

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

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

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

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

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

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

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

$$p'(x) = 3 a x^2 + 2 b x + c$$

$$p''(x) = 6 a x + 2 b$$

$$p(3) = a \cdot 3^3 + b \cdot 3^2 + c \cdot 3 - 3,375 = 0 \quad | +3,375$$

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

$$p''(4) = 6 a \cdot 4 + 2 b = 19,5$$

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

$$6,75 a - 3 b + 1 c = -22,5$$

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

27	9	3		3,375 :3	9	3	1		1,125
6,75	-3	1		-22,5	2,25	6	0		23,625
24	2	0		19,5	72	6	0		58,5
9	3	1		1,125	9	3	1		1,125
6,75	-3	1		-22,5	2,25	6	0		23,625
24	2	0		19,5 :3	-69,75	0	0		-34,875

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

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

$$a = 0,5$$

$$2,25 \cdot 0,5 + 6b = 23,625$$

$$1,125 + 6b = 23,625 | -1,125$$

$$6b = 22,5 | :6$$

$$b = 3,75$$

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

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

$$c = -14,625$$

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

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

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

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

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

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

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

$$0 + 0$$

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

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

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

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

$$x_1 = -10,28$$

$$x_2 = -0,22$$

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

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

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

$$x_{1/2} = -2,5 \pm 4$$

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

$$x_1 = 1,5$$

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

$$x_2 = -6,5$$

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

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

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

$$\text{WP } f''=0 \quad 3x + 7,5 = 0 \quad | -7,5$$

$$f''' \geq 0 \text{ RL Kurve} \quad 3x = -7,5 \quad | :3$$

$$f'=0 \text{ Sattel} \quad x = -2,5$$

$$f' \neq 0 \text{ einfach WP} \quad f'''(-2,5) = 3, \text{ denn RLKW}$$

$$\begin{array}{l} f(-2,5) = 48,8125 \\ f'(-2,5) = -24 \end{array} \quad \left| \text{WP}(-2,5 | 48,8125) \right.$$

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

$$\text{WT-Steigung: } -24$$

$$\text{Winkel: } -87,61^\circ$$

$$\text{Abstand: } \sqrt{(x_B - x_A)^2 + (y_B - y_A)^2}$$

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

Durchschnittswert der Funktion:

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

$$\begin{aligned} a=3 \quad b=5 \quad \left| \bar{m} = \frac{1}{5-3} \cdot \left[\frac{0,5}{4} x^4 + \frac{3,75}{3} x^3 - \frac{14,625}{2} x^2 - 3,375 x \right] \right|_3^5 \\ = 0,5 \cdot \left[\underbrace{0,125 x^4}_{F(5)} + \underbrace{1,25 x^3}_{F(3)} - 7,3125 x^2 - 3,375 x \right]_3^5 \\ = 0,5 \cdot [34,6875 - (-32,0625)] = 33,375 \end{aligned}$$

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