

Aufgabe 1.1:

Lösen Sie folgende quadratische Gleichungen.

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

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

b) $x^2 + 3x + 2 = 0$

g) $x^2 + 2x - 35 = 0$

c) $x^2 - 2x - 3 = 0$

h) $x^2 - 8x - 48 = 0$

d) $x^2 + x - 6 = 0$

i) $x^2 + 4x - 117 = 0$

e) $x^2 - 2x - 15 = 0$

j) $x^2 - 21x + 104 = 0$

Aufgabe 1.2:

Lösen Sie folgende quadratische Gleichungen.

a) $x^2 - \frac{5}{2}x - \frac{3}{2} = 0$

f) $x^2 + \frac{1}{9}x - \frac{4}{27} = 0$

b) $x^2 + \frac{17}{4}x - \frac{15}{4} = 0$

g) $x^2 + \frac{1}{7}x - \frac{30}{7} = 0$

c) $x^2 + \frac{13}{12}x - \frac{1}{3} = 0$

h) $x^2 + \frac{47}{21}x - \frac{8}{7} = 0$

d) $x^2 + \frac{22}{9}x + \frac{8}{9} = 0$

i) $x^2 + \frac{62}{45}x - \frac{32}{45} = 0$

e) $x^2 - \frac{18}{11}x - \frac{8}{11} = 0$

Aufgabe 1.3:

Lösen Sie die folgenden Gleichungen:

a) $x^2 + 6x - 55 = 0$

d) $30x^2 - 41x = -13$

b) $3 - 4x^2 = 5 - 6x^2$

e) $5x^2 + 87x - 506 = 0$

c) $(7x - 2)(7x + 2) = 60$

f) $2x^2 + x + 1 = x^2 + \frac{3}{2}x + 4$

Aufgabe 1.4:

Lösen Sie die folgenden Gleichungen:

a) $x^2 + 11x + 6 = 6x$

e) $x + 5 = (x - 1) \cdot (x - 1)$

b) $6x^2 - 12 = -6x$

f) $\left(x + \frac{1}{2}\right) \cdot \left(x - \frac{1}{2}\right) = \frac{5}{16}$

c) $(2x - 1)^2 - 2(x - 3)^2 - x(x + 6) + 2 = 0$

g) $3(x + 5) - 5(x^2 - 3(x - 25)) = 6x(6 - x)$

d) $4x^2 - 26 = 2x^2 + 8x + 166$

h) $x(x + 2) + 2(x + 1)^2 = (x + 3)^2 - (x + 2)(2 - x)$

Aufgabe 1.1:

a) $x^2 - x - 2 = 0 \rightarrow x_{1,2} = \frac{1}{2} \pm \sqrt{\frac{1}{4} + 2} \rightarrow x_{1,2} = \frac{1}{2} \pm \sqrt{\frac{9}{4}} \rightarrow x_{1,2} = \frac{1}{2} \pm \frac{3}{2}$

$x_1 = 2$; $x_2 = -1$

b) $x^2 + 3x + 2 = 0 \rightarrow x_{1,2} = -\frac{3}{2} \pm \sqrt{\frac{9}{4} - 2} \rightarrow x_{1,2} = -\frac{3}{2} \pm \sqrt{\frac{1}{4}} \rightarrow x_{1,2} = -\frac{3}{2} \pm \frac{1}{2}$

$x_1 = -1$; $x_2 = -2$

c) $x^2 - 2x - 3 = 0 \rightarrow x_{1,2} = 1 \pm \sqrt{1 + 3} \rightarrow x_{1,2} = 1 \pm \sqrt{4} \rightarrow x_{1,2} = 1 \pm 2$

$x_1 = 3$; $x_2 = -1$

d) $x^2 + x - 6 = 0 \rightarrow x_{1,2} = -\frac{1}{2} \pm \sqrt{\frac{1}{4} + 6} \rightarrow x_{1,2} = -\frac{1}{2} \pm \sqrt{\frac{25}{4}} \rightarrow x_{1,2} = -\frac{1}{2} \pm \frac{5}{2}$

