

Funktionen 9. Schulst. 1/30

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Funktionen

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Grades

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Grades

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23: f_{u} : Ungerade Funktionen

24: f_{gebr1} : gebrochen

rationale Funktionen mit x im

Nenner

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rationale Funktionen mit x^2

im Nenner

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Funktionen 9. Schulst. 3/30

$$f_{\text{lin}}: f(x) = k \cdot x + d$$

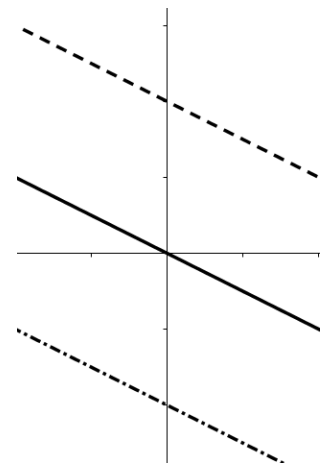
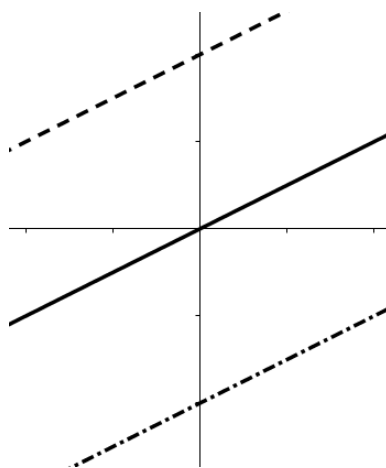
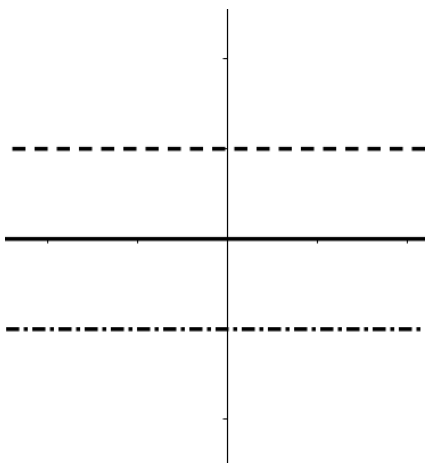
$$f(x) = k \cdot x + d$$

$d = 0$: 

$d > 0$: 

$d < 0$: 

$k = 0$ || $k > 0$ || $k < 0$




Funktionen 9. Schulst. 4/30

$$f_{q_1}: f(x) = a \cdot x^2$$

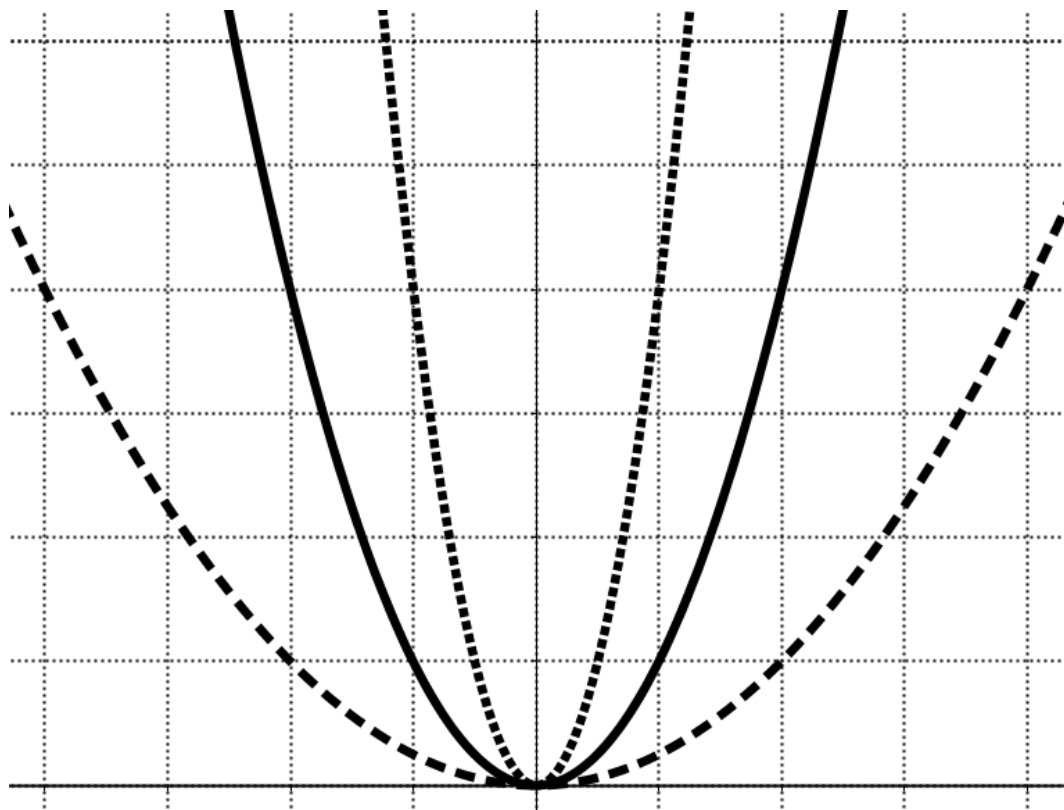
Parabel nach oben offen:

$a > 0$: 

$f(x) = x^2$; $a = +1$: 

$f(x) = 1/4 \cdot x^2$; $a = 1/4$: 

$f(x) = 4 \cdot x^2$; $a = 4$: 



Funktionen 9. Schulst. 5/30

$$f_{q_2}: f(x) = a \cdot x^2$$

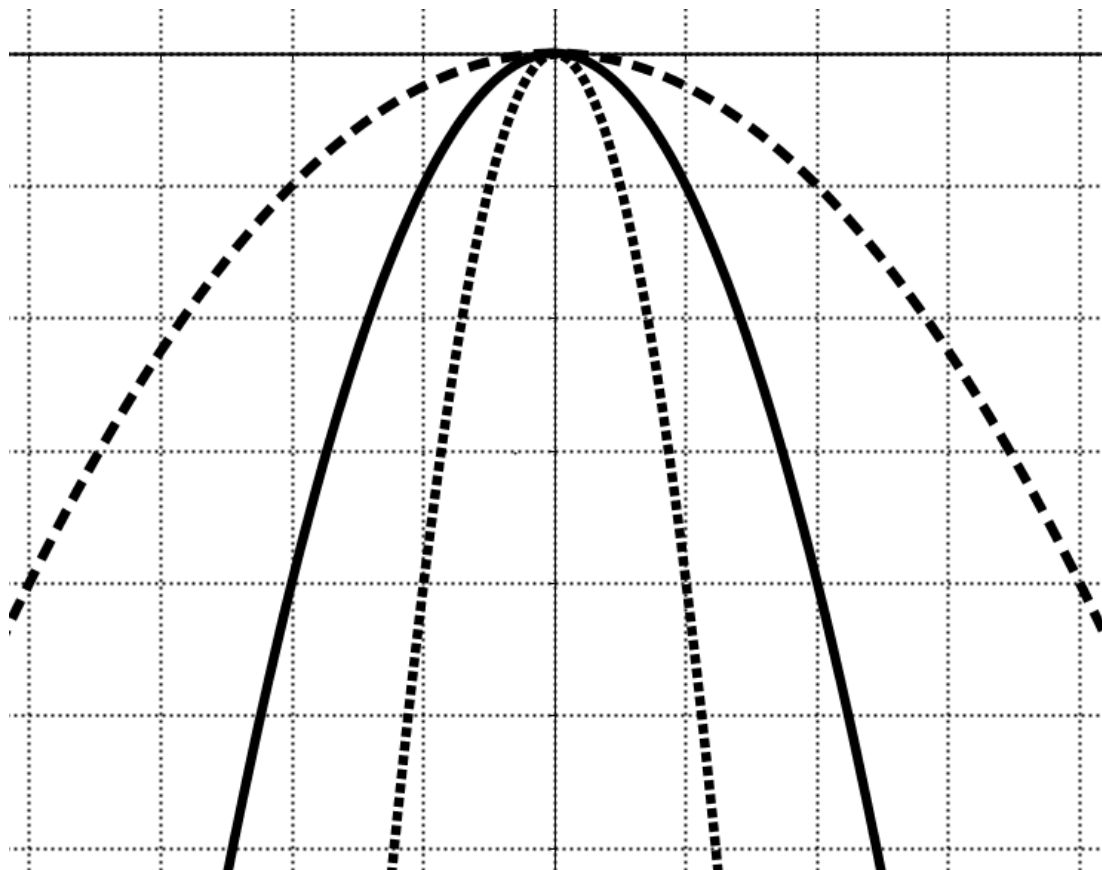
Parabel nach unten offen:

