x=\frac{3+2\cdot\sqrt{5}}{2}$

$$\frac{2\cdot\frac{3+2\cdot\sqrt{5}}{2}+1}{2}+\frac{10}{3-2\cdot\frac{3+2\cdot\sqrt{5}}{2}}=2$$

$$\frac{3+2\cdot\sqrt{5}+1}{2}+\frac{10}{3-(3+2\cdot\sqrt{5})}=2$$

$$\frac{4+2\cdot\sqrt{5}}{2}+\frac{10}{-2\cdot\sqrt{5}}=2$$

$$\frac{2(2+\sqrt{5})}{2}-\frac{5}{\sqrt{5}}=2$$

$$2+\sqrt{5}-\sqrt{5}=2$$

$2=2\quad(w)$

42) $\frac{3x+4}{3}+\frac{18}{2-3x}=2$

$L=\{\frac{2-\sqrt{6}\cdot 3}{3};\frac{2+\sqrt{6}\cdot 3}{3}\}$

$a)\,\mathrm{Pr}obe: x=\frac{2-\sqrt{6}\cdot 3}{3}$

$$\frac{3\cdot\frac{2-\sqrt{6}\cdot 3}{3}+4}{3}+\frac{18}{2-3\cdot\frac{2-\sqrt{6}\cdot 3}{3}}=2$$

$$\frac{2-\sqrt{6}\cdot 3+4}{3}+\frac{18}{2-(2-\sqrt{6}\cdot 3)}=2$$

$$\frac{6-\sqrt{6}\cdot 3}{3}+\frac{18}{\sqrt{6}\cdot 3}=2$$

$$\frac{3(2-\sqrt{6})}{3}+\frac{6}{\sqrt{6}}=2$$

$$2-\sqrt{6}+\sqrt{6}=2$$

$2=2 \quad (w)$

$b)\,\mathrm{Pr}obe: x=\frac{2+\sqrt{6}\cdot 3}{3}$

$$\frac{3\cdot\frac{2+\sqrt{6}\cdot 3}{3}+4}{3}+\frac{18}{2-3\cdot\frac{2+\sqrt{6}\cdot 3}{3}}=2$$

$$\frac{2+\sqrt{6}\cdot 3+4}{3}+\frac{18}{2-(2+\sqrt{6}\cdot 3)}=2$$

$$\frac{6+\sqrt{6}\cdot 3}{3}+\frac{18}{-\sqrt{6}\cdot 3}=2$$

$$\frac{3(2+\sqrt{6})}{3}-\frac{6}{\sqrt{6}}=2$$

$$2+\sqrt{6}-\sqrt{6}=2$$

$2=2 \quad (w)$

43) $\frac{x+3}{x}+\frac{x}{x-2}=5$

$L=\left\{3;\frac{2}{3}\right\}$

$a)\ \text{Pr}obe: x=3$

$\frac{3+3}{3}+\frac{3}{3-2}=5$

$\frac{6}{3}+\frac{3}{1}=5$

$2+3=5$

$5=5 \quad (w)$

$b)\ \text{Pr}obe: x=\frac{2}{3}$

$\frac{\frac{2}{3}+3}{\frac{2}{3}}+\frac{\frac{2}{3}}{\frac{2}{3}-2}=5$

$\frac{\frac{11}{3}}{\frac{2}{3}}+\frac{\frac{2}{3}}{-\frac{4}{3}}=5$

$\frac{33}{6}+\left(-\frac{6}{12}\right)=5$

$\frac{66}{12}-\frac{6}{12}=5$

$\frac{60}{12}=5$

$5=5 \quad (w)$

44) $\frac{7-x}{x}-\frac{x}{x+8}=5$

$L=\left\{-7;\frac{8}{7}\right\}$

$a)\ \text{Pr}obe: x=(-7)$

$\frac{7-(-7)}{-7}-\frac{-7}{(-7)+8}=5$

$-2+7=5$

$5=5 \quad (w)$

$b)\ \text{Pr}obe: x=\frac{8}{7}$

$\frac{7-\frac{8}{7}}{\frac{8}{7}}-\frac{\frac{8}{7}}{\frac{8}{7}+8}=5$

$\frac{\frac{41}{7}}{\frac{8}{7}}-\frac{\frac{8}{7}}{\frac{64}{7}}=5$

$\frac{287}{56}-\frac{56}{448}=5$

$\frac{2296}{448}-\frac{56}{448}=5$

$5=5 \quad (w)$

45) $\frac{x}{2x-3}-\frac{1}{2x}=\frac{3}{4x-6}$

$L=\{1\}$

$a)\ \text{Pr}obe: x=1$

$\frac{1}{2\cdot 1-3}-\frac{1}{2\cdot 1}=\frac{3}{4\cdot 1-6}$

$\frac{1}{-1}-\frac{1}{2}=\frac{3}{-2}$

$-\frac{2}{2}-\frac{1}{2}=-\frac{3}{2}$

$0=0 \quad (w)$

46) $\frac{2x}{x-4}+\frac{3x}{x+4}=\frac{4(x^2-x+4)}{x^2-16}$

$L=\{\ \}$

48) $\frac{9+2x}{9-x^2}=\frac{5}{3-x}-\frac{4+x}{6+2x}$

$L=\{0;-7\}$

$a)\ \text{Pr}obe: x=0$

$\frac{9+2\cdot 0}{9-0^2}=\frac{5}{3-0}-\frac{4+0}{6+2\cdot 0}$

$\frac{9}{9}=\frac{5}{3}-\frac{4}{6}$

$1=\frac{10}{6}-\frac{4}{6}$

$1=1\quad (w)$

$b)\ \text{Pr}obe: x=(-7)$

$\frac{9+2\cdot(-7)}{9-(-7)^2}=\frac{5}{3-(-7)}-\frac{4+(-7)}{6+2(-7)}$

$\frac{-5}{-40}=\frac{5}{10}-\frac{-3}{-8}$

$\frac{5}{40}=\frac{20}{40}-\frac{15}{40}$

$\frac{5}{40}=\frac{5}{40}\quad (w)$

49) $\frac{4x-3}{x-1}-\frac{10}{x+2}=\frac{5x}{x+2}$

$L=\{2\}$

$\text{Pr}obe: x=2$

$\frac{4\cdot 2-3}{2-1}-\frac{10}{2+2}=\frac{5\cdot 2}{2+2}$

$\frac{5}{1}-\frac{10}{4}=\frac{10}{4}$

$2{,}5=2{,}5\ \ (w)$