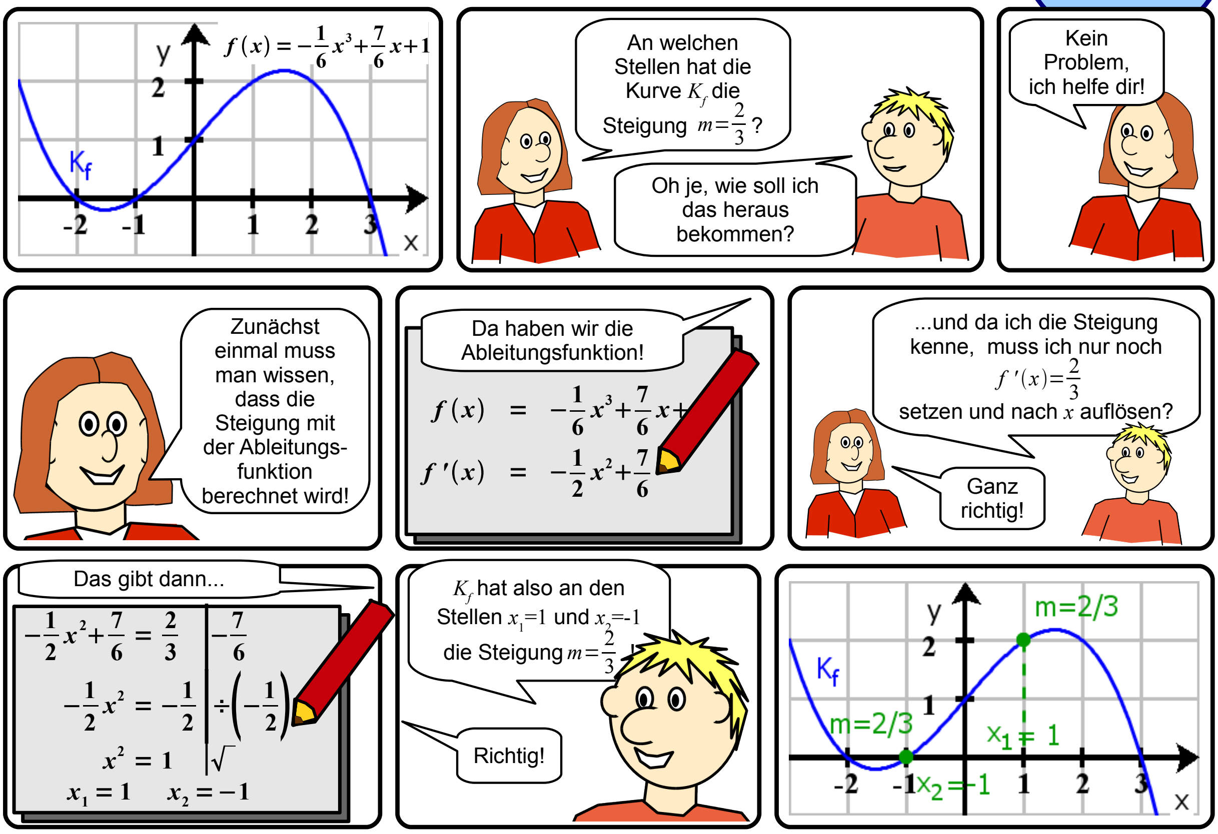
Benny berechnet die Stellen zu einer gegebenen Steigung

