Lösungen zu Schwerste lineare Gleichungen:

Übungen:

a) $23\frac{1}{7} + \frac{1}{7}(2x-39)^2 - \frac{1}{2}(5-x)(5+x) - 3\frac{5}{7}x^2 = \frac{3}{14}x\left(4 - \frac{1}{3}x\right) - \frac{2}{7}\left(\frac{5}{2} - 3x\right)^2$

b) $\frac{5}{11}(\frac{3}{2} - \frac{y}{5})^2 - \frac{11}{5}(\frac{y}{11} - 2)^2 + \frac{2561}{1650} = -\frac{1}{2}(\frac{2y}{11} - \frac{4}{5})^2 - \frac{2}{11}(\frac{y}{3} - \frac{3}{2})(\frac{1}{5} - y) - \frac{63}{1100} + \frac{162y^2}{1815}$

c) $1,125(\Omega^2 + 1)^2 - 0,625\Omega^2(\Omega - 0,5)(0,\overline{6} + \Omega) - \frac{5}{24}\Omega^3 + 0,8\overline{3} - \Omega^4 =$

$$= -0,5(\Omega^2 - 2,5)^2 - 0,1\overline{6}(3,5\Omega - 1)^2 - \frac{167}{96}\Omega^2$$

d) $\frac{2}{5}(2q - 3)^3 + \frac{1}{4}(\frac{1}{3} - 3q)^3 - \frac{q^2}{180}(-37q + 751) =$

$$= -3(q - \frac{1}{2})^2(q + \frac{1}{2}) + \frac{1}{90}q(31q^2 - 988q) + \frac{37}{270} - \frac{3}{2}q$$

zu a)

$$23\frac{1}{7} + \frac{1}{7}(2x-39)^2 - \frac{1}{2}(5-x)(5+x) - 3\frac{5}{7}x^2 = \frac{3}{14}x\left(4 - \frac{1}{3}x\right) - \frac{2}{7}\left(\frac{5}{2} - 3x\right)^2 \qquad |\cdot 14$$

$$\Leftrightarrow \quad 324 + 2(2x-39)^2 - 7(5-x)(5+x) - 52x^2 = 3x\left(4 - \frac{1}{3}x\right) - 4\left(\frac{5}{2} - 3x\right)^2$$

$$\Leftrightarrow 324 + 2(4x^2 - 156x + 1521) - 7(25 - x^2) - 52x^2 = 12x - x^2 - 4\left(\frac{25}{4} - 15x + 9x^2\right)$$

$$\Leftrightarrow \quad 324 + 8x^2 - 312x + 3042 - 175 + 7x^2 - 52x^2 = 12x - x^2 - 25 + 60x - 36x^2$$

$$\Leftrightarrow \qquad -37x^2 - 312x + 3191 = -37x^2 + 72x - 25 \qquad |+37x^2$$

$$\Leftrightarrow \qquad -312x + 3191 = +72x - 25 \qquad |+312x$$

$$\Leftrightarrow \qquad 3191 = 384x - 25 \qquad |+25$$

$$\Leftrightarrow \qquad 3216 = 384x \qquad |\div 384$$

$$\Leftrightarrow \qquad \frac{67}{8} = x$$

$$\Rightarrow \qquad L = \{\frac{67}{8}\}$$

zu b)

$$\frac{5}{11}(\frac{3}{2}-\frac{y}{5})^2-\frac{11}{5}(\frac{y}{11}-2)^2+\frac{2561}{1650}=-\frac{1}{2}(\frac{2y}{11}-\frac{4}{5})^2-\frac{2}{11}(\frac{y}{3}-\frac{3}{2})(\frac{1}{5}-y)-\frac{63}{1100}+\frac{162y^2}{1815} \qquad |\cdot 330$$

$$\Leftrightarrow \quad 50(\frac{3}{2}-\frac{y}{5})^2-726(\frac{y}{11}-2)^2+\frac{2561}{5}=-165(\frac{2y}{11}-\frac{4}{5})^2-60(\frac{y}{3}-\frac{3}{2})(\frac{1}{5}-y)-\frac{189}{10}+\frac{324y^2}{11}$$

$$\Leftrightarrow \quad 50(\frac{9}{4}-\frac{3y}{5}+\frac{y^2}{25})-726(\frac{y^2}{121}-\frac{4y}{11}+4)+\frac{2561}{5}=$$

$$=-165(\frac{4y^2}{121}-\frac{16}{55}y+\frac{16}{25})-60(\frac{y}{15}-\frac{3}{10}-\frac{y^2}{3}+\frac{3y}{2})-\frac{189}{10}+\frac{324y^2}{11}$$

$$\Leftrightarrow \quad \frac{225}{2}-30y+2y^2-6y^2-264y+2904+\frac{2561}{5}=$$

$$=-\frac{60y^2}{11}+48y+\frac{528}{5}-4y+18-20y^2+90y-\frac{189}{10}+\frac{324y^2}{11}$$