$a < 0$: 

$$f(x) = -x^2; a = -1: \text{———}$$

$$f(x) = -\frac{1}{4} \cdot x^2; a = -\frac{1}{4}: \text{-----}$$

$$f(x) = -4 \cdot x^2; a = -4: \text{.....}$$

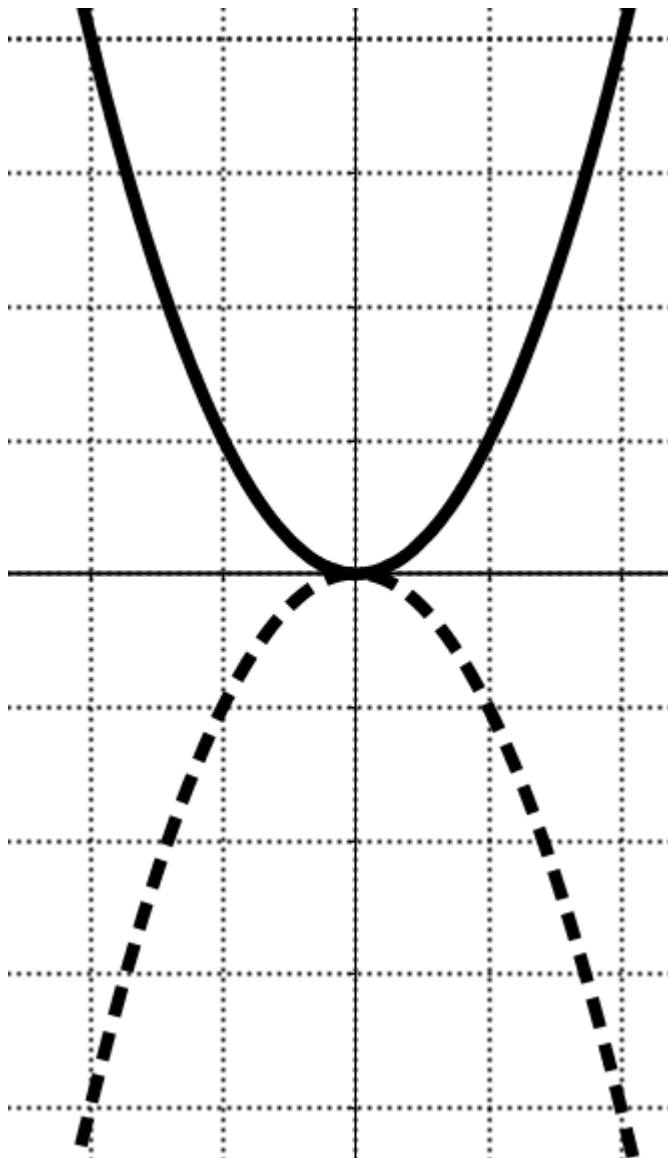


Funktionen 9. Schulst. 6/30

$$f_{q_3}: f(x) = a \cdot x^2$$

Parabel spiegeln

$a = 1$: — ||| $a = -1$: - - - - -



Funktionen 9. Schulst. 7/30

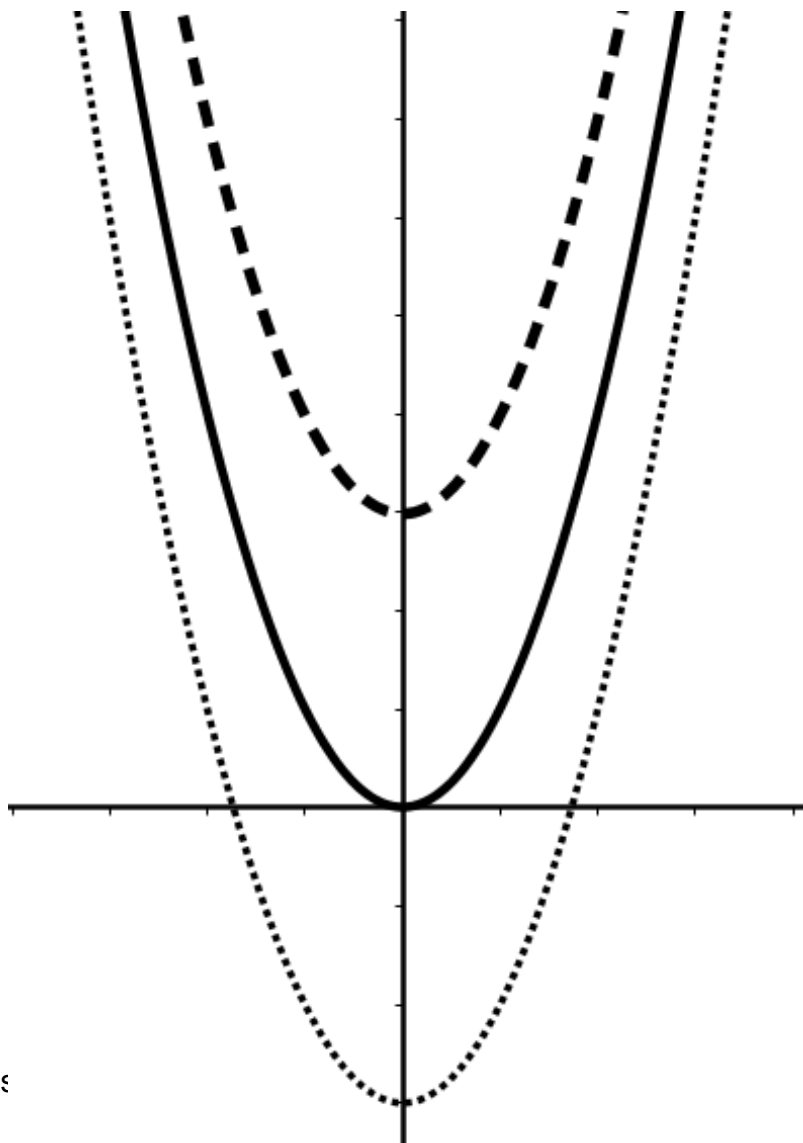
$$f_{q_4}: f(x) = x^2 + c$$

senkrecht verschieben

$c = 0$ ($f(x) = x^2$): ———

$c > 0$ (hinauf): - - - - -

$c < 0$ (hinunter):
.....



