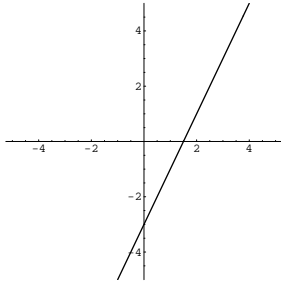


2 Einfache Funktionen - Lösungen

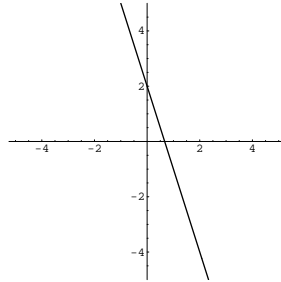
2.1 Geraden

1. Geraden:

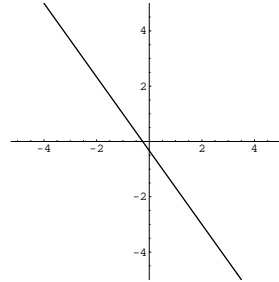
$$y = 2x - 3$$



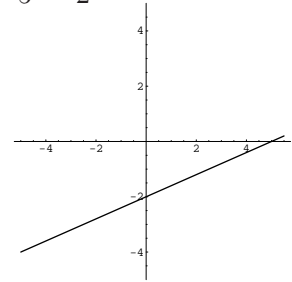
$$y = 2 - 3x$$



$$4x + 3y - 1 = 0$$



$$\frac{x}{5} - \frac{y}{2} = 1$$



2. Gegeben sei die Gerade durch die beiden Punkte $P_1(1, -2)$ und $P_2 = (3, 5)$.

(a) Gleichung dieser Geraden:

$$y = y_1 + \frac{y_2 - y_1}{x_2 - x_1}(x - x_1) = -2 + \frac{7}{2}(x - 1) = \frac{7}{2}x - \frac{11}{2}$$

(b) Achsenabschnitte:

$$\frac{7}{11}x - \frac{2}{11} = 1 \rightarrow \frac{x}{11} + \frac{y}{-\frac{11}{2}} = 1 \rightarrow \text{Achsenabschnitte } a = \frac{11}{7}, b = -\frac{11}{2}$$

(c) Gerade, die P_1 enthält und senkrecht auf der gegebenen Geraden steht:

$$y = -2 - \frac{2}{7}(x - 1) = -\frac{2}{7}x - \frac{12}{7}$$

2.2 Parabeln

1. Scheitelpunktsform:

$$(a) y = x^2 - 10x + 22 = (x - 5)^2 - 3$$

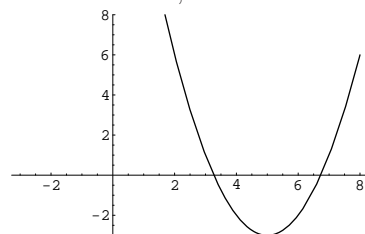
$$(b) y = 2x^2 + 4x + 5 = 2(x^2 + 2x) + 5 = 2((x + 1)^2 - 1) + 5 = 2(x + 1)^2 + 3$$

$$(c) y = -\frac{1}{2}x^2 + 2x - 1 = -\frac{1}{2}(x^2 - 4x - 2) = -\frac{1}{2}(x - 2)^2 + 1$$

2. Parabeln :

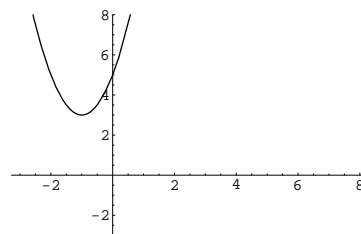
(a) Scheitelpunkt $S[5, -3]$

Nullstellen $x_{1,2} = 5 \pm \sqrt{3}$



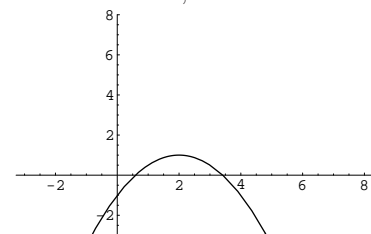
(a) Scheitelpunkt $S[-1, 3]$

keine Nullstellen



(a) Scheitelpunkt $S[2, 1]$

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



3. Parabel durch die drei Punkte $P_1(2, 1)$, $P_2(3, \frac{1}{2})$ und $P_3(-4, -17)$?

$$y(x) = ax^2 + bx + c$$

$$y(2) = 4a + 2b + c = 1$$

$$y(3) = 9a + 3b + c = \frac{1}{2}$$

$$y(-4) = 16a - 4b + c = -17$$

lineares Gleichungs-
system für a , b und c

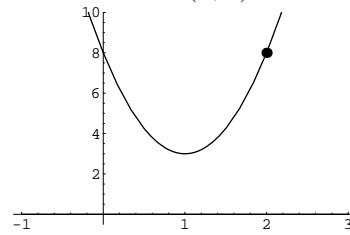
$$\rightarrow \begin{cases} a = -\frac{1}{2}, b = 2, c = -1 \\ y = -\frac{1}{2}x^2 + 2x - 1 \end{cases}$$

