

## Lösungen zu schwierige lineare Gleichungen:

- Übungen:
- a)  $2(x+0,1)(0,5x+2) = (3+\frac{1}{3}x)(3-\frac{1}{3}x) + \frac{10}{9}x^2$
- b)  $3a(a-5) + 2(3-2a)^2 = 2a(9+2a) + (5-3a)(2-5a) - 8a^2$
- c)  $(\varphi-0,5)(\varphi+0,5) - (\varphi-0,2)^2 + 4,44 = (\varphi+1,2)^2 - (\varphi+0,3)^2$
- d)  $(8p+2)^2 + 4(p+5)(p-5) = (2p+3)^2 - (5-8p)(5+8p)$

zu a)

$$\begin{aligned}
 & 2(x+0,1)(0,5x+2) = (3+\frac{1}{3}x)(3-\frac{1}{3}x) + \frac{10}{9}x^2 \\
 \Leftrightarrow & 2(0,5x^2 + 0,05x + 2x + 0,2) = 9 - \frac{1}{9}x^2 + \frac{10}{9}x^2 \\
 \Leftrightarrow & x^2 + 0,1x + 4x + 0,4 = 9 + x^2 \\
 \Leftrightarrow & x^2 + 4,1x + 0,4 = 9 + x^2 && | -x^2 \\
 \Leftrightarrow & 4,1x + 0,4 = 9 && | -0,4 \\
 \Leftrightarrow & 4,1x = 8,6 && | \div 4,1 \\
 \Leftrightarrow & x = \frac{86}{41} \\
 \Rightarrow & L = \left\{ \frac{86}{41} \right\}
 \end{aligned}$$

zu b)

$$\begin{aligned}
 & 3a(a-5) + 2(3-2a)^2 = 2a(9+2a) + (5-3a)(2-5a) - 8a^2 \\
 \Leftrightarrow & 3a^2 - 15a + 2(9 - 12a + 4a^2) = 18a + 4a^2 + 10 - 6a - 25a + 15a^2 - 8a^2 \\
 \Leftrightarrow & 3a^2 - 15a + 18 - 24a + 8a^2 = -13a + 11a^2 + 10 \\
 \Leftrightarrow & 11a^2 - 39a + 18 = -13a + 11a^2 + 10 && | -11a^2 \\
 \Leftrightarrow & -39a + 18 = -13a + 10 && | +39a \\
 \Leftrightarrow & 18 = 26a + 10 && | -10 \\
 \Leftrightarrow & 8 = 26a && | \div 26 \\
 \Leftrightarrow & \frac{4}{13} = a \\
 \Rightarrow & L = \left\{ \frac{4}{13} \right\}
 \end{aligned}$$

zu c)

$$\begin{aligned} & (\varphi - 0,5)(\varphi + 0,5) - (\varphi - 0,2)^2 + 4,44 = (\varphi + 1,2)^2 - (\varphi + 0,3)^2 \\ \Leftrightarrow & \varphi^2 - 0,25 - (\varphi^2 - 0,4\varphi + 0,04) + 4,44 = \varphi^2 + 2,4\varphi + 1,44 - (\varphi^2 + 0,6\varphi + 0,09) \\ \Leftrightarrow & \varphi^2 - 0,25 - \varphi^2 + 0,4\varphi - 0,04 + 4,44 = \varphi^2 + 2,4\varphi + 1,44 - \varphi^2 - 0,6\varphi - 0,09 \\ \Leftrightarrow & 4,15 + 0,4\varphi = 1,8\varphi + 1,35 && | -0,4\varphi \\ \Leftrightarrow & 4,15 = 1,4\varphi + 1,35 && | -1,35 \\ \Leftrightarrow & 2,8 = 1,4\varphi && | \div 1,4 \\ \Leftrightarrow & 2 = \varphi \\ \Rightarrow & L = \{2\} \end{aligned}$$

zu d)

$$\begin{aligned} & (8p + 2)^2 + 4(p + 5)(p - 5) = (2p + 3)^2 - (5 - 8p)(5 + 8p) \\ \Leftrightarrow & 64p^2 + 32p + 4 + 4(p^2 - 25) = 4p^2 + 12p + 9 - (25 - 64p^2) \\ \Leftrightarrow & 64p^2 + 32p + 4 + 4p^2 - 100 = 4p^2 + 12p + 9 - 25 + 64p^2 \\ \Leftrightarrow & 68p^2 + 32p - 96 = 68p^2 + 12p - 16 && | -68p^2 \\ \Leftrightarrow & 32p - 96 = 12p - 16 && | -12p \\ \Leftrightarrow & 20p - 96 = -16 && | +96 \\ \Leftrightarrow & 20p = 80 && | \div 20 \\ \Leftrightarrow & p = 4 \\ \Rightarrow & L = \{4\} \end{aligned}$$