Funktionen 9. Schulst. 8/30

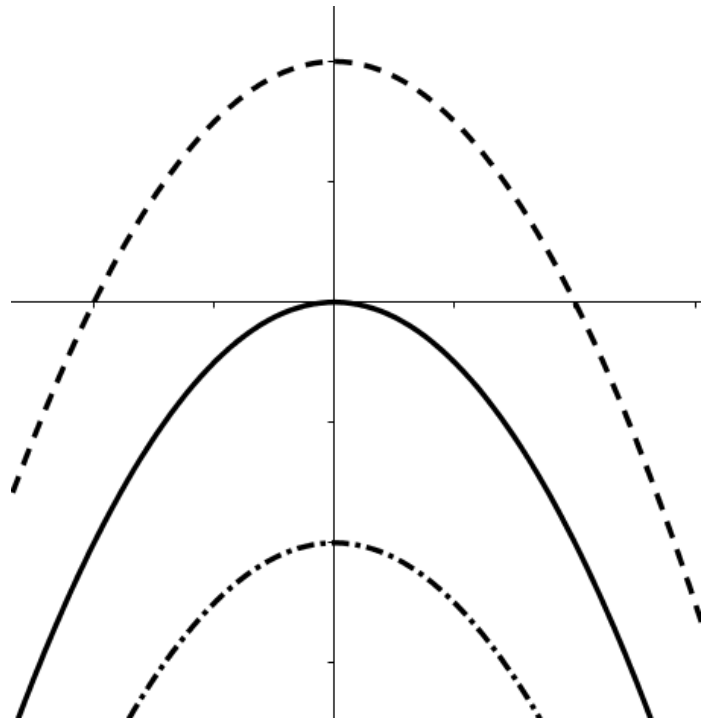
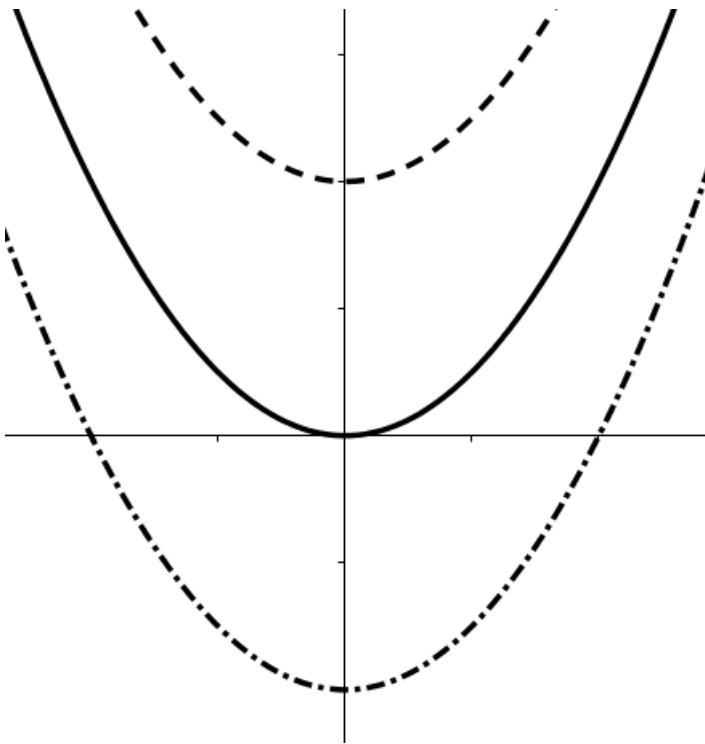
$$f_{q_5}: f(x) = a \cdot x^2 + c$$

$c = 0$: ———

$c > 0$: - - - -

$c < 0$: - . -

$a > 0$ || $a < 0$



Funktionen 9. Schulst. 9/30

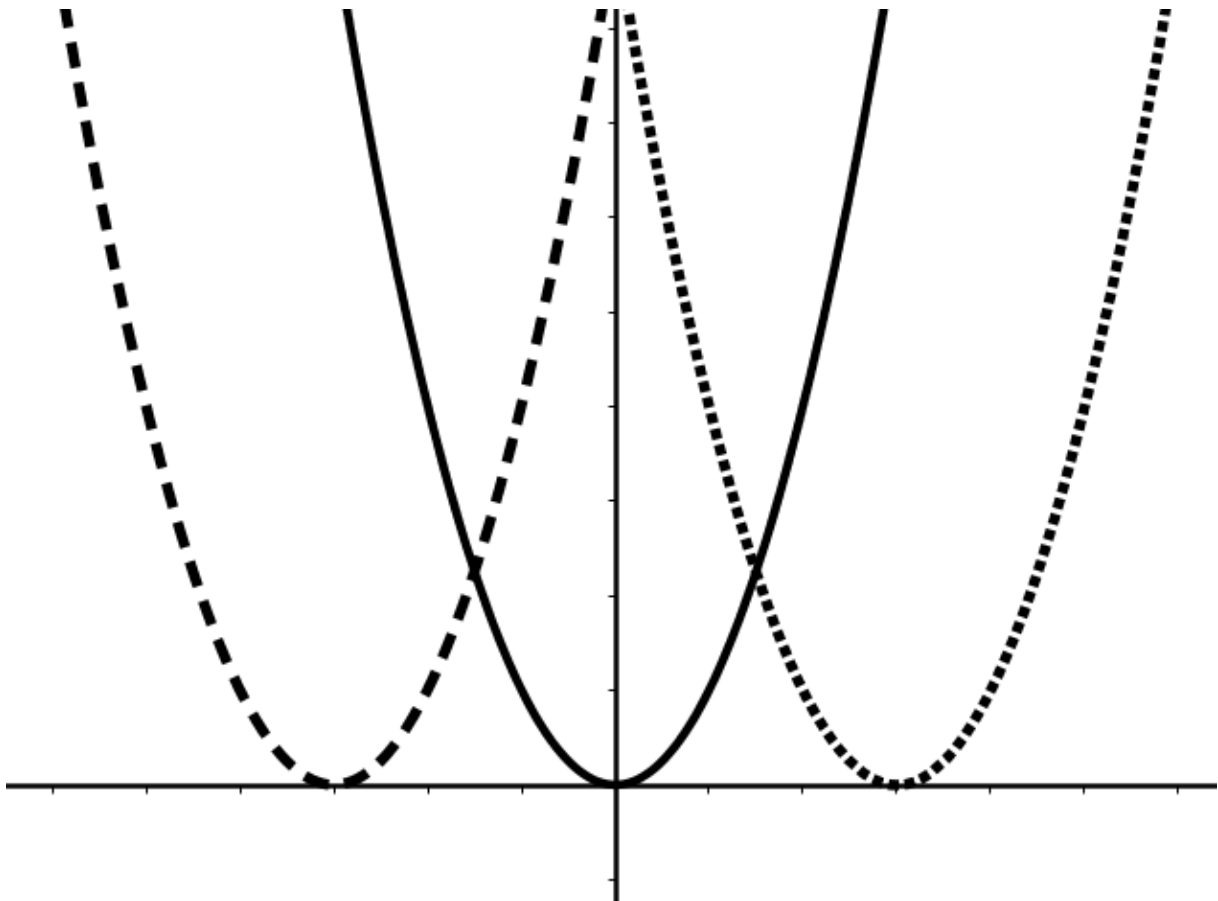
$$f_{q_6}: f(x) = (x + b)^2$$

waagrecht verschoben

$b = 0$ ($f(x) = x^2$): ———

$b > 0$ (nach links): - - - -

$b < 0$ (nach rechts):
.....