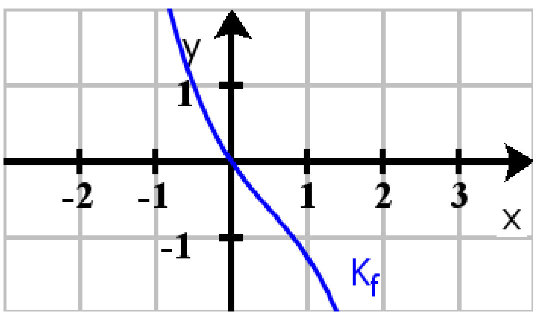
2



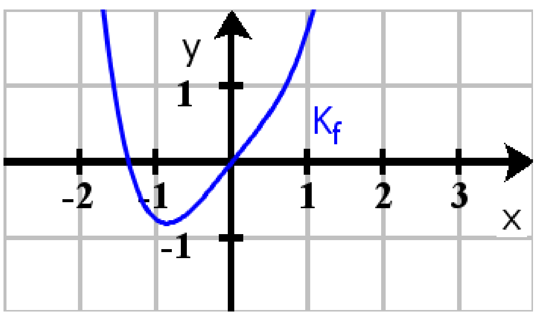
Aufgaben

Zeichnen Sie das Schaubild ab. Berechnen Sie die Stellen an denen die Kurve die gegebene Steigung hat und markieren Sie die Stellen im Schaubild.

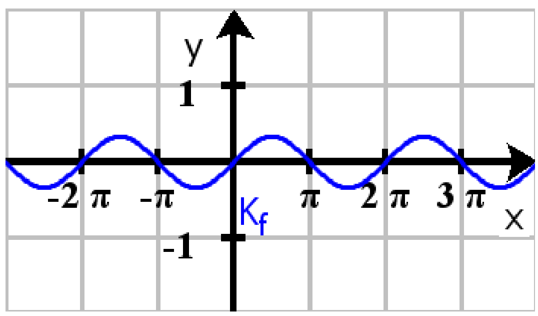
1) $f(x) = -\frac{1}{2}x^3 + \frac{3}{4}x^2 - \frac{3}{2}x\,;\; m = -\frac{3}{2}$



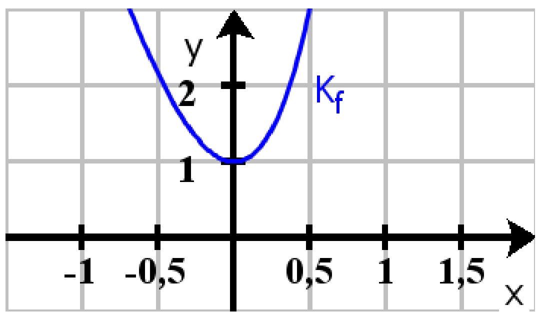
2) $f(x) = \frac{1}{2}x^4 + \frac{5}{4}x\,;\; m = 1$



3) $f(x) = \frac{1}{3}\sin(x)\,;\; m = \frac{1}{6}\,;\; -\pi < x < 4\pi$



4) $f(x) = 2e^{2x} + 4e^{x} - 8x - 5\,;\; m = 0$



1) $f(x) = -\frac{1}{2}x^3+\frac{3}{4}x^2-\frac{3}{2}x$; $m=-\frac{3}{2}$

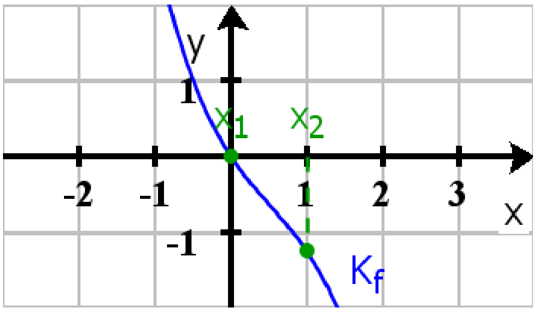
Setze $f'(x)=-\frac{3}{2}$:

$f'(x)=-\frac{3}{2}x^2+\frac{3}{2}x-\frac{3}{2}$

$$
\begin{aligned}
-\frac{3}{2}x^2+\frac{3}{2}x-\frac{3}{2} &= -\frac{3}{2} && |\cdot 2\\
-3x^2+3x-3 &= -3 && |+3\\
-3x^2+3x &= 0\\
x(-3x+3) &= 0
\end{aligned}
$$

$\Rightarrow x_1=0$ oder $-3x+3=0$

$$
\begin{aligned}
-3x+3 &= 0 && |-3\\
-3x &= -3 && |\div(-3)\\
x_2 &= 1
\end{aligned}
$$