$x_1 = 2$; $x_2 = -3$

e) $x^2 - 2x - 15 = 0 \rightarrow x_{1,2} = 1 \pm \sqrt{1 + 15} \rightarrow x_{1,2} = 1 \pm \sqrt{16} \rightarrow x_{1,2} = 1 \pm 4$

$x_1 = 5$; $x_2 = -3$

f) $x^2 - 8x + 12 = 0 \rightarrow x_{1,2} = 4 \pm \sqrt{16 - 12} \rightarrow x_{1,2} = 4 \pm \sqrt{4} \rightarrow x_{1,2} = 4 \pm 2$

$x_1 = 6$; $x_2 = 2$

g) $x^2 + 2x - 35 = 0 \rightarrow x_{1,2} = -1 \pm \sqrt{1 + 35} \rightarrow x_{1,2} = -1 \pm \sqrt{36} \rightarrow x_{1,2} = -1 \pm 6$

$x_1 = 5$; $x_2 = -7$

h) $x^2 - 8x - 48 = 0 \rightarrow x_{1,2} = 4 \pm \sqrt{16 + 48} \rightarrow x_{1,2} = 4 \pm \sqrt{64} \rightarrow x_{1,2} = 4 \pm 8$

$x_1 = 12$; $x_2 = -4$

i) $x^2 + 4x - 117 = 0 \rightarrow x_{1,2} = 2 \pm \sqrt{4 + 117} \rightarrow x_{1,2} = 2 \pm \sqrt{121} \rightarrow x_{1,2} = 2 \pm 11$

$x_1 = 9$; $x_2 = -13$

j) $x^2 - 21x + 104 = 0 \rightarrow x_{1,2} = \frac{21}{2} \pm \sqrt{\frac{441}{4} - 104} \rightarrow x_{1,2} = \frac{21}{2} \pm \sqrt{\frac{441}{4} - \frac{416}{4}} \rightarrow$

$x_{1,2} = \frac{21}{2} \pm \sqrt{\frac{25}{4}} \rightarrow x_{1,2} = \frac{21}{2} \pm \frac{5}{2} \rightarrow$ $x_1 = 13$; $x_2 = 8$

Aufgabe 1.2:

$$a) x^2 - \frac{5}{2}x - \frac{3}{2} = 0 \rightarrow x_{1,2} = \frac{5}{4} \pm \sqrt{\frac{25}{16} + \frac{3}{2}} \rightarrow x_{1,2} = \frac{5}{4} \pm \sqrt{\frac{25}{16} + \frac{24}{16}} \rightarrow x_{1,2} = \frac{5}{4} \pm \sqrt{\frac{49}{16}}$$

$$x_{1,2} = \frac{5}{4} \pm \frac{7}{4} \rightarrow \underline{x_1 = 3} ; \underline{x_2 = -\frac{1}{2}}$$

$$b) x^2 + \frac{17}{4}x - \frac{15}{4} = 0 \rightarrow x_{1,2} = -\frac{17}{8} \pm \sqrt{\frac{289}{64} + \frac{15}{4}} \rightarrow x_{1,2} = -\frac{17}{8} \pm \sqrt{\frac{289}{64} + \frac{240}{64}} \rightarrow$$

$$x_{1,2} = -\frac{17}{8} \pm \sqrt{\frac{529}{64}} \rightarrow x_{1,2} = -\frac{17}{8} \pm \frac{23}{8} \rightarrow \underline{x_1 = -5} ; \underline{x_2 = \frac{3}{4}}$$

$$c) x^2 + \frac{13}{12}x - \frac{1}{3} = 0 \rightarrow x_{1,2} = -\frac{13}{24} \pm \sqrt{\frac{169}{576} + \frac{1}{3}} \rightarrow x_{1,2} = -\frac{13}{24} \pm \sqrt{\frac{169}{576} + \frac{192}{576}} \rightarrow$$