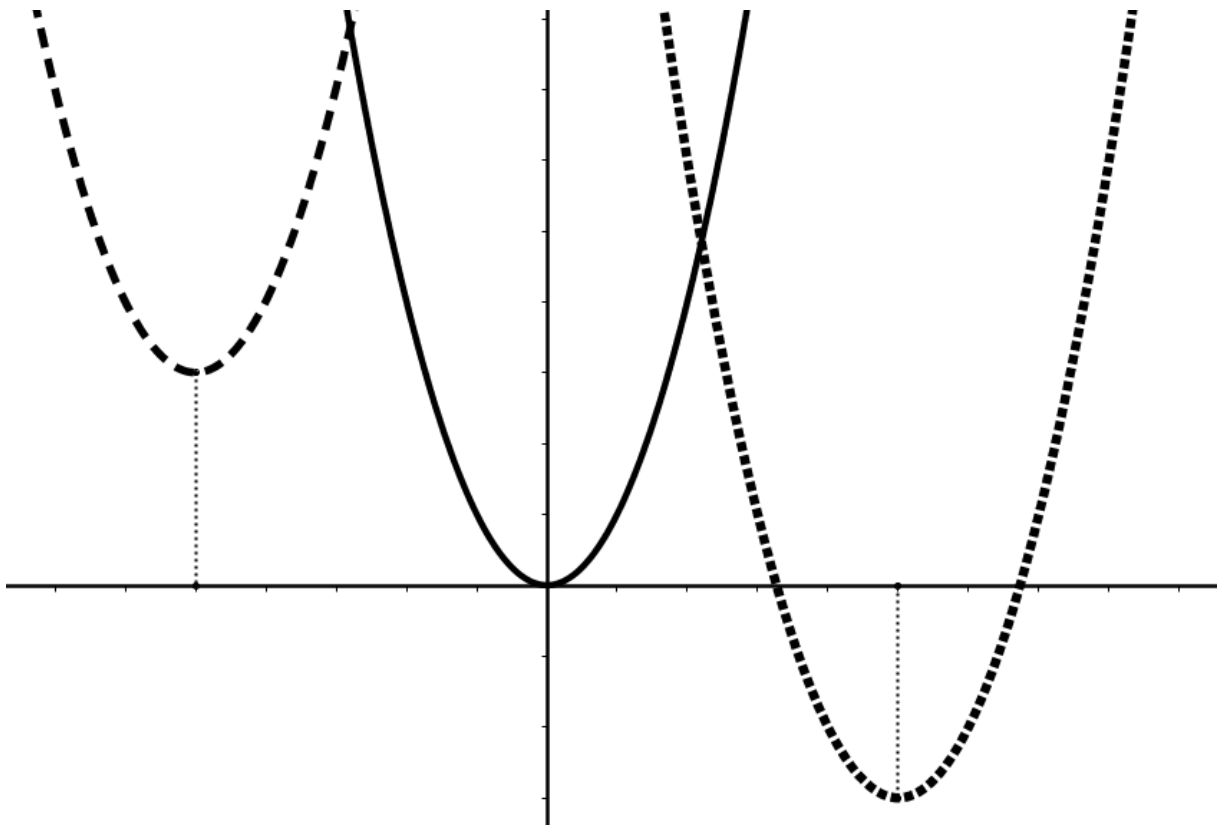
Funktionen 9. Schulst. 10/30

$$f_{q_7}: f(x) = (x + b)^2 + c$$

$b = 0, c = 0$ ($f(x) = x^2$): ———

$b > 0, c > 0$ (li, hinauf): - - - -

$b < 0, c < 0$ (re, hinunter): ······



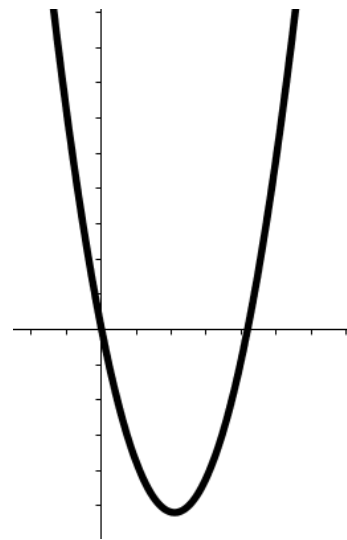
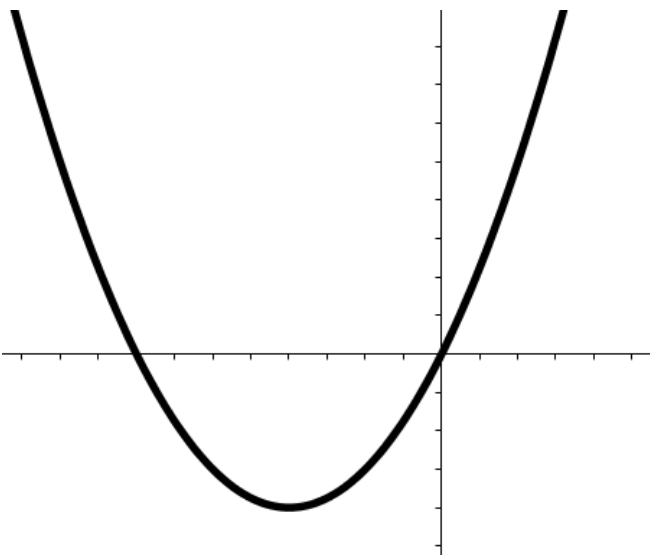
Funktionen 9. Schulst. 11/30

$$f_{q_8}: f(x) = a \cdot x^2 + b \cdot x$$

enthält Ursprung (0|0)

$$a > 0, b > 0$$

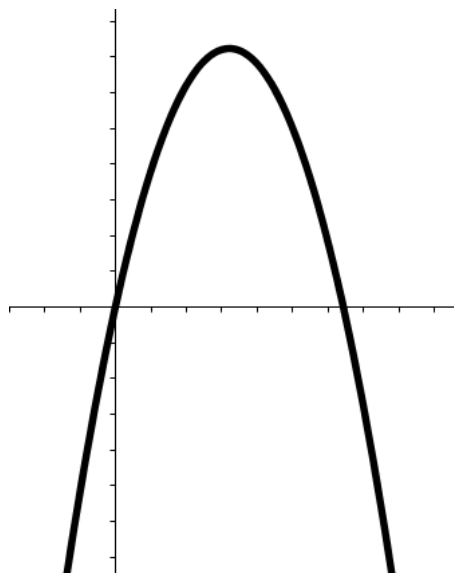
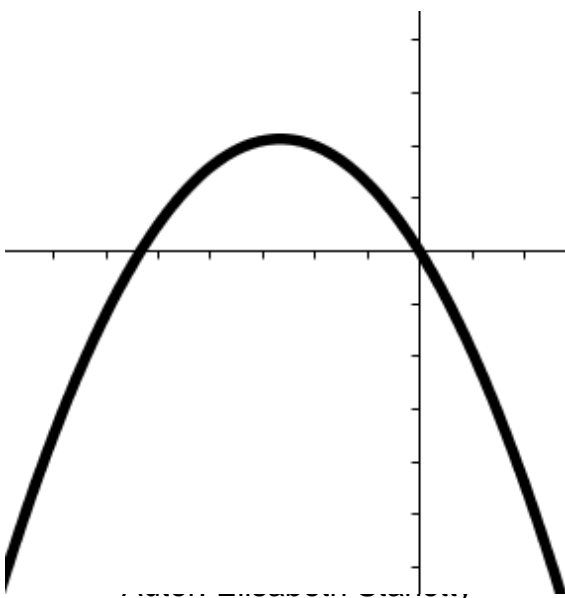
$$a > 0, b < 0$$



