Kurven Aufgabe 24

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

$f'_{(x)} = 3x^2 - 4x - 3$, $f''_{(x)} = 6x - 4$, $f'''_{(x)} = 6$

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

Wertebereich: **$-\infty < f_{(x)} < \infty$**

Asymptoten: -

Symmetrie zur y-Achse bzw. zum Punkt (0|0):

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

$f_{(-x)} = -x^3 - 2x^2 + 3x \neq f_{(x)}$

---> **keine Achsensymmetrie**

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

$-f_{(-x)} = x^3 + 2x^2 - 3x \neq f_{(x)}$

---> **keine Punktsymmetrie**

Nullstellen:

$f_{(x)} = 0$

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

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

$x_1 = 0$

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

p, q - Formel:

$p = -2$, $q = -3$

$$x_{1,2} = \frac{-(-2)}{2} \pm \sqrt{\left(\frac{-2}{2}\right)^2 - (-3)}$$

$x_{1,2} = 1 \pm \sqrt{4}$

$x_{1,2} = 1 \pm 2$

$x_1 = 3$

$x_2 = -1$ **$N_1(0|0), N_2(3|0), N_3(-1|0)$**

Schnittpunkt mit der y-Achse:

$x = 0$

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

$S_y(0|0)$

Extrempunkte:

$f'_{(x)} = 0$

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

A, B, C - Formel:

$A = 3, B = -4, C = -3$

$$x_{1,2} = \frac{-(-4) \pm \sqrt{(-4)^2-(4*3*(-3))}}{2 * 3} = \frac{4 \pm \sqrt{52}}{6}$$

$$x_{1,2} = \frac{4 \pm 7{,}21}{6}$$

$x_1 = 1{,}87, f_{(1,87)} = 1{,}87^3 - 2 * 1{,}87^2 - 3 * 1{,}87 = -6{,}06$

$x_2 = -0{,}54, f_{(-0,54)} = (-0{,}54)^3 - 2 * (-0{,}54)^2 - 3 * (-0{,}54) = 0{,}88$

$f''_{(1,87)} = 6 * 1{,}87 - 4 > 0$ --> **Tiefpunkt (1,87|- 6,06)**

$f''_{(-0,54)} = 6 * (-0{,}54) - 4 < 0$ --> **Hochpunkt (-0,54|0,88)**

Wendepunkte:

$f''_{(x)} = 0$

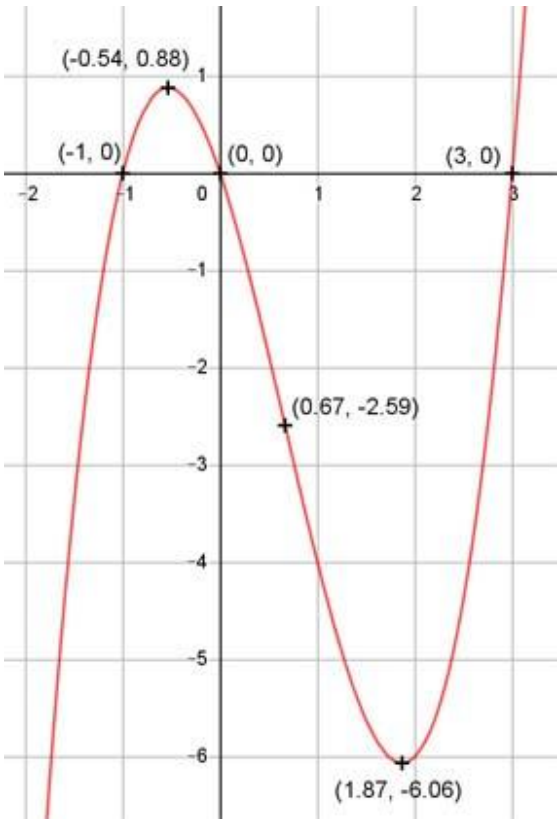
$6x - 4 = 0|+4$

$6x = 4 \mid :6$

$x = 2/3, f_{(2/3)} = (2/3)^3 - 2 * (2/3)^2 - 3 * (2/3) = -2{,}59$

$f'''_{(2/3)} \neq 0$ --> **Wendepunkt (2/3|-2,59)**

Graph:


(-0.54, 0.88)
(-1, 0)
(0, 0)
(3, 0)
(0.67, -2.59)
(1.87, -6.06)
-2
-1
0
1
2
3
1
-1
-2
-3
-4
-5
-6