$$x_{1,2} = -\frac{13}{24} \pm \sqrt{\frac{361}{576}} \rightarrow x_{1,2} = -\frac{13}{24} \pm \frac{19}{24} \rightarrow \underline{x_1 = \frac{1}{4}} ; \underline{x_2 = -\frac{4}{3}}$$

$$d) x^2 + \frac{22}{9}x + \frac{8}{9} = 0 \rightarrow x_{1,2} = -\frac{11}{9} \pm \sqrt{\frac{121}{81} - \frac{8}{9}} \rightarrow x_{1,2} = -\frac{11}{9} \pm \sqrt{\frac{121}{81} - \frac{72}{81}} \rightarrow$$

$$x_{1,2} = -\frac{11}{9} \pm \sqrt{\frac{49}{81}} \rightarrow x_{1,2} = -\frac{11}{9} \pm \frac{7}{9} \rightarrow \underline{x_1 = -\frac{4}{9}} ; \underline{x_2 = -2}$$

$$e) x^2 - \frac{18}{11}x - \frac{8}{11} = 0 \rightarrow x_{1,2} = \frac{9}{11} \pm \sqrt{\frac{81}{121} + \frac{8}{11}} \rightarrow x_{1,2} = \frac{9}{11} \pm \sqrt{\frac{81}{121} + \frac{88}{121}} \rightarrow$$

$$x_{1,2} = \frac{9}{11} \pm \sqrt{\frac{169}{121}} \rightarrow x_{1,2} = \frac{9}{11} \pm \frac{13}{11} \rightarrow \underline{x_1 = 2} ; \underline{x_2 = -\frac{4}{11}}$$

$$f) x^2 + \frac{1}{9}x - \frac{4}{27} = 0 \rightarrow x_{1,2} = -\frac{1}{18} \pm \sqrt{\frac{1}{324} + \frac{4}{27}} \rightarrow x_{1,2} = -\frac{1}{18} \pm \sqrt{\frac{1}{324} + \frac{48}{324}} \rightarrow$$

$$x_{1,2} = -\frac{1}{18} \pm \sqrt{\frac{49}{324}} \rightarrow x_{1,2} = -\frac{1}{18} \pm \frac{7}{18} \rightarrow \underline{x_1 = \frac{1}{3}} ; \underline{x_2 = -\frac{4}{9}}$$

$$g) x^2 + \frac{1}{7}x - \frac{30}{7} = 0 \rightarrow x_{1,2} = -\frac{1}{14} \pm \sqrt{\frac{1}{196} + \frac{30}{7}} \rightarrow x_{1,2} = -\frac{1}{14} \pm \sqrt{\frac{1}{196} + \frac{840}{196}} \rightarrow$$

$$x_{1,2} = -\frac{1}{14} \pm \sqrt{\frac{841}{196}} \rightarrow x_{1,2} = -\frac{1}{14} \pm \frac{29}{14} \rightarrow \underline{x_1 = 2} ; \underline{x_2 = -\frac{15}{7}}$$

$$h) x^2 + \frac{47}{21}x - \frac{8}{7} = 0 \rightarrow x_{1,2} = -\frac{47}{42} \pm \sqrt{\frac{2209}{1764} + \frac{8}{7}} \rightarrow x_{1,2} = -\frac{47}{42} \pm \sqrt{\frac{2209}{1764} + \frac{2016}{1764}} \rightarrow$$

$$x_{1,2} = -\frac{47}{42} \pm \sqrt{\frac{4225}{1764}} \rightarrow x_{1,2} = -\frac{47}{42} \pm \frac{65}{42} \rightarrow \underline{x_1 = \frac{3}{7}} ; \underline{x_2 = -\frac{8}{3}}$$

$$\begin{aligned} \text{i) } x^2 + \frac{62}{45}x - \frac{32}{45} &= 0 \rightarrow x_{1,2} = -\frac{32}{45} \pm \sqrt{\frac{961}{2025} + \frac{32}{45}} \rightarrow x_{1,2} = -\frac{32}{45} \pm \sqrt{\frac{961}{2025} + \frac{1440}{2025}} \rightarrow \\ x_{1,2} &= -\frac{32}{45} \pm \sqrt{\frac{2401}{2025}} \rightarrow x_{1,2} = -\frac{32}{45} \pm \frac{49}{45} \rightarrow \underline{x_1 = \frac{2}{5}} ; \underline{x_2 = -\frac{16}{9}} \end{aligned}$$