a

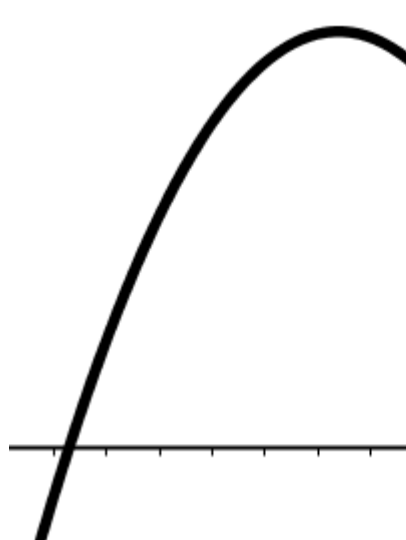
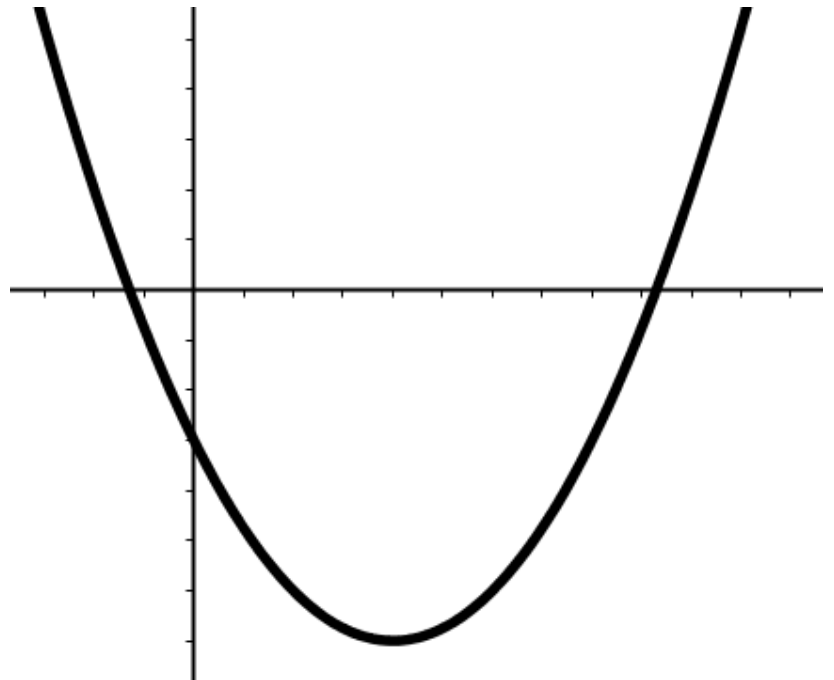
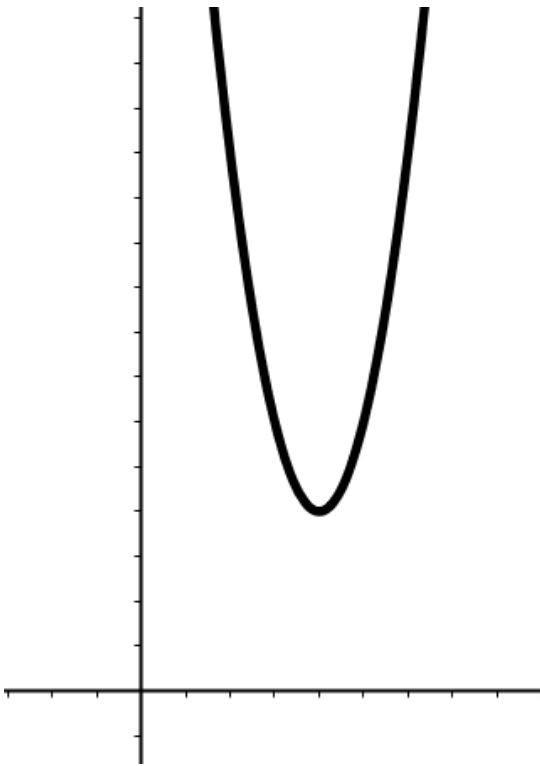
$$a < 0, b > 0$$

$$a < 0, b < 0$$

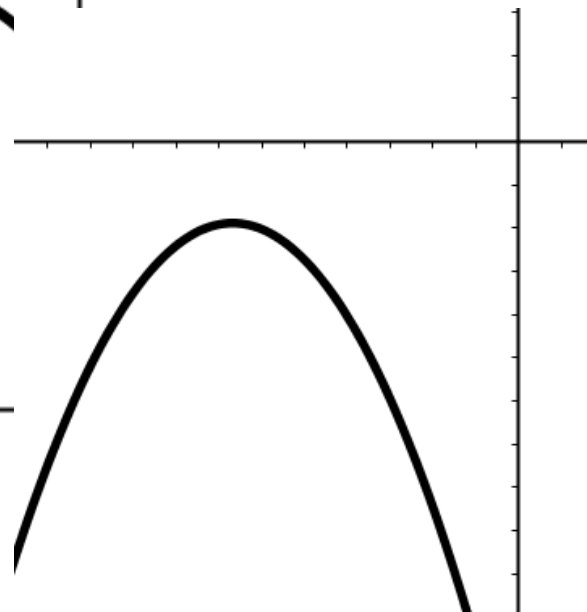


Funktionen 9. Schulst. 12/30

$$f_{q_9}: f: a \cdot x^2 + b \cdot x + c$$



1

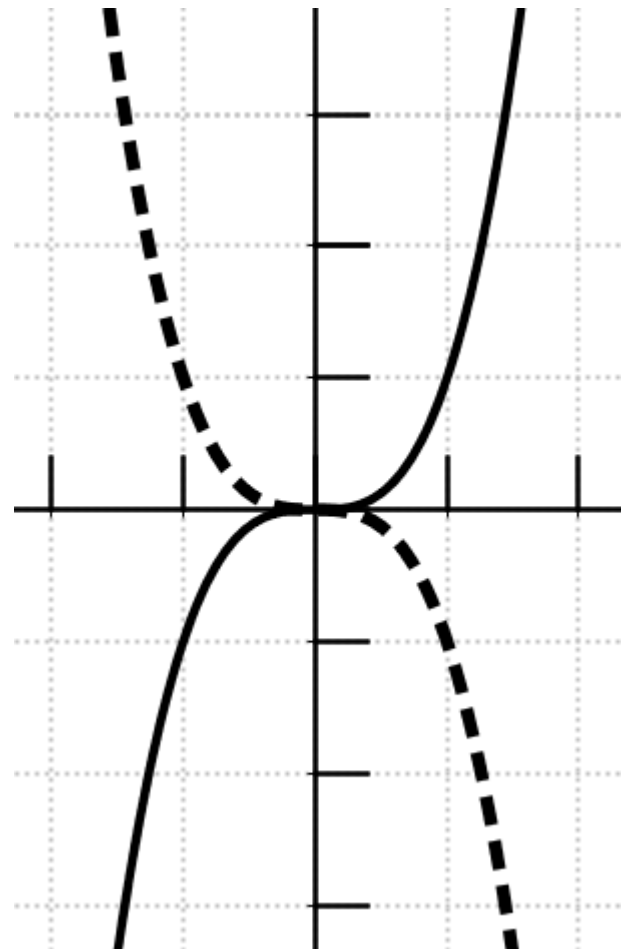
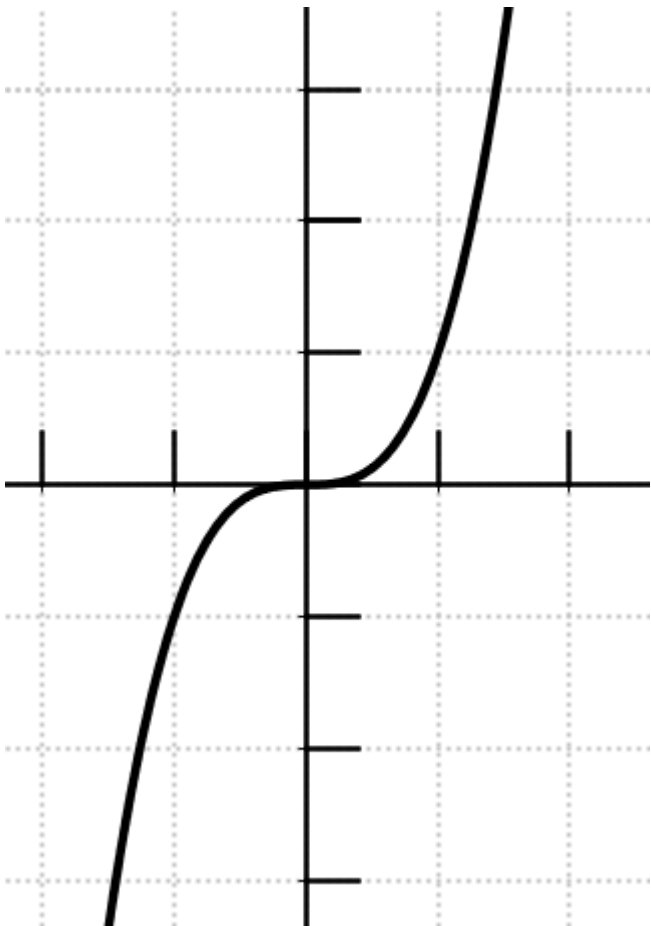


