Quadratische Gleichung

Gleichungen, die sich durch Äquivalenzumformungen auf die Form

$ax^2 + bx + c = 0$. (a,b,c∈R; a≠0)

bringen lassen, heißen **quadratische Gleichungen**.

Bsp. $3x^2-6x+7=0$ $0{,}4y^2-1=2$ $a^2=2a$ keine quadr. Gl. $5z-2=0$

ax^2. quadratisches Glied
bx lineares Glied
c absolutes Glied

	quadratisches Glied	quadratisches +lineares Glied	quadratisches +lineares +absolutes Glied Binomische Formel	quadratische Ergänzung	pq Formel
Gleich-ung	$ax^2 = c$ (a≠ 0)	$ax^2 + bx = 0$ (a≠ 0)	$x^2 + 2cx + c^2 = (x+c)^2 = 0$ (a≠ 0)	$ax^2 + bx + c = (x+c*)^2 = 0$ (a≠ 0)	$x^2 + px + q = 0$ a=1 und Gleichung …= 0
Bsp.	$4x^2 = 0$ I: 4 $x^2 = 0$ I$\sqrt{}$ $\|x\| = 0$ $\mathbb{L} = \{0\}$	$4x^2 + 2x = 0$ I *AusKl* $x(4x+2) = 0$ I *ein Produkt wird Null, wenn jeweils ein Faktor Null wird* (ab=0) 1.Faktor. 2. Faktor	$x^2 + 4x + 4 = 0$ I *BF* $(x+2)^2 = 0$ I$\sqrt{}$ -> | | $\|x+2\| = 0$ Null ist immer positiv $x + 2 = 0$ $x = -2$ $\mathbb{L} = \{-2\}$	$x^2 + 4x - 12 = 0$ I *quadr.Erg.* $x^2 + 4x + 4 - 4 - 12 = 0$ $(x+2)^2 - 16 = 0$ $(x+2)^2 = 16$ I$\sqrt{}$ → I I $\|x+2\| = 4$ 1. $x + 2 = 4$ $x = 2$	$x^2 + 6x - 1 = 0$ I Bedig. $x_{1/2} = -\frac{p}{2} \pm \sqrt{(\frac{p}{2})^2 - q}$

		x= 0 $(4x+$ $2) = 0$ $x_1 = 0$ $x_2 = -\frac{1}{2}$ Probe $0 \cdot (4x+2) = 0$ $w.A.$ $x\left(4 \cdot (-\frac{1}{2}) + 2\right) = 0$ $w.A.$ $\mathbb{L} = \left\{0; -\frac{1}{2}\right\}$		2. $x + 2 = -4$ $x = -6$ $\mathbb{L} = \{2, -6\}$	$x_{1/2}$ $= -\frac{6}{2} \pm \sqrt{(\frac{6}{2})^2 - (-16)}$ $= -3 \pm \sqrt{9+16}$ $x_{1/2} = -3 \pm \sqrt{9+16}$ $= -3 \pm 5$ $x_1 = -3+5 = 2$ $x_2 = -3-5 = -8$ $\mathbb{L} = \{2, -8\}$
	$4x^2 = 36$ I: 4 $x^2 = 9$ I$\sqrt{\ }$ -> I I $\lvert x \rvert = 3$ $x_1 = 3$ $x_2 = -3$ $\mathbb{L} = \{3; -3\}$	$9x^2 = 6x$ $9x^2 - 6x = 0$ I $AusKl$ $x(9x-6) = 0$ 1. Fall 2. Fall $x_1 = 0$ $(9x-6) =$ 0 I +6 I:9 $x_2 = \frac{2}{3}$ $\mathbb{L} = \left\{0; \frac{2}{3}\right\}$	$4x^2 + 8x + 4 = 9$ I BF $(2x+2)^2 = 9$ I$\sqrt{\ }$ -> I I $\lvert 2x+2 \rvert = 3$ 1. Fall $2x + 2 = +3$ $x_1 = 0{,}5$ 2. Fall $2x + 2 = -3$ $x = -\frac{5}{2} = -2{,}5$ Probe $\left(2 \cdot \frac{1}{2} + 2\right)^2 = 9$ $(3)^2 = 9.$ $w.A.$ $(2 \cdot (-2{,}5) + 2)^2 = 9$ $(-3)^2 = 9.$ $w.A.$	$4x^2 + 8x - 12 = 9$ / qE $4x^2 + 8x + 4 - 4 - 12 = 9$ $(2x+2)^2 - 4 - 12 = 9$ $I + 16$ $(2x+2)^2 = 25$ I $\sqrt{\ }$ -> I $\lvert 2x+2 \rvert = 5$ **1. Fall** $2x + 2 = +5$ $x_1 = \frac{3}{2} = 1{,}5$ **2. Fall** $2x + 2 = -5$ $x_2 = -\frac{7}{2} = -3{,}5$ Probe $4 * (1{,}5)^2 + 8 * 1{,}5 - 12 = 9$ $9 = 9$ $(3)^2 = 9.$ $w.A.$	$2x^2 + 8x + 10 = 20$ $/Bdg$ $2x^2 + 8x + 10 = 20$ $/:2$ $x^2 + 4x + 5 = 10$ /-10 $x^2 + 4x - 5 = 0$ / pq $x_{1/2} = -\frac{p}{2} \pm \sqrt{(\frac{p}{2})^2 - q}$ $x_{1/2} = -\frac{4}{2} \pm \sqrt{(\frac{4}{2})^2 + 5}$ $= -2 \pm \sqrt{4+5}$ $= -2 \pm 3$ $x_1 = -2 + 3 = 1$ $x_2 = -2 - 3 = -5$ $\mathbb{L} = \{1, -5\}$

			$\mathbb{L} = \left\{\frac{1}{2}; -2,5\right\}$	$4 * (-3,5)^2 + 8 * (-3,5) - 12 = 9$ $9 = 9 \quad w.A.$ $\mathbb{L} = \left\{\frac{3}{2}; -3,5\right\}$	