Aufgabe 1.3:

a) $x_1 = -11$; $x_2 = 5$

b) $2x^2 - 2 = 0 \rightarrow x^2 = 1 \rightarrow x_{1,2} = \pm 1$

c) $49x^2 - 4 = 60 \rightarrow x^2 = \frac{64}{49} \rightarrow x_{1,2} = \pm \frac{8}{7}$; $x_{1,2} \approx \pm 1,143$

d) $x^2 - \frac{41}{30}x + \frac{13}{30} = 0 \rightarrow x_1 = \frac{13}{15}$; $x_2 = \frac{1}{2}$; $x_1 \approx 0,8667$; $x_2 = 0,5$

e) $x^2 + \frac{87}{5}x - \frac{506}{5} = 0 \rightarrow x_1 = \frac{23}{5}$; $x_2 = -22$; $x_1 = 4,6$

f) $2x^2 + x + 1 = x^2 + \frac{3}{2}x + 4 \rightarrow x^2 - \frac{1}{2}x - 3 = 0 \rightarrow x_1 = 2$; $x_2 = -\frac{3}{2}$

Aufgabe 1.4:

a) $x^2 + 5x + 6 = 0 \rightarrow \underline{x_1 = -3} ; \underline{x_2 = -2}$

b) $x^2 - x - 2 = 0 \rightarrow \underline{x_1 = 2} ; \underline{x_2 = -1}$

c) $(4x^2 - 4x + 1) - (2x^2 - 12x + 18) - (x^2 + 6x) + 2 = 0 \rightarrow x^2 + 2x - 15 = 0 \rightarrow$
 $\underline{x_1 = -5} ; \underline{x_2 = 3}$

d) $2x^2 - 8x - 192 = 0 \rightarrow x^2 - 4x - 96 = 0 \rightarrow \underline{x_1 = 12} ; \underline{x_2 = -8}$

e) $x^2 - 3x - 4 = 0 \rightarrow \underline{x_1 = 4} ; \underline{x_2 = -1}$

f) $x^2 - \frac{1}{4} = \frac{5}{16} \rightarrow x^2 = \frac{9}{16} \rightarrow \underline{x_1 = \frac{3}{4}} ; \underline{x_2 = -\frac{3}{4}}$

g) $(3x + 15) - (5x^2 - 15x + 375) = 36x - 6x^2 \rightarrow -5x^2 + 18x - 360 = 36x - 6x^2 \rightarrow$
 $x^2 - 18x - 360 = 0 \rightarrow \underline{x_1 = 30} ; \underline{x_2 = -12}$

h) $x(x+2) + 2(x+1)^2 = (x+3)^2 - (x+2)(2-x) \rightarrow$
 $x^2 + 2x + 2(x^2 + 2x + 1) = x^2 + 6x + 9 - (2x - x^2 + 4 - 2x) \rightarrow$
 $x^2 + 2x + 2x^2 + 4x + 2 = x^2 + 6x + 9 - (-x^2 + 4) \rightarrow 3x^2 + 6x + 2 = x^2 + 6x + 9 + x^2 - 4 \rightarrow$
 $3x^2 + 6x + 2 = 2x^2 + 6x + 5 \rightarrow x^2 = 3 \rightarrow$
 $\underline{x_1 = \sqrt{3}} ; \underline{x_1 \approx 1,732} ; \underline{x_2 = -\sqrt{3}} ; \underline{x_2 \approx -1,732}$