$$\Leftrightarrow \quad -4y^2-294y+3528,7=-4y^2+134y+104,7 \qquad |+4y^2$$

$$\Leftrightarrow \quad -294y+3528,7=+134y+104,7 \qquad |+294y$$

$$\Leftrightarrow \quad +3528,7=+428y+104,7 \qquad |-104,7$$

$$\Leftrightarrow \quad 3424=428y \qquad |\div 428$$

$$\Leftrightarrow \quad y=8$$

$$\Rightarrow \quad L=\{8\}$$

zu c)

$$1{,}125(\Omega^2+1)^2 - 0{,}625\Omega^2(\Omega-0{,}5)(0{,}\overline{6}+\Omega) - \frac{5}{24}\Omega^3 + 0{,}8\overline{3} - \Omega^4 =$$

$$= -0{,}5(\Omega^2-2{,}5)^2 - 0{,}1\overline{6}(3{,}5\Omega-1)^2 - \frac{167}{96}\Omega^2$$

$$\Leftrightarrow \quad \frac{9}{8}(\Omega^4+2\Omega^2+1)^2 - \frac{5}{8}\Omega^2(\Omega^2-\frac{1}{3}\Omega-\frac{1}{12}) - \frac{5}{24}\Omega^3 + \frac{5}{6} - \Omega^4 =$$

$$= -\frac{1}{2}(\Omega^4-5\Omega^2+6{,}25) - \frac{1}{6}(\frac{49}{4}\Omega^2-7\Omega+1) - \frac{167}{96}\Omega^2 \qquad \text{\colorbox{yellow}{$|\cdot 96$}}$$

$$\Leftrightarrow \quad 108(\Omega^4+2\Omega^2+1)^2 - 60\Omega^2(\Omega^2-\frac{1}{3}\Omega-\frac{1}{12}) - 20\Omega^3 + 80 - 96\Omega^4 =$$

$$= -48(\Omega^4-5\Omega^2+6{,}25) - 16(\frac{49}{4}\Omega^2-7\Omega+1) - 167\Omega^2$$

$$\Leftrightarrow \quad 108\Omega^4+216\Omega^2+108-60\Omega^4+20\Omega^3+5\Omega^2-20\Omega^3+80-96\Omega^4 =$$

$$= -48\Omega^4+5\Omega^2-300-196\Omega^2+112\Omega-16-167\Omega^2$$

$$\Leftrightarrow \quad -48\Omega^4+211\Omega^2+188 = -48\Omega^4+211\Omega^2+112\Omega-316 \qquad \text{\colorbox{yellow}{$|+48\Omega^4-211\Omega^2$}}$$

$$\Leftrightarrow \quad 188 = 112\Omega-316 \qquad \text{\colorbox{yellow}{$|+316$}}$$

$$\Leftrightarrow \quad 504 = 112\Omega \qquad \text{\colorbox{yellow}{$|\div 112$}}$$

$$\Leftrightarrow \quad 4{,}5 = \Omega$$

$$\Rightarrow \quad L = \{4{,}5\}$$

zu d)

$$\frac{2}{5}(2q-3)^3+\frac{1}{4}(\frac{1}{3}-3q)^3-\frac{q^2}{180}(-37q+751)=$$

$$=-3(q-\frac{1}{2})^2(q+\frac{1}{2})+\frac{1}{90}q(31q^2-988q)+\frac{37}{270}-\frac{3}{2}q \qquad |\cdot 180$$

$$\Leftrightarrow \quad 72(2q-3)^3+45(\frac{1}{3}-3q)^3-q^2(-37q+751)=$$

$$=-540(q-\frac{1}{2})^2(q+\frac{1}{2})-2q(31q^2-988q)+\frac{74}{3}-270q$$

$$\Leftrightarrow \quad 72(8q^3+36q^2+54q+27)+45(\frac{1}{27}-q+9q^2-27q^3)+37q^3-751q^2=$$

$$=-540(q^2-q+\frac{1}{4})(q+\frac{1}{2})-62q^3+1976q^2+\frac{74}{3}-270q$$

$$\Leftrightarrow \quad 576q^3+2592q^2+3888q+1944+\frac{5}{3}-45q+405q^2-1215q^3+37q^3-751q^2=$$

$$=-540(q^3-\frac{1}{2}q^2-\frac{1}{4}q+\frac{1}{8})-62q^3+1976q^2+\frac{74}{3}-270q$$

$$\Leftrightarrow \quad 576q^3+2592q^2+3888q+1944+\frac{5}{3}-45q+405q^2-1215q^3+37q^3-751q^2=$$

$$=-540q^3+270q^2+135q-\frac{135}{2}-62q^3+1976q^2+\frac{74}{3}-270q$$

$$\Leftrightarrow \quad -602q^3+2246q^2+3843q+1945\frac{2}{3}=-602q^3+2246q^2-135q-42\frac{5}{6} \qquad |+602q^3-2246q^2$$

$$\Leftrightarrow \qquad 3843q+1945\frac{2}{3}=-135q-42\frac{5}{6} \qquad |-1945\frac{2}{3}$$

$$\Leftrightarrow \qquad 3843q=-135q-1988{,}5 \qquad |+135q$$

$$\Leftrightarrow \qquad 3977q=-1988{,}5 \qquad |\div 3977$$

$$\Leftrightarrow \qquad q=-0{,}5$$

$$\Rightarrow \qquad L=\{-0{,}5\}$$