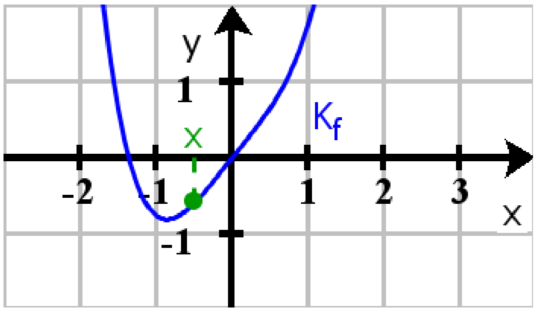


2) $f(x) = \frac{1}{2}x^4+\frac{5}{4}x$; $m=1$

Setze $f'(x)=1$:

$f'(x)=2x^3+\frac{5}{4}$

$$
\begin{aligned}
2x^3+\frac{5}{4} &= 1 && |\cdot 4\\
8x^3+5 &= 4 && |-5\\
8x^3 &= -1 && |\div 8\\
x^3 &= -\frac{1}{8} && |\sqrt[3]{}\\
x &= \sqrt[3]{-\frac{1}{8}}\\
x &= -\frac{1}{2}
\end{aligned}
$$



3) $f(x)=\frac{1}{3}\sin(x)$; $m=\frac{1}{6}$; $-\pi<x<4\pi$

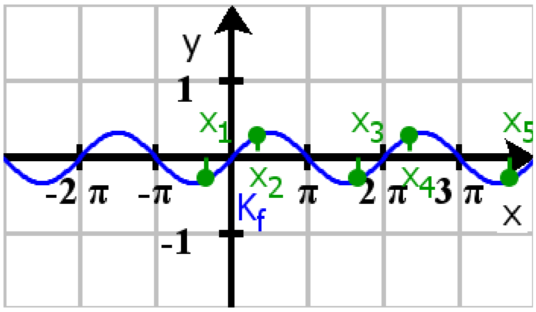
Setze $f'(x)=\frac{1}{6}$:

$f'(x)=\frac{1}{3}\cos(x)$

$$
\begin{aligned}
\frac{1}{3}\cos(x) &= \frac{1}{6} && \left|\div\frac{1}{3}\right.\\
\cos(x) &= \frac{1}{2}
\end{aligned}
$$

$\Rightarrow x_1=-\frac{1}{3}\pi$; $x_2=\frac{1}{3}\pi$; $x_3=\frac{5}{3}\pi$

$x_4=\frac{7}{3}\pi$; $x_5=\frac{11}{3}\pi$



4) $f(x) = 2e^{2x}+4e^{x}-8x-5\,;\ m=0$

Setze $f'(x)=0$:

$f'(x)=4e^{2x}+4e^{x}-8$

Löse nach x auf:

$$\begin{aligned} 4e^{2x}+4e^{x}-8 &= 0 \\ 4e^{2(x)}+4e^{x}-8 &= 0 \\ 4\left(e^{(x)}\right)^2+4e^{x}-8 &= 0 \quad \left|\, e^{x} \rightarrow u \right. \\ 4u^2+4u-8 &= 0 \end{aligned}$$

mit $a=4$, $b=4$ und $c=-8$
in die Lösungsformel einsetzen:

$$u_{1,2}=\frac{-4\pm\sqrt{4^2-4\cdot4\cdot(-8)}}{2\cdot4}$$

$$\begin{aligned} u_{1,2} &= \frac{-4\pm12}{8} \\ u_1 &= 1 \\ u_2 &= -2 \end{aligned}$$

Rücksubstituton: $u \rightarrow e^{x}$

u_1: $e^{x}=1$

$$\begin{aligned} e^{x} &= 1 \quad \left|\, \ln \right. \\ x &= \ln(1) \\ x &= 0 \end{aligned}$$

$x_1=0$

u_2: $e^{x}=-2$

hat keine Lösung