

LÖSUNGEN (HILFSMITTELFREIER TEIL)

$$\begin{aligned} \text{1a)} \quad 2x + 6 &= 0 \quad | -6 \\ 2x &= -6 \quad | :2 \\ x &= -3 \end{aligned}$$

$$\begin{aligned} \text{b)} \quad -8x + 4 &= 0 \quad | -4 \\ -8x &= -4 \quad | :(-8) \\ x &= 0,5 \end{aligned}$$

$$\begin{aligned} \text{c)} \quad x^2 - 81 &= 0 \quad | +81 \\ x^2 &= 81 \quad | \sqrt{} \\ x_1 &= 9 \\ x_2 &= -9 \end{aligned}$$

$$\begin{aligned} \text{d)} \quad 2x^2 + 30x &= 0 \\ x \cdot (2x + 30) &= 0 \quad | \text{Nullprodukt} \\ x = 0 \text{ oder } 2x + 30 &= 0 \\ x_1 = 0 \quad 2x &= -30 \\ x_2 &= -15 \end{aligned}$$

$$\begin{aligned} \text{e)} \quad x^2 - 4x &= 0 \\ x \cdot (x - 4) &= 0 \quad | \text{Nullprodukt} \\ x = 0 \text{ oder } x - 4 &= 0 \\ x_1 = 0 \quad x_2 &= 4 \end{aligned}$$

$$\begin{aligned}
 f) \quad & x^2 + 3x - 10 = 0 \\
 & x = -1,5 \pm \sqrt{2,25 + 10} \\
 & x = -1,5 \pm \sqrt{12,25} \\
 & x = -1,5 \pm 3,5 \\
 & x_1 = -5 \\
 & x_2 = 2
 \end{aligned}$$

$$\begin{aligned}
 g) \quad & 2x^2 + 20x + 32 = 0 \quad | :2 \\
 & x^2 + 10x + 16 = 0 \\
 & x = -5 \pm \sqrt{25 - 16} \\
 & x = -5 \pm \sqrt{9} \\
 & x = -5 \pm 3 \\
 & x_1 = -8 \\
 & x_2 = -2
 \end{aligned}$$

$$\begin{aligned}
 h) \quad & 2x^2 + 16x + 32 = 0 \quad | :2 \\
 & x^2 + 8x + 16 = 0 \\
 & x = -4 \pm \sqrt{16 - 16} \\
 & x = -4
 \end{aligned}$$

$$\begin{aligned}
 i) \quad & x^2 - 18x + 80 = 0 \\
 & x = 9 \pm \sqrt{81 - 80} \\
 & x = 9 \pm \sqrt{1} \\
 & x = 9 \pm 1 \\
 & x_1 = 10 \\
 & x_2 = 8
 \end{aligned}$$

$$j) \quad x^2 + 2x + 6 = 0$$

$$x = -1 \pm \sqrt{1-6}$$

$$x = -1 \pm \sqrt{-5} \quad \Leftarrow$$

Keine Nullstelle vorhanden

$$2a) \quad x^2 + 2x + 2 = 2x + 3 \quad | -2x$$

$$x^2 + 2 = 3 \quad | -2$$

$$x^2 = 1 \quad | \sqrt{\quad}$$

$$x_1 = 1$$

$$x_2 = -1$$

$$b) \quad 6x + 8 = 10x - 2 \quad | -6x$$

$$8 = 4x - 2 \quad | +2$$

$$10 = 4x \quad | :4$$

$$2,5 = x$$

$$c) \quad x^2 + 2x + 2 = 5x \quad | -5x$$

$$x^2 - 3x + 2 = 0$$

$$x = 1,5 \pm \sqrt{2,25 - 2}$$

$$x = 1,5 \pm \sqrt{0,25}$$

$$x = 1,5 \pm 0,5$$

$$x_1 = 2$$

$$x_2 = 1$$

$$d) \quad x^2 + x + 4 = x + 2 \quad | -x$$

$$x^2 + 4 = 2 \quad | -4$$

$$x^2 = -2$$

\Leftarrow Keine Lösung vorhanden

$$3a) f(x) = 3(x+4)^2 - 7$$

$$\Rightarrow S(-4|-7)$$

$$\begin{aligned} b) f(x) &= 2x^2 - 4x + 6 \\ &= 2(x^2 - 2x + 3) \\ &= 2((x-1)^2 + 3 - 1) \\ &= 2((x-1)^2 + 2) \\ &= 2(x-1)^2 + 4 \\ &\Rightarrow S(1|4) \end{aligned}$$

