

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

$$1. p(0) = -3,375$$

$$2. P(3) = 0$$

$$3. P'(-1,5) = -22,5 \quad \text{Steigung von Tangente, kein Hoch- oder Tiefpunkt}$$

$$4. P''(4) = 19,5 \quad \text{kein Wendepunkt}$$

$$P(0) = -3,375, \text{ denn } a \cdot 0^3 + b \cdot 0^2 + c \cdot 0 + d = -3,375, \text{ also } d = -3,375$$

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

$$P'(x) = 3ax^2 + 2bx + c$$

$$P''(x) = 6ax + 2b$$

$$\underline{P(3) = a \cdot 3^3 + b \cdot 3^2 + c \cdot 3 - 3,375 = 0 \quad | +3,375}$$

$$P'(-1,5) = 3a \cdot (-1,5)^2 + 2b \cdot (-1,5) + c = -22,5$$

$$\underline{P''(4) = 6a \cdot 4 + 2b = 19,5}$$

$$27a + 9b + 3c = 3,375$$

$$6,75a - 3b + c = -22,5$$

$$24a + 2b + 0c = 19,5$$

$$\begin{array}{r|rrr} 27 & 9 & 3 & | 3,375 \\ \hline 6,75 & -3 & 1 & | -22,5 \\ \hline 24 & 2 & 0 & | 19,5 \\ \hline 9 & 3 & 1 & | 1,125 \\ \hline 6,75 & -3 & 1 & | -22,5 \\ \hline 24 & 2 & 0 & | 19,5 \end{array} \quad \begin{array}{r|rrr} 9 & 3 & 1 & | 1,125 \\ \hline 2,25 & 6 & 0 & | 23,625 \\ \hline 72 & 6 & 0 & | 58,5 \\ \hline 2,25 & 6 & 0 & | 23,625 \\ \hline -69,75 & 0 & 0 & | -34,875 \end{array}$$

$$-69,75a = -34,875 \quad | :69,75$$

$$a = 0,5$$

$$2,25 \cdot 0,5 + 66 = 23,625$$

$$1,125 + 66 = 23,625 \quad | -1,125$$

$$66 = 22,5 \quad | :6$$

$$b = 3,75$$

$$9 \cdot 0,5 + 3 \cdot 3,75 + c = 1,125$$

$$15,75 + c = 1,125 \quad | -15,75$$

$$c = -14,625$$

$$\text{Antwort: } p(x) = 0,5x^3 + 3,75x^2 - 14,625x - 3,375$$

$$p(x) = 0,5x^3 + 3,75x^2 - 14,625x - 3,375$$

$$p'(x) = 1,5x^2 + 7,5x - 14,625$$

$$p''(x) = 3x + 7,5$$

$$p'''(x) = 3$$

$$\begin{array}{r} 0,5x^3 + 3,75x^2 - 14,625x - 3,375 : (x-3) = 0,5x^2 + 5,25x + 1,125 \\ -(0,5x^3 - 1,50x^4) \end{array}$$

$$\begin{array}{r} 0 + 5,25x^2 - 14,625x \\ -(5,25x^2 - 15,750x) \end{array}$$

$$\begin{array}{r} 0 + 1,125x - 3,375 \\ -(1,125x - 3,375) \end{array}$$

$$0 + 0$$

$$0,5x^2 + 5,25x + 1,125 = 0 \quad |:5$$

$$x^2 + 10,5x + 2,25 = 0 \quad |pq$$

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

$$x_{1,2} = -5,25 \pm 5,03$$

$$x_1 = -10,28$$

$$x_2 = -0,22$$

$$\text{HP } f'(x) = 0 \quad 1,5x^2 + 7,5x - 14,625 = 0 \quad |:1,5$$

$$\text{TP } f''(x) \geq 0 \quad x^2 + 5x - 9,75 = 0$$

$$x_{1,2} = -2,5 \pm \sqrt{2,5^2 + 9,75} \quad f''(-6,5) = 3 \cdot (-6,5) + 7,5 = -12 \quad (\text{HP})$$

$$x_{1,2} = -2,5 \pm 4 \quad f''(1,5) = 3 \cdot 1,5 + 7,5 = 12 \quad (\text{TP})$$

$$x_1 = 1,5$$

$$f(-6,5) \approx 112,813$$

$$x_2 = -6,5$$

$$f(1,5) = -15,1875$$

$$\text{HP}(-6,5 | 112,813)$$

$$\text{TP}(1,5 | -15,1875)$$

WP $f''=0$

$f''' \geq 0$ RL Kurve

$f'=0$ Sattel

$f' \neq 0$ einfache WP

$$3x + 7,5 = 0 \quad | -7,5$$

$$3x = -7,5 \quad | :3$$

$$x = -2,5$$

$$f'''(-2,5) = 3, \text{ denn RLKW}$$

$$f(-2,5) = 48,8125$$

$$f'(-2,5) = -24$$

WP(-2,5|48,8125)

$$\arctan(-24) = -87,61^\circ$$

WT-Steigung: -24

Winkel: -87,61°

Abstand: $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$$\begin{aligned} & \sqrt{(-6,5 - 1,5)^2 + (112,813 - (-15,1875))^2} \\ & = \sqrt{(-8)^2 + (-128)^2} \approx 128,25 \text{ [LE]} \end{aligned}$$

Durchschnittswert der Funktion:

$$\bar{m} = \frac{\int_a^b f(x) dx}{b-a} = \frac{1}{b-a} \cdot \int_a^b f(x) dx$$

$$\begin{aligned} a &= 3 \\ b &= 5 \end{aligned} \quad \left| \bar{m} = \frac{1}{5-3} \cdot \left[\frac{0,5}{4} x^4 + \frac{3,75}{3} x^3 - \frac{14,625}{2} x^2 - 3,375 x \right] \right|_3^5$$

$$= 0,5 \cdot \left[0,125 x^4 + 1,25 x^3 - 7,3125 x^2 - 3,375 x \right] \Big|_3^5$$

$$= 0,5 \cdot \underbrace{[34,6875]}_{F(5)} - \underbrace{[-32,0625]}_{F(3)} = 33,375$$

$$\int_a^b f(x) dx = F(b) - F(a)$$