Verbesserung KW 02

Aufgabe 1:

a) $x^2 + 15x + 56 = 0$

$$D = b^2 - 4ac = 15^2 - 4 \cdot 1 \cdot 56 = 1$$
$$x_{1,2} = \frac{-b \pm \sqrt{D}}{2a} = \frac{-15 \pm \sqrt{1}}{2}$$
$$x_1 = -7 \qquad x_2 = -8 \qquad \mathbb{L} = \{-8, -7\}$$

b) $x^2 = -10x - 25$

$$x^2 + 10x + 25 = 0 \qquad |\text{binom. Formel}$$
$$(x+5)^2 = 0$$
$$x = -5 \qquad \mathbb{L} = \{-5\}$$

c) $x^2 - 9x = 10$

$$x^2 - 9x - 10 = 0$$
$$D = b^2 - 4ac = (-9)^2 - 4 \cdot 1 \cdot (-10) = 121$$
$$x_{1,2} = \frac{-b \pm \sqrt{D}}{2a} = \frac{9 \pm \sqrt{121}}{2}$$
$$x_1 = 10 \qquad x_2 = -1 \qquad \mathbb{L} = \{-1, 10\}$$

d) $3x = 5$ (lineare Gleichung)

$$x = \frac{5}{3} \qquad \mathbb{L} = \{\frac{5}{3}\}$$

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

$$2x^2 - 3x - 4 = 0$$
$$D = b^2 - 4ac = (-3)^2 - 4 \cdot 2 \cdot (-4) = 41$$
$$x_{1,2} = \frac{-b \pm \sqrt{D}}{2a} = \frac{3 \pm \sqrt{41}}{4}$$
$$x_1 = \frac{3 + \sqrt{41}}{4} \qquad x_2 = \frac{3 - \sqrt{41}}{4} \qquad \mathbb{L} = \left\{\frac{3 - \sqrt{41}}{4}, \frac{3 + \sqrt{41}}{4}\right\}$$

f) $4x^2 = 5x$

$$\begin{aligned} 4x^2 - 5x &= 0 \\ x(4x-5) &= 0 \qquad x_1 = 0 \\ 4x - 5 &= 0 \\ 4x &= 5 \\ x &= \frac{5}{4} \qquad\qquad \mathbb{L} = \left\{0, \frac{5}{4}\right\} \end{aligned}$$

g) $x^2 - 25 = 0$

$$\begin{aligned} x^2 &= 25 \\ |x| &= 5 \\ x_1 &= -5 \qquad x_2 = 5 \qquad\qquad \mathbb{L} = \{-5, 5\} \end{aligned}$$

h) $5x^2 - 3x = -4$

$$\begin{aligned} 5x^2 - 3x + 4 &= 0 \\ D = b^2 - 4ac &= (-3)^2 - 4 \cdot 5 \cdot 4 = -71 \\ \mathbb{L} &= \{\} \end{aligned}$$

Aufgabe 2:

a) $D = b^2 - 4ac = (-3)^2 - 4 \cdot 2 \cdot (-5) = 49 \qquad \Rightarrow$ zwei Lösungen

b) $D = b^2 - 4ac = 9^2 - 4 \cdot 5 \cdot 2 = 41 \qquad \Rightarrow$ zwei Lösungen

c) $D = b^2 - 4ac = 6^2 - 4(-1)(-9) = 0 \qquad \Rightarrow$ eine Lösung

d) $-5x - 9 = 0 \Rightarrow$ lineare Gleichung (besitzt eine Lösung)

e) $D = b^2 - 4ac = 5^2 - 4(-1)(-9) = -11 \qquad \Rightarrow$ keine Lösung

Aufgabe 3:

$$f(x) = -\tfrac{1}{30}x^2 + 2x$$

a) Bestimme $f(x) = 0$

$$\begin{aligned} -\frac{1}{30}x^2 + 2x &= 0 \\ x\left(-\frac{1}{30} + 2\right) &= 0 \qquad \Rightarrow x_1 = 0 \\ -\frac{1}{30}x + 2 &= 0 \\ x &= 60 \end{aligned}$$

Der Frosch springt 60cm weit.

b) Bestimme $f(x) = \frac{45}{2}$

$$-\frac{1}{30}x^2 + 2x = \frac{45}{2}$$

$$-\frac{1}{30}x^2 + 2x - \frac{45}{2} = 0$$

$$D = b^2 - 4ac = 2^2 - 4\left(\frac{-1}{30}\right)\left(\frac{-45}{2}\right) = 1$$

$$x_{1,2} = \frac{-b \pm \sqrt{D}}{2a} = \frac{-2 \pm \sqrt{1}}{2 \cdot \left(\frac{-1}{30}\right)}$$

$$x_1 = 15 \qquad x_2 = 45 \qquad \mathbb{L} = \{15, 45\}$$

Nach 15cm und 45cm hat der Frosch eine Höhe von 22,5cm.