4. Parabel mit dem Scheitelpunkt $S(1, 3)$ und durch den Punkt $P(2, 8)$:

$$y(x) = a(x - 1)^2 + 3$$

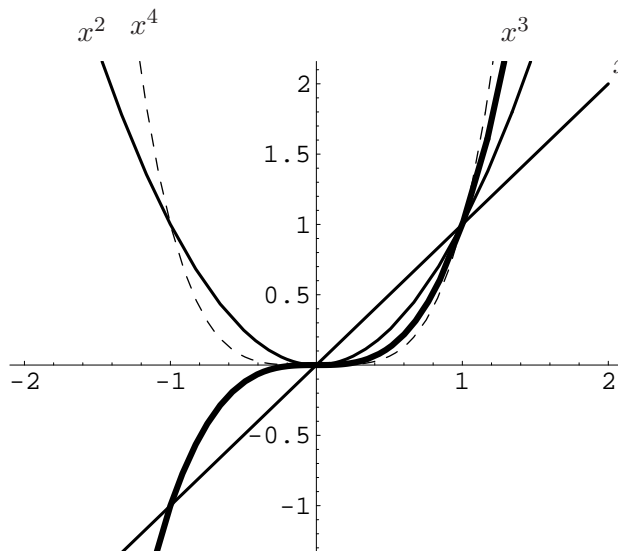
$$y(2) = a + 3 = 8 \rightarrow a = 5$$

$$y(x) = 5(x - 1)^2 + 3$$

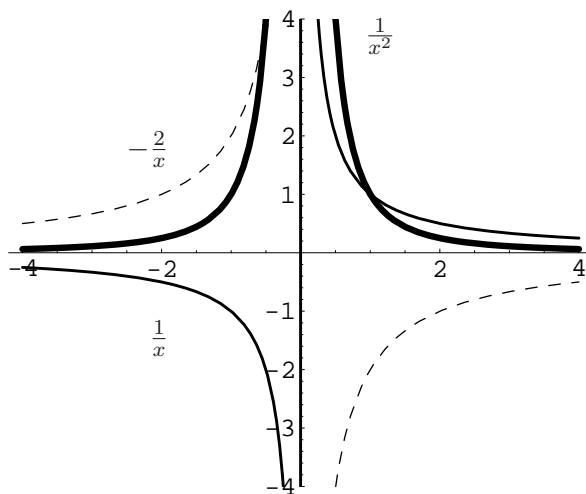


2.3 Potenz- und Wurzelfunktionen

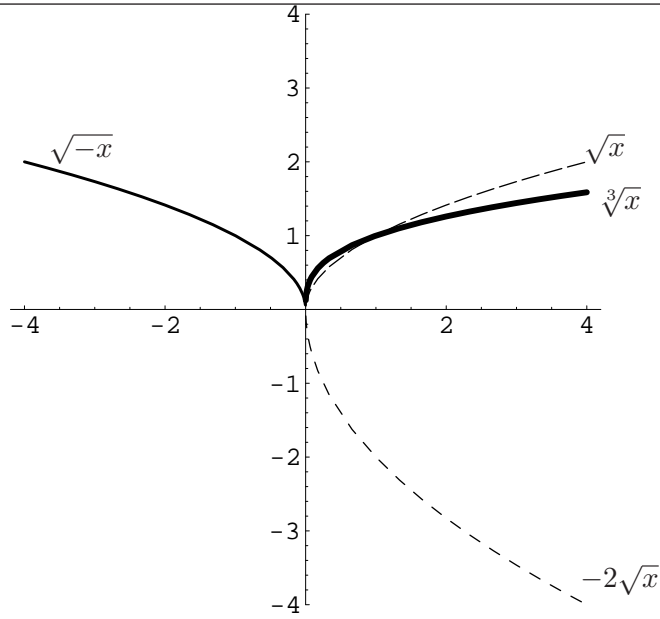
1. $y = x$, $y = x^2$, $y = x^3$, $y = x^4$



