

Parabeln - Scheitelpunktform

1) Bestimme den Scheitelpunkt der Parabeln

$$\text{a) } f(x) = (x - 3)^2 + 2 \quad \Rightarrow \quad S(3 \mid 2)$$

$$\text{b) } f(x) = (x + 1)^2 + 8 \quad \Rightarrow \quad S(-1 \mid 8)$$

$$\text{c) } f(x) = 3(x - 1)^2 - 3 \quad \Rightarrow \quad S(1 \mid -3)$$

$$\text{d) } f(x) = 2x^2 + 3 \quad \Rightarrow \quad S(0 \mid 3)$$

2) Überführe die Funktionen in die Form: $f(x) = ax^2 + bx + c$

$$\text{a) } f(x) = (x - 2)^2 + 1 = (x^2 - 4x + 4) + 1 = x^2 - 4x + 5$$

$$\text{b) } f(x) = 3(x + 1)^2 - 3 = 3(x^2 + 2x + 1) - 3 = 3x^2 + 6x$$

$$\text{c) } f(x) = 2(x - 1)^2 + 1 = 2(x^2 - 2x + 1) + 1 = 2x^2 - 4x + 3$$

$$\text{d) } f(x) = -(x + 9)^2 - 5 = -(x^2 + 18x + 81) - 5 = -x^2 - 18x - 86$$

3) Bestimme die Scheitelpunktformen der Funktionen

$$\text{a) } f(x) = x^2 + 2x - 3 = x^2 + 2x + 1 - 1 - 3 = (x + 1)^2 - 4$$

$$\text{b) } f(x) = x^2 - 8x + 5 = x^2 - 8x + 16 - 16 + 5 = (x - 4)^2 - 11$$

$$\begin{aligned} \text{c) } f(x) &= 3x^2 + 6x - 12 = 3(x^2 + 2x - 4) = 3(x^2 + 2x + 1 - 1 - 4) \\ &= 3[(x + 1)^2 - 5] = 3(x + 1)^2 - 15 \end{aligned}$$

$$\begin{aligned} \text{d) } f(x) &= 2x^2 - 20x + 10 = 2(x^2 - 10x + 5) \\ &= 2(x^2 - 10x + 25 - 25 + 5) = 2[(x - 5)^2 - 20] \\ &= 2(x - 5)^2 - 40 \end{aligned}$$