Funktionen 9. Schulst. 13/30

$$f_{G3_1}: f(x) = a \cdot x^3$$

$$a = 1 (f(x) = x^3): \text{———}$$

$$a = -1 (f(x) = -x^3): \text{-----}$$



Funktionen 9. Schulst. 14/30

$$f_{G3_2}: f(x) = a \cdot x^3 + c$$

senkrecht verschieben

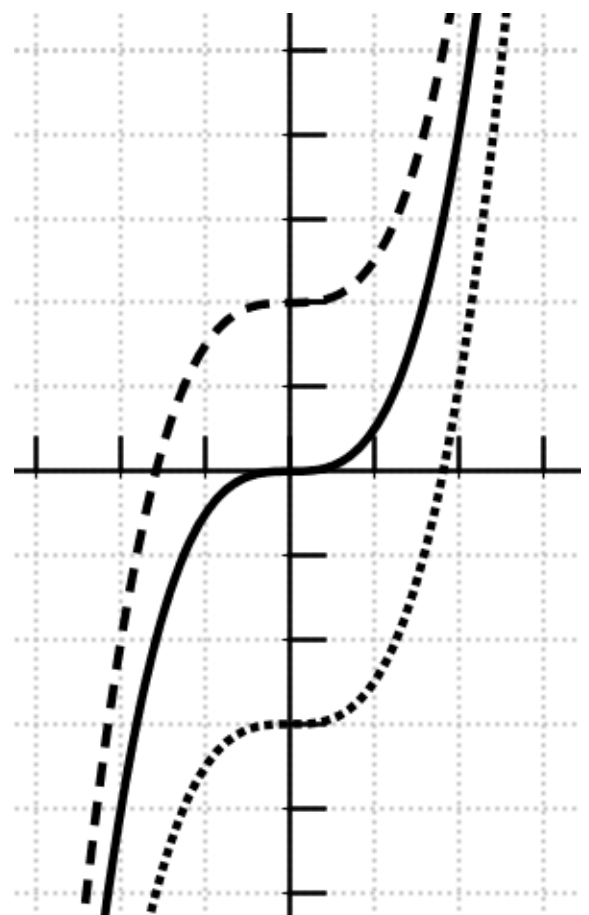
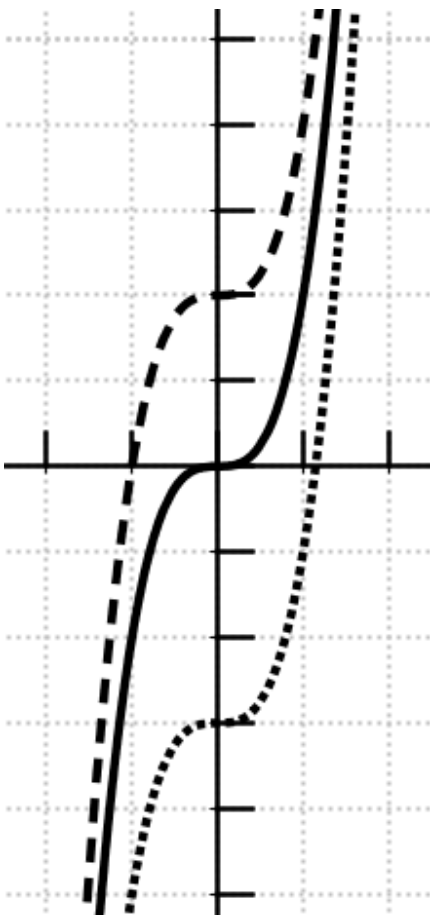
$a > 0, c = 0$: ———

$a > 0, c > 0$ (hinauf): - - - -

$a > 0, c < 0$ (hinunter):
.....

$a=2$

$a=0,5$



Funktionen 9. Schulst. 15/30

$$f_{G3_3}: f(x) = a * x^3 + c$$

senkrecht verschieben

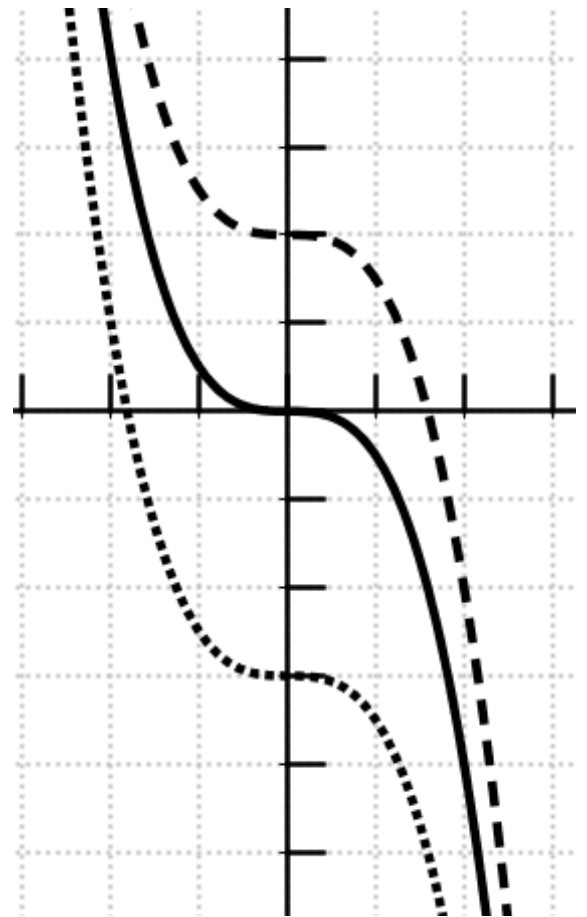
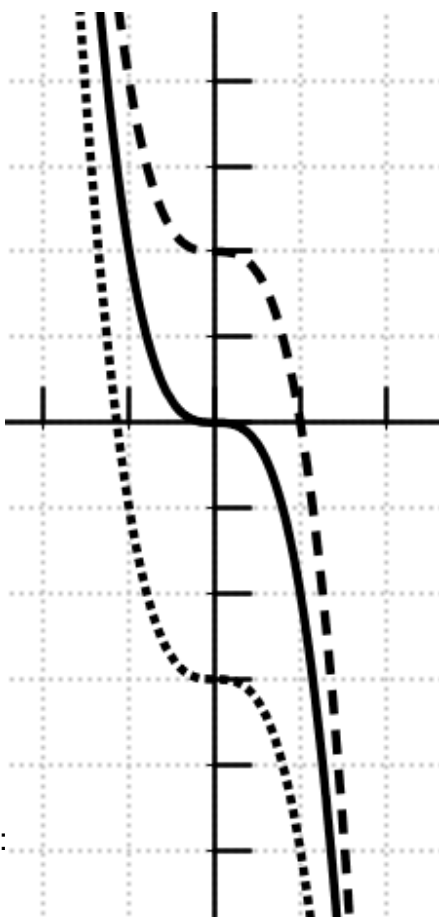
$a < 0, c = 0$: ———

$a < 0, c > 0$ (hinauf): - - - -

$a < 0, c < 0$ (hinunter):
.....

