Kurven Aufgabe 58

$f_{(x)} = - 3x^4 + 5x^2 - 2x$

$f'_{(x)} = - 12x^3 + 10x - 2$, $f''_{(x)} = - 36x^2 + 10$, $f'''_{(x)} = -72x$

Definitionsbereich: **$- \infty < x < \infty$**

Wertebereich: **$- \infty < f_{(x)} \leq 4$** (siehe Extrempunkte)

Asymptoten: -

Symmetrie: -

Nullstellen:

$- 3x^4 + 5x^2 - 2x = 0$

$x * (-3x^3 + 5x - 2) = 0$

$x_1 = 0$

Durch Probieren gefunden $x_2 = 1$

$- 3x^3 + 5x - 2 = 0$

Hornerschema:

	-3	0	5	-2
$x_2 = 1$		-3	-3	2
	-3	-3	2	0

Polynomdivision:

$$
\begin{array}{l}
-3x^3 + 5x - 2 : (x - 1) = -3x^2 - 3x + 2 \\
-(-3x^3 + 3x^2) \\
\hline
\quad -3x^2 + 5x - 2 \\
\quad -(-3x^3 + 3x^2) \\
\hline
\qquad -3x^2 + 5x - 2 \\
\qquad -(-3x^2 + 3x) \\
\hline
\qquad\quad 2x - 2 \\
\qquad\quad -(2x - 2) \\
\hline
\qquad\qquad 0
\end{array}
$$

$-3x^2 - 3x + 2 = 0$

A, B, C - Formel:

A = - 3, B = - 3, C = 2

$$x_{3,4} = \frac{-(-3) \pm \sqrt{(-3)^2 - 4*(-3)*2}}{2*(-3)} = \frac{3 \pm \sqrt{33}}{-6}$$

$$x_{3,4} = \frac{3 \pm 5{,}74}{-6}$$

$x_3 = -1{,}46$

$x_4 = 0{,}46$

N_1 (0|0), N_2(1|0), N_3(-1,46|0), N_4(0,46|0)

Schnittpunkt mit der y-Achse:

$f_{(0)} = -3 * 0^4 + 5 * 0^2 - 2 * 0 = 0$

S_y(0|0)

Extrempunkte:

$-12x^3 + 10x - 2 = 0$

Durch Probieren gefunden $x_1 = -1$

$f_{(-1)} = -3 * (-1)^4 + 5 * (-1)^2 - 2 * (-1) = 4$

Hornerschema:

	-12	0	10	-2
$x_1 = -1$		12	-12	2
	-12	12	-2	0

Polynomdivision: $x_1 = -1$

$$\begin{array}{l}
-12x^3 + 10x - 2 : (x + 1) = -12x^2 + 12x - 2 \\
-(-12x^3 - 12x^2) \\
\hline
\quad 12x^2 + 10x - 2 \\
\quad -(12x^2 + 12x) \\
\hline
\qquad -2x - 2
\end{array}$$

$$\frac{-(-2x - 2)}{0}$$

$-12x^2 + 12x - 2 = 0$

A, B, C - Formel:

A = -12, B = 12, C = - 2

$$x_{2,3} = \frac{-12 \pm \sqrt{12^2 - 4*(-12)*(-2)}}{2*(-12)} = \frac{-12 \pm \sqrt{48}}{-24}$$

$$x_{2,3} = \frac{-12 \pm 6{,}93}{-24}$$

$x_2 = 0{,}21$, $f_{(0,21)} = -3 * (0{,}21)^4 + 5 * (0{,}21)^2 - 2 * (0{,}21) = -0{,}21$

$x_3 = 0{,}79$, $f_{(0,79)} = -3 * (0{,}79)^4 + 5 * (0{,}79)^2 - 2 * (0{,}79) = 0{,}37$

$f''_{(-1)} = -36 * (-1)^2 + 10 < 0$ --> **Hochpunkt (-1|4)**

$f''_{(0,21)} = -36 * (0{,}21)^2 + 10 > 0$ --> **Tiefpunkt (0,21|-0,21)**

$f''_{(0,79)} = -36 * (0{,}79)^2 + 10 < 0$ --> **Hochpunkt (0,79|0,37)**

Wendepunkte:

