

Lösung vom 06. 07. 2009

Martin Wellmann

$$f(x) = x^3 - (4 + 2t)x^2 + (4 + 8t)x - 8t$$

$$f'(x) = 3x^2 - (8 + 4t)x + 4 + 8t$$

$$f''(x) = 6x - (8 + 4t)$$

$$f'''(x) = 6$$

Extrema:

$$f'(x) = 0 \Rightarrow 0 = x^2 - \frac{8 + 4t}{3}x + \frac{4 + 8t}{3}$$

$$x_{1,2} = \frac{4 + 2t}{3} \pm \sqrt{\frac{16 + 16t + 4t^2 - 12 - 24t}{9}} = \frac{4 + 2t}{3} \pm \frac{2 - 2t}{3}$$

$$x_1 = 2 \rightarrow f''(2) \neq 0 \leftarrow (t \neq 1) \rightarrow f(2) = 0 \Rightarrow E_1(2/0)$$

$$x_2 = \frac{2 + 4t}{3} \rightarrow f''(x_2) \neq 0 \Rightarrow E_2\left(\frac{2 + 4t}{3} / f\left(\frac{2 + 4t}{3}\right)\right)$$

Ortslinie:

$$x = \frac{2 + 4t}{3} \Rightarrow t = \frac{3x - 2}{4} \Rightarrow t^2 = \frac{9x^2 - 12x + 4}{16} \Rightarrow t^3 = \frac{27x^3 - 54x^2 + 36x - 8}{64}$$

$$y = \frac{8 + 48t + 96t^2 + 64t^3}{27} - \frac{16 + 72t + 96t^2 + 32t^3}{9} + \frac{8 + 32t + 32t^2}{3} - 8t$$

$$y = \frac{32 - 96t + 96t^2 - 32t^3}{27} \leftarrow t$$

$$y = \frac{32 - 72x + 48 + 54x^2 - 72x + 24 - \frac{27}{2}x^3 + 27x^2 - 18x + 4}{27}$$

$$y = -\frac{1}{2}x^3 + 3x^2 - 6x + 4 \leftarrow \text{Ortslinie}$$