$a = -2$

$a = -0,5$



Funktionen 9. Schulst. 16/30

$$f_{G3_4}: f(x) = (x + b)^3$$

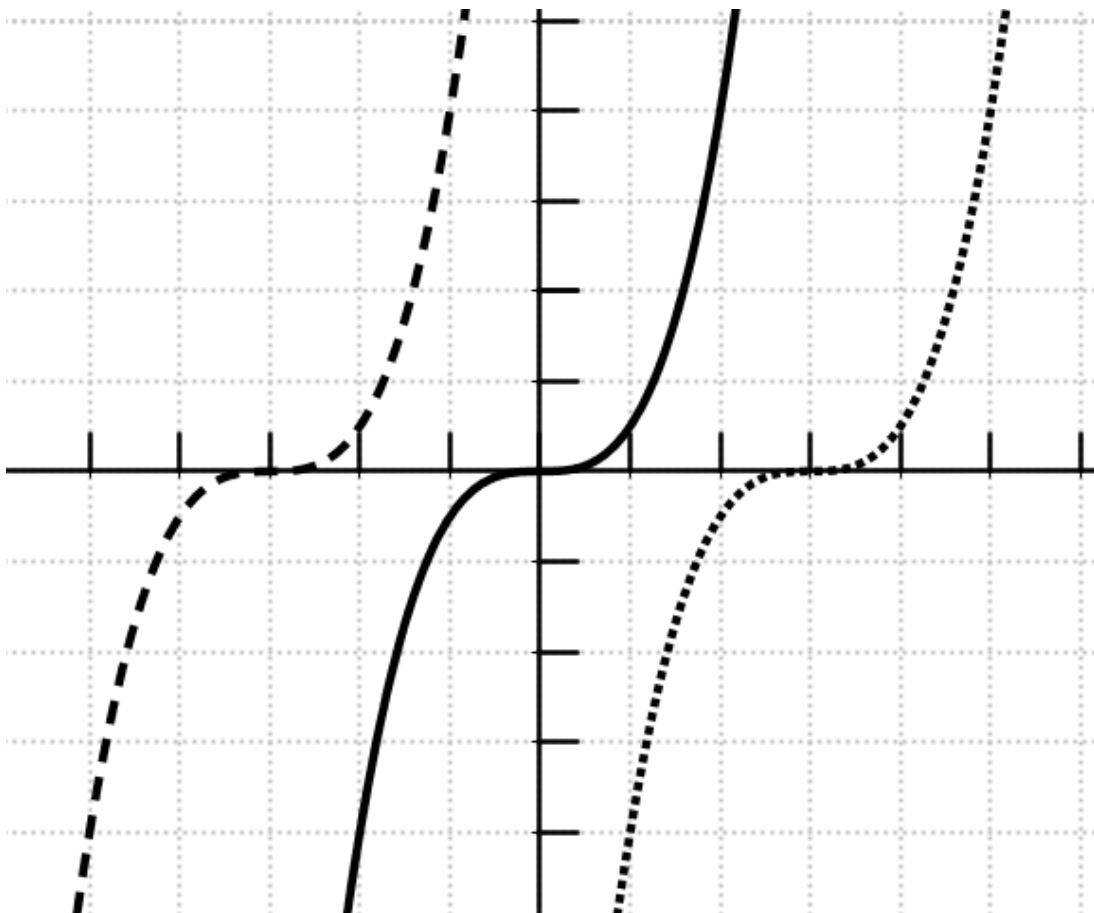
waagrecht verschieben

$a > 0, b = 0$: ———

$a > 0, b > 0$ (nach links: - - - -

$a > 0, b < 0$ (n. rechts):

$$a = 0,5$$



Funktionen 9. Schulst. 17/30

$$f_{G3_5}: f(x) = (x + b)^3$$

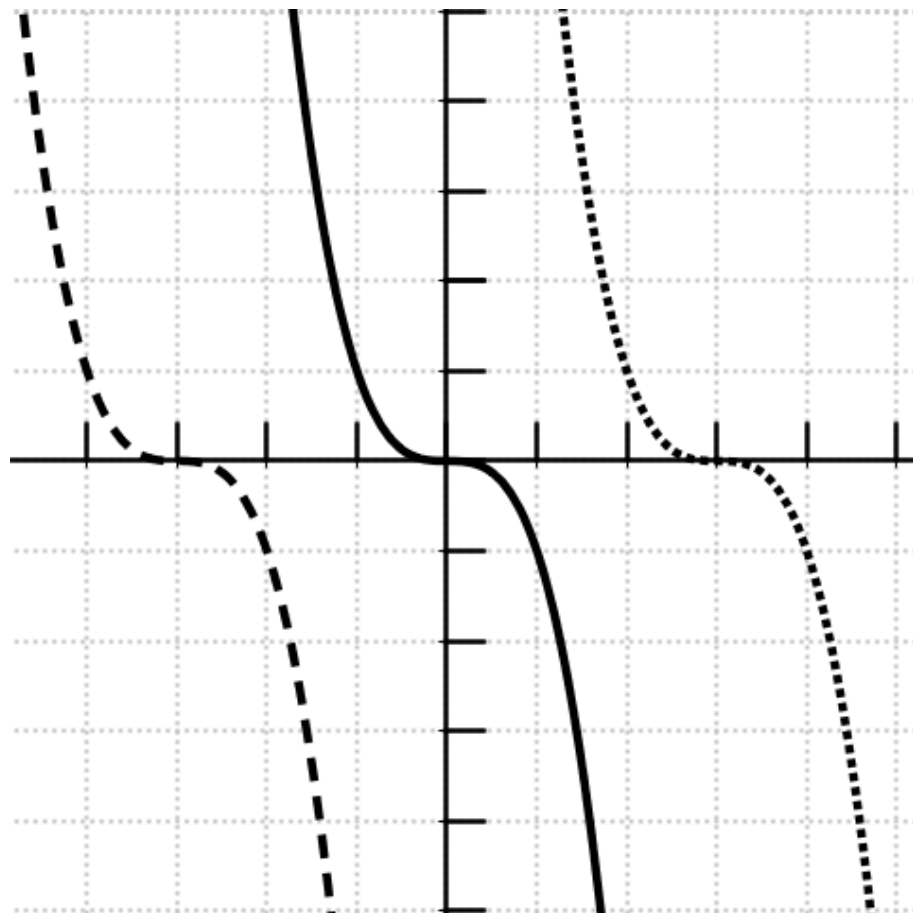
waagrecht verschieben

$a < 0, b = 0$: ———

$a < 0, b > 0$ (nach links): - - - -

$a < 0, b < 0$ (n. rechts):