$-36x^2 + 10 = 0 \mid -10$

$-36x^2 = -10 \mid :(-36)$

$x^2 = (10/36)$ √

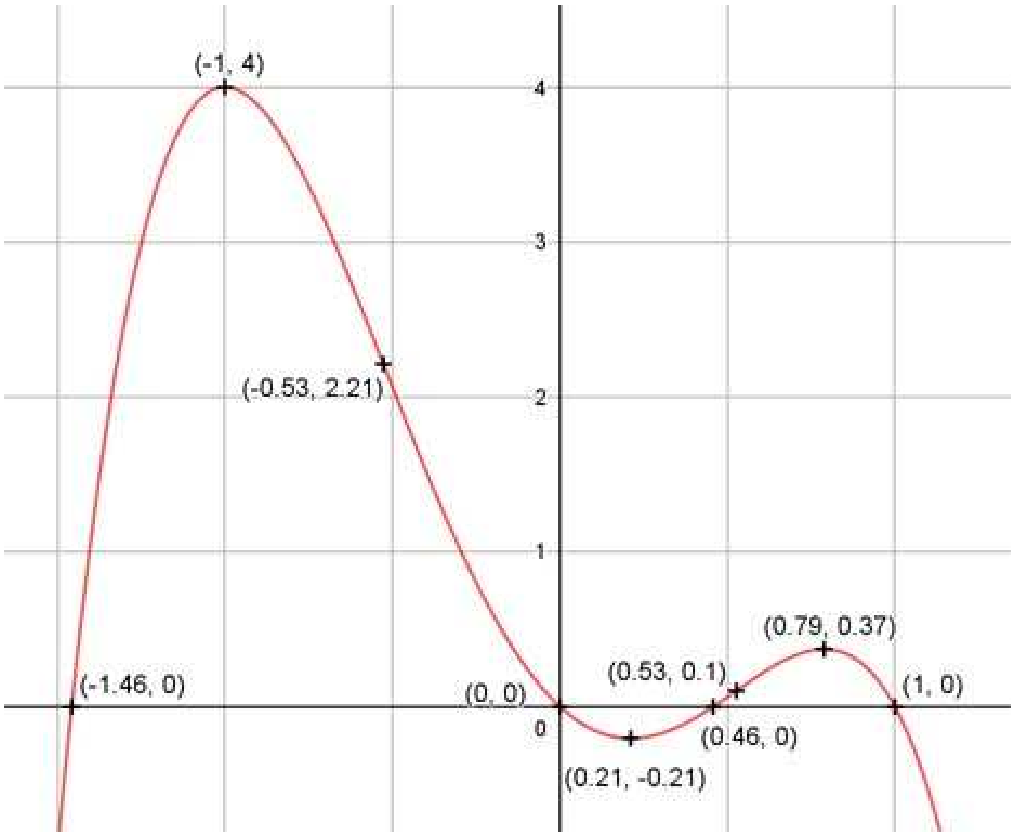
$x_{1,2} = \pm 0{,}53$, $f_{(0,53)} = -3 * (0{,}53)^4 + 5 * (0{,}53)^2 - 2 * 0{,}53 = 0{,}1$

$f_{(-0,53)} = -3 * (-0{,}53)^4 + 5 * (-0{,}53)^2 - 2 * (-0{,}53) = 2{,}21$

$f'''_{(0,53)} = -72 * 0{,}53 \neq 0$ --> **Wendepunkt (0,53|0,1)**

$f'''_{(-0,53)} = -72 * (-0{,}53) \neq 0$ --> **Wendepunkt (-0,53|2,21)**

Graph:



(-1, 4)
4
3
(-0.53, 2.21)
2
1
(0.79, 0.37)
(0.53, 0.1)
(-1.46, 0)
(0, 0)
(1, 0)
0
(0.46, 0)
(0.21, -0.21)