

a) $2x^2 - (x+2)(x-2) = 13(4-x)$

$$2x^2 - (x^2 - 4) = 13(4 - x)$$

$$x^2 + 4 = 52 - 13x$$

$$x^2 + 13x - 48 = 0$$

$$(x+16)(x-3) = 0$$

$$\mathbf{x_1 = -16, \quad x_2 = 3}$$

b) $(x+5)^2 - (2x-1)(3x+5) = (x+3)^2 - (x+1)^2$

$$(x^2 + 10x + 25) - (6x^2 + 10x - 3x - 5) = (x^2 + 6x + 9) - (x^2 + 2x + 1)$$

$$x^2 + 10x + 25 - 6x^2 - 10x + 3x + 5 = x^2 + 6x + 9 - x^2 - 2x - 1$$

$$-5x^2 + 3x + 30 = 4x + 8$$

$$0 = 5x^2 + x - 22$$

$$x_{1,2} = \frac{-1 \pm \sqrt{1 + 20 \cdot 22}}{10} = \frac{-1 \pm 21}{10}$$

$$\mathbf{x_1 = 2, \quad x_2 = -\frac{11}{5}}$$

c) $2(3x+1)^2 - 32(3x+1) + 126 = 0$

$$\begin{aligned} 2(9x^2 + 6x + 1) - 96x - 32 + 126 &= 0 \\ 18x^2 + 12x + 2 - 96x - 32 + 126 &= 0 \\ 18x^2 - 84x + 96 &= 0 & | : 6 \\ 3x^2 - 14x + 16 &= 0 \end{aligned}$$

$$x_{1,2} = \frac{14 \pm \sqrt{196 - 12 \cdot 16}}{6} = \frac{14 \pm 2}{6}$$

$$x_1 = \frac{8}{3}, \quad x_2 = 2$$

Eleganter lösbar mit Substitution: $(3x+1) = u$

$$\begin{aligned} 2u^2 - 32u + 126 &= 0 \\ u^2 - 16u + 63 &= 0 \\ (u-9)(u-7) &= 0 \end{aligned}$$

$$u_1 = 9 = 3x+1 \Rightarrow x = \frac{8}{3}$$

$$u_2 = 7 = 3x+1 \Rightarrow x = 2$$