5.69) 1-2)

$f(x) := \boxed{a} \cdot x^2 + b \cdot x + d$

$P := \begin{bmatrix} -2 \\ \boxed{y_Q} \end{bmatrix}$

$f'(x) := \frac{d}{dx} f(x) \rightarrow 2 \cdot a \cdot x + b$

2: Bedingungen
I: f(3) = 0
II: f'(-2) = -2
III: f'(3) = 0

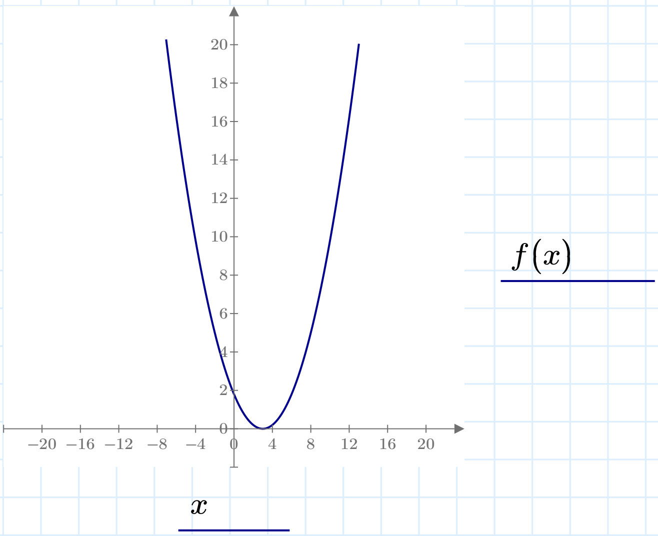
$[a \;\; b \;\; d] := \begin{bmatrix} f(3) = 0 \\ f'(-2) = -2 \\ f'(3) = 0 \end{bmatrix} \rightarrow \begin{bmatrix} d + 3 \cdot b + 9 \cdot a = 0 \\ b - 4 \cdot a = -2 \\ b + 6 \cdot a = 0 \end{bmatrix} \xrightarrow{solve, a, b, d} \begin{bmatrix} \frac{1}{5} & -\frac{6}{5} & \frac{9}{5} \end{bmatrix}$

Funktionsgleichung

$f(x) := a \cdot x^2 + b \cdot x + d \xrightarrow{expand} \frac{x^2}{5} - \frac{6 \cdot x}{5} + \frac{9}{5}$

$y_Q := f(-2) \rightarrow 5 \quad P := \begin{bmatrix} -2 \\ 5 \end{bmatrix}$

Grafik



$\text{clear}(a, b, d, f)$

5.72 a)

$f(x) := a \cdot x^3 + b \cdot x^2 + c \cdot x + d$

$E_1 := \begin{bmatrix} 0 \\ 0 \end{bmatrix} \quad E_2 := \begin{bmatrix} 4 \\ 4 \end{bmatrix}$

Bedingungen:
I: f'(0) = 0
II: f'(4) = 0
III: f(4) = 4
IIII: f(0) = 0

$f'(x) := \frac{d}{dx} f(x) \rightarrow 3 \cdot a \cdot x^2 + 2 \cdot b \cdot x + c$

$f''(x) := \frac{d}{dx} f'(x) \rightarrow 6 \cdot a \cdot x + 2 \cdot b$

$$[a \ b \ c \ d] := \begin{bmatrix} f'(0) = 0 \\ f'(4) = 0 \\ f(4) = 4 \\ f(0) = 0 \end{bmatrix} \rightarrow \begin{bmatrix} c = 0 \\ c + 8 \cdot b + 48 \cdot a = 0 \\ d + 4 \cdot c + 16 \cdot b + 64 \cdot a = 4 \\ d = 0 \end{bmatrix} \xrightarrow{solve, a, b, c, d} \begin{bmatrix} -\frac{1}{8} & \frac{3}{4} & 0 & 0 \end{bmatrix}$$

$f(x) := a \cdot x^3 + b \cdot x^2 + c \cdot x + d \xrightarrow{expand} -\frac{x^3}{8} + \frac{3 \cdot x^2}{4}$

clear (a, b, c, d)

5.72 b)

$E := \begin{bmatrix} 0 \\ 0 \end{bmatrix} \quad W := \begin{bmatrix} 1 \\ 3 \end{bmatrix} \quad f(x) := a \cdot x^3 + b \cdot x^2 + c \cdot x + d$

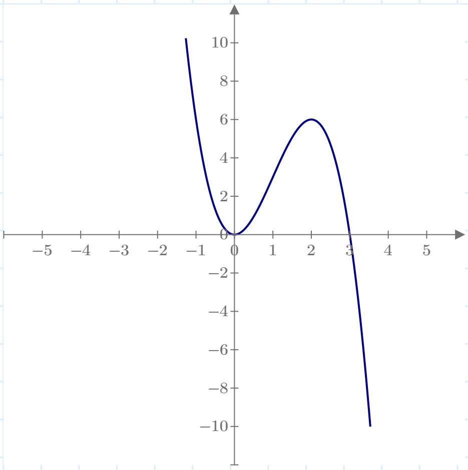
Bedingungen:
I: f(0) = 0
II: f'(0) = 0
III: f''(1) = 0
IIII: f(1) = 3

$f'(x) := \frac{d}{dx} f(x) \xrightarrow{expand} 3 \cdot a \cdot x^2 + 2 \cdot b \cdot x + c$

$$[a \ b \ c \ d] := \begin{bmatrix} f(0) = 0 \\ f''(1) = 0 \\ f'(0) = 0 \\ f(1) = 3 \end{bmatrix} \xrightarrow{solve, a, b, c, d} \begin{bmatrix} -\frac{3}{2} & \frac{9}{2} & 0 & 0 \end{bmatrix}$$

$f(x) := a \cdot x^3 + b \cdot x^2 + c \cdot x + d \xrightarrow{expand} -\frac{3 \cdot x^3}{2} + \frac{9 \cdot x^2}{2}$

Grafik



$f(x)$

x