$$a = -1$$



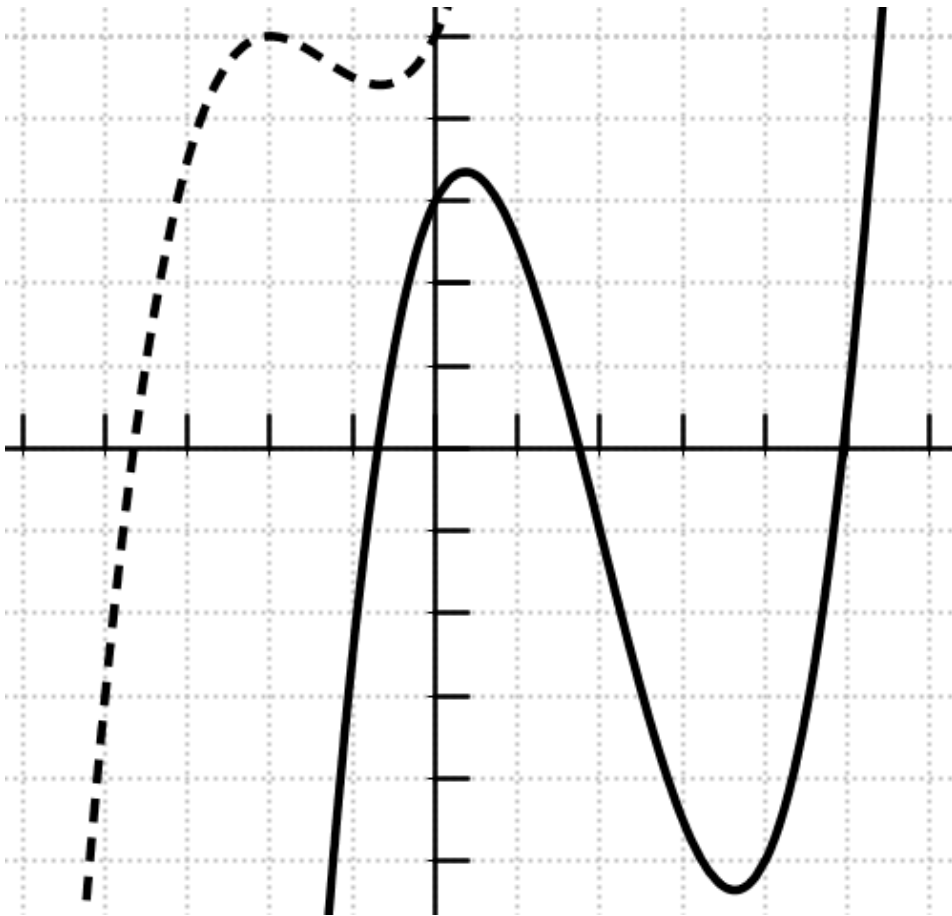
Funktionen 9. Schulst. 18/30

$$f_{G3_6}: a \cdot x^3 + b \cdot x^2 + c \cdot x + d$$

enthält Punkt $(0|d)$

1 bis 3 Nullstellen

$a > 0$: beginnt steigend



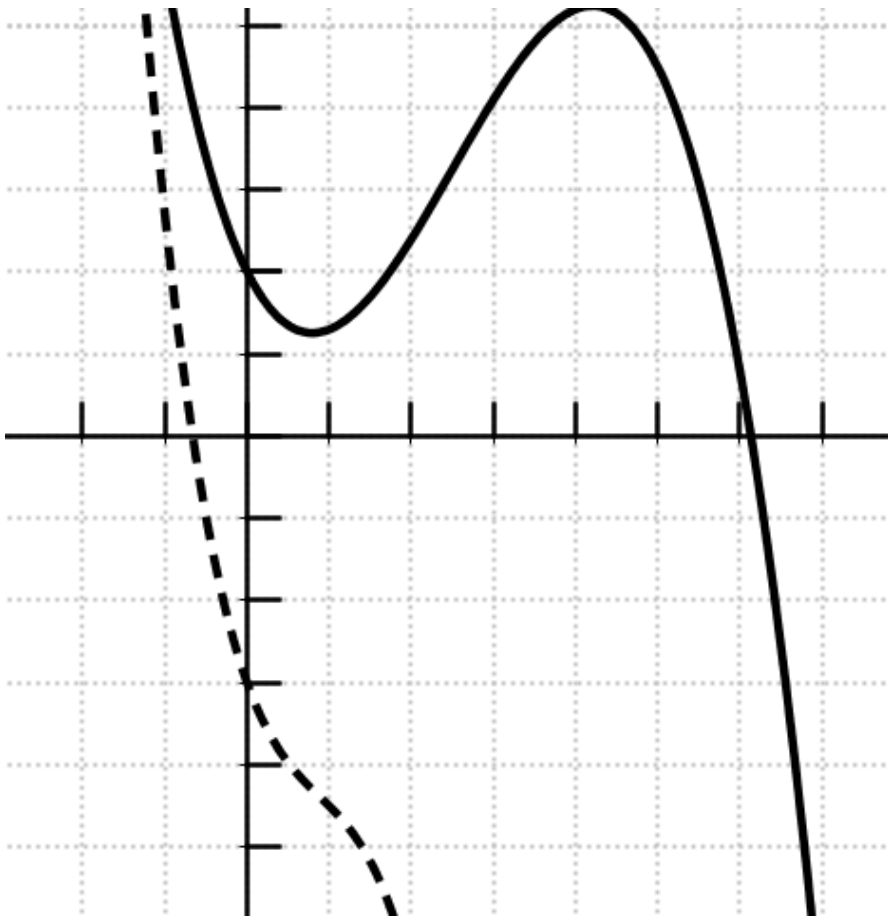
Funktionen 9. Schulst. 19/30

$$f_{G3_7}: a \cdot x^3 + b \cdot x^2 + c \cdot x + d$$

enthält Punkt $(0|d)$

1 bis 3 Nullstellen

$a < 0$: beginnt fallend



Funktionen 9. Schulst. 20/30

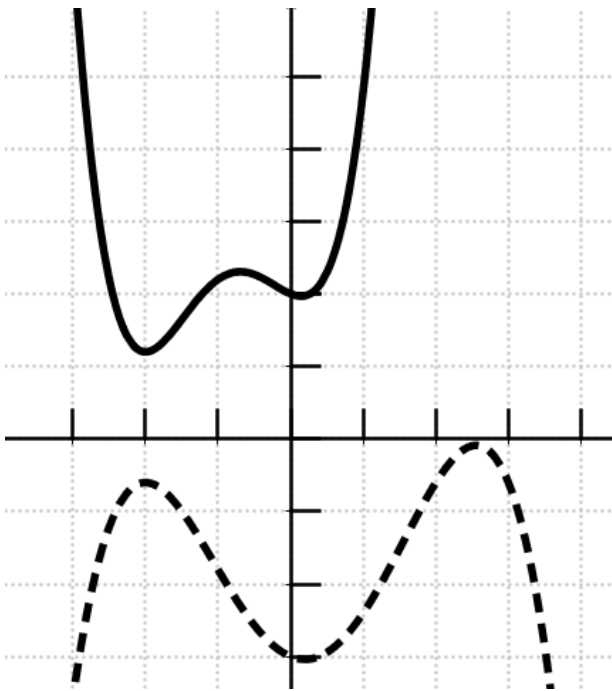
$$f_{G4_1}: f(x) = a \cdot x^4 + b \cdot x^3 + c \cdot x^2 + d \cdot x + e$$

enthält Punkt $(0|e)$,

0 bis 4 Nullstellen

$a > 0$: beginnt fallend

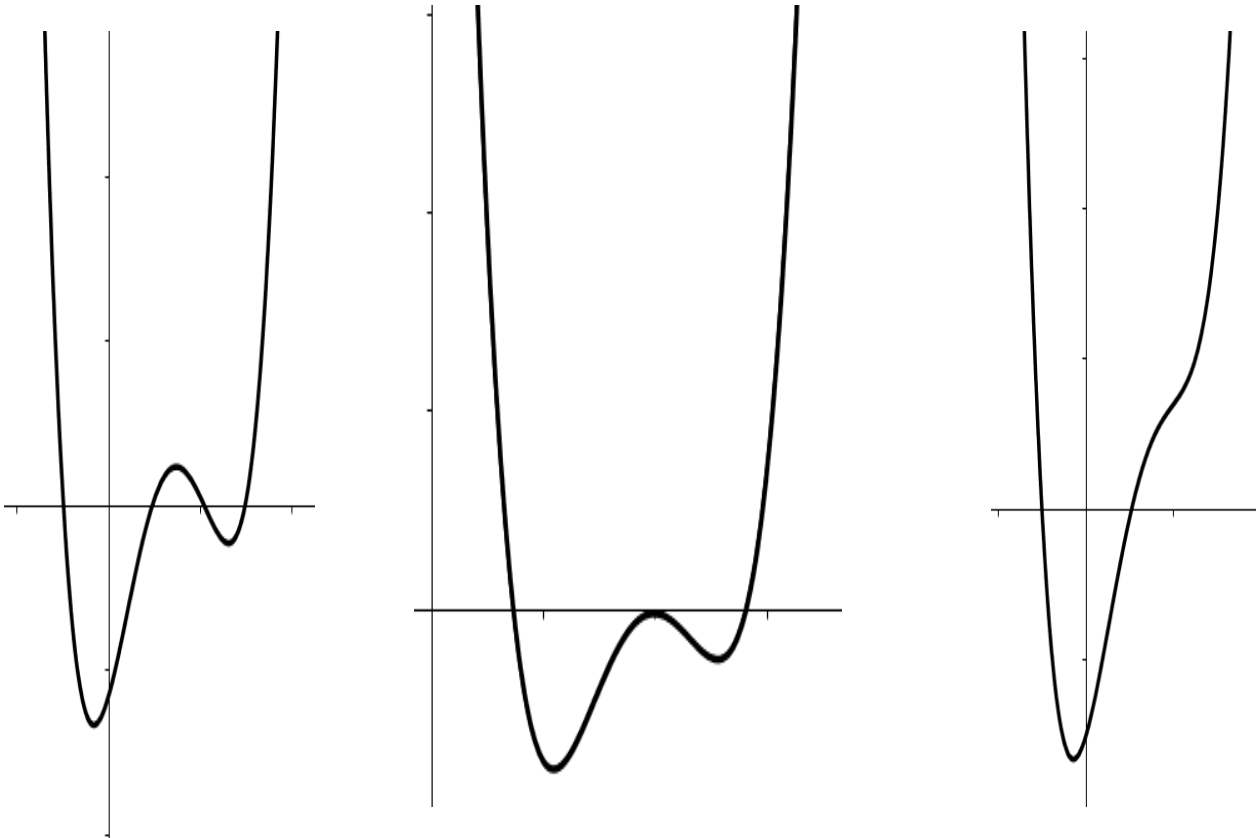
$a < 0$: beginnt steigend



Funktionen 9. Schulst. 21/30

$$f_{G4_1}: f(x) = a \cdot x^4 + b \cdot x^3 + c \cdot x^2 + d \cdot x + e$$

Doppel-S-Kurve
verschiedenste
Ausprägungen



Funktionen 9. Schulst. 22/30