$$\begin{aligned} c) f(x) &= x^2 + 2x + 6 \\ &= (x+1)^2 + 6 - 1 \\ &= (x+1)^2 + 5 \\ &\Rightarrow S(-1|5) \end{aligned}$$

$$\begin{aligned} d) f(x) &= 2x^2 + 16x + 30 \\ &= 2(x^2 + 8x + 15) \\ &= 2((x+4)^2 + 15 - 16) \\ &= 2((x+4)^2 - 1) \\ &= 2(x+4)^2 - 2 \\ &\Rightarrow S(-4|-2) \end{aligned}$$

$$\begin{aligned} e) f(x) &= 2x^2 + 8 \\ &= 2(x-0)^2 + 8 \\ &\Rightarrow S(0|8) \end{aligned}$$

$$\begin{aligned} f) f(x) &= 3x^2 + 6x \\ &= 3(x^2 + 2x) \\ &= 3((x+1)^2 - 1) \\ &= 3(x+1)^2 - 3 \\ &\Rightarrow S(-1|-3) \end{aligned}$$

$$4a) m = \frac{11-3}{6-2} = \frac{8}{4} = 2$$

$$\Rightarrow f(x) = 2x + b$$

$$A(2|3) \text{ auf } f \Rightarrow f(2) = 3$$

$$2 \cdot 2 + b = 3$$

$$4 + b = 3 \quad | -4$$

$$b = -1$$

$$\Rightarrow f(x) = 2x - 1$$

$$b) m = \frac{-15-5}{3-(-2)} = \frac{-20}{5} = -4$$

$$\Rightarrow f(x) = -4x + b$$

$$A(-2|5) \text{ auf } f \Rightarrow f(-2) = 5$$

$$-4 \cdot (-2) + b = 5$$

$$8 + b = 5 \quad | -8$$

$$b = -3$$

$$\Rightarrow f(x) = -4x - 3$$

$$c) m = \frac{20-4}{4-2} = \frac{16}{2} = 8$$

$$\Rightarrow f(x) = 8x + b$$

$$A(2|4) \text{ auf } f \Rightarrow f(2) = 4$$

$$8 \cdot 2 + b = 4$$

$$16 + b = 4 \quad | -16$$

$$b = -12$$

$$\Rightarrow f(x) = 8x - 12$$

5) erbenbare Punkte: $A(1|1)$
 $B(3|2)$

$$m = \frac{2-1}{3-1} = \frac{1}{2} = 0,5$$

$$\Rightarrow f(x) = 0,5x + b$$

$$A(1|1) \text{ auf } f \Rightarrow f(1) = 1$$

$$0,5 \cdot 1 + b = 1$$

$$0,5 + b = 1 \quad | -0,5$$

$$b = 0,5$$

$$\Rightarrow f(x) = 0,5x + 0,5$$