2. $y = \frac{1}{x}$, $y = \frac{1}{x^2}$, $y = -\frac{2}{x}$

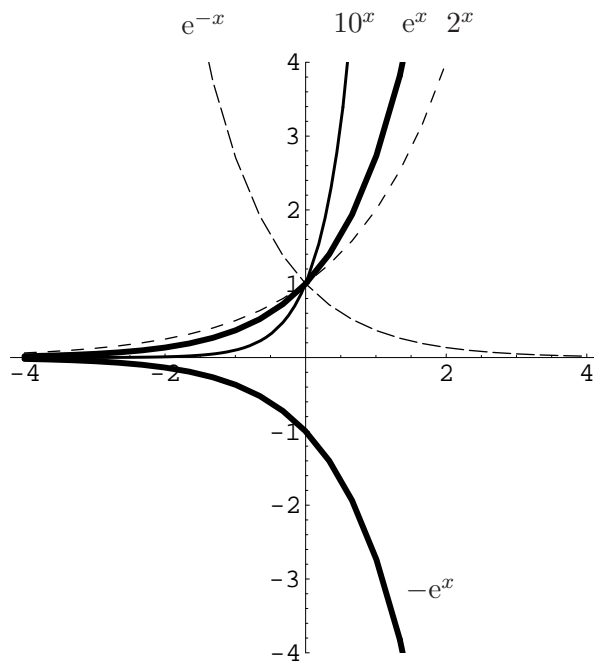


3. $y = \sqrt{x}$, $y = \sqrt{-x}$, $y = -2\sqrt{x}$, $y = \sqrt[3]{x}$

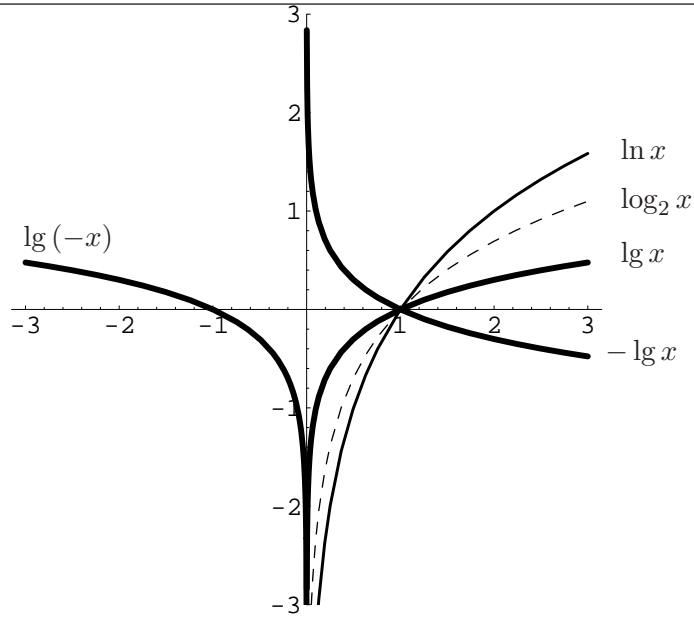


2.4 Exponential- und Logarithmusfunktionen

1. $y = e^x$, $y = -e^x$, $y = e^{-x}$, $y = 10^x$, $y = 2^x$

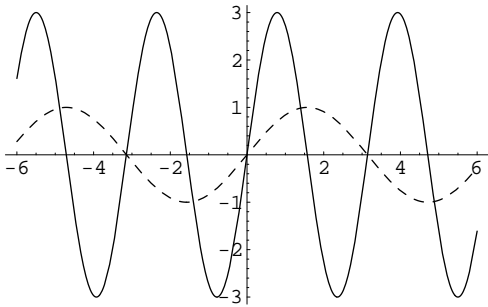


2. $y = \ln x$, $y = \lg x$, $y = \log_2 x$, $y = \lg(-x)$, $y = -\lg x$

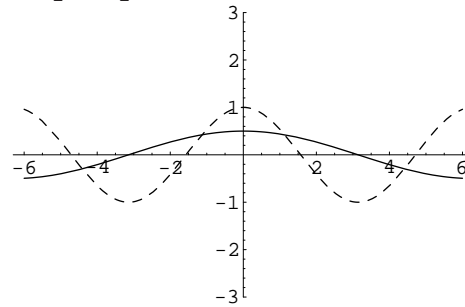


2.5 Trigonometrische Funktionen

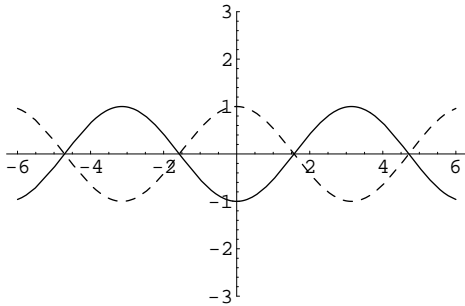
$y = 3 \sin 2x$ ($y = \sin x$)



$y = \frac{1}{2} \cos \frac{1}{2}x$ ($y = \cos x$)



$y = \sin(x - \frac{\pi}{2})$ ($y = \sin x$)



$y = -\tan \frac{x}{2}$ ($y = \tan x$)