6) Scheitelpunkt $S(1|2) \Rightarrow f(x) = a \cdot (x-1)^2 + 2$

$$A(3|8) \text{ auf } f \Rightarrow f(3) = 8$$

$$a \cdot (3-1)^2 + 2 = 8$$

$$a \cdot 2^2 + 2 = 8$$

$$4a + 2 = 8 \quad | -2$$

$$4a = 6 \quad | :4$$

$$a = 1,5$$

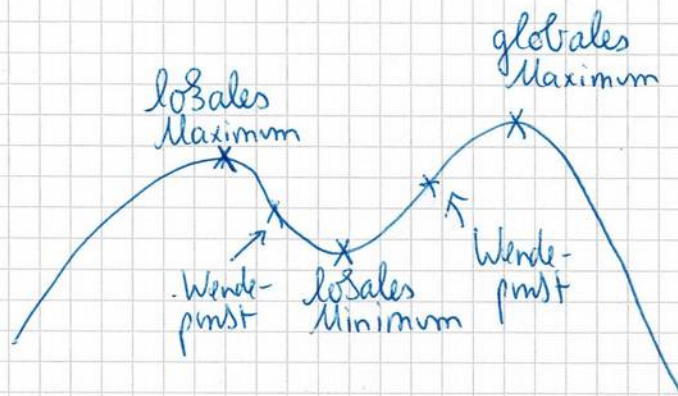
$$\Rightarrow f(x) = 1,5 \cdot (x-1)^2 + 2$$

$$= 1,5 \cdot (x^2 - 2x + 1) + 2$$

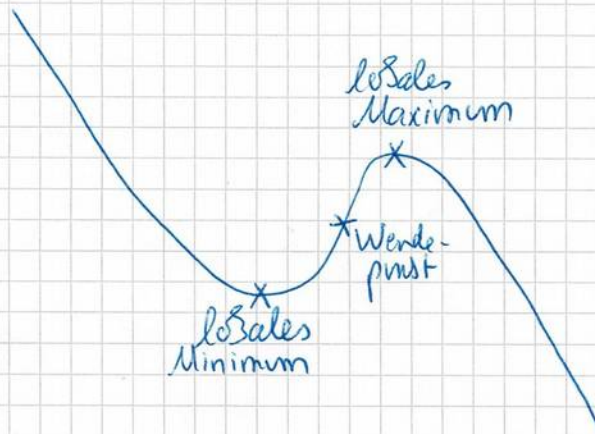
$$= 1,5x^2 - 3x + 1,5 + 2$$

$$= 1,5x^2 - 3x + 3,5$$

7a)



b)



8a) $x=2$ Nullstelle $\Rightarrow f(2)=0$
 $2 \cdot 2 + a = 0$
 $4 + a = 0 \quad | -4$
 $a = -4$

b) $x=2$ Nullstelle $\Rightarrow f(2)=0$
 $a \cdot 2 + 6 = 0$
 $2a + 6 = 0 \quad | -6$
 $2a = -6 \quad | :2$
 $a = -3$

$$\begin{aligned}
 \text{c) } x=2 \text{ Nullstelle} &\Rightarrow f(2)=0 \\
 2^2 + 2 \cdot 2 + a &= 0 \\
 4 + 4 + a &= 0 \\
 8 + a &= 0 \quad | -8 \\
 a &= -8
 \end{aligned}$$

$$\begin{aligned}
 \text{d) } x=2 \text{ Nullstelle} &\Rightarrow f(2)=0 \\
 2^2 + a \cdot 2 + 4 &= 0 \\
 4 + 2a + 4 &= 0 \\
 2a + 8 &= 0 \quad | -8 \\
 2a &= -8 \quad | :2 \\
 a &= -4
 \end{aligned}$$

$$\begin{aligned}
 \text{g) Weg 1:} \quad (x+4) \cdot (x-6) &= 0 \quad | \text{Nullprodukt} \\
 x+4=0 \text{ oder } x-6 &= 0 \\
 x_1 &= -4 \quad x_2 = 6
 \end{aligned}$$

$$\begin{aligned}
 \text{Weg 2:} \quad (x+4) \cdot (x-6) &= 0 \\
 x^2 - 6x + 4x - 24 &= 0 \\
 x^2 - 2x - 24 &= 0 \\
 x &= 1 \pm \sqrt{1+24} \\
 x &= 1 \pm \sqrt{25} \\
 x &= 1 \pm 5 \\
 x_1 &= -4 \\
 x_2 &= 6
 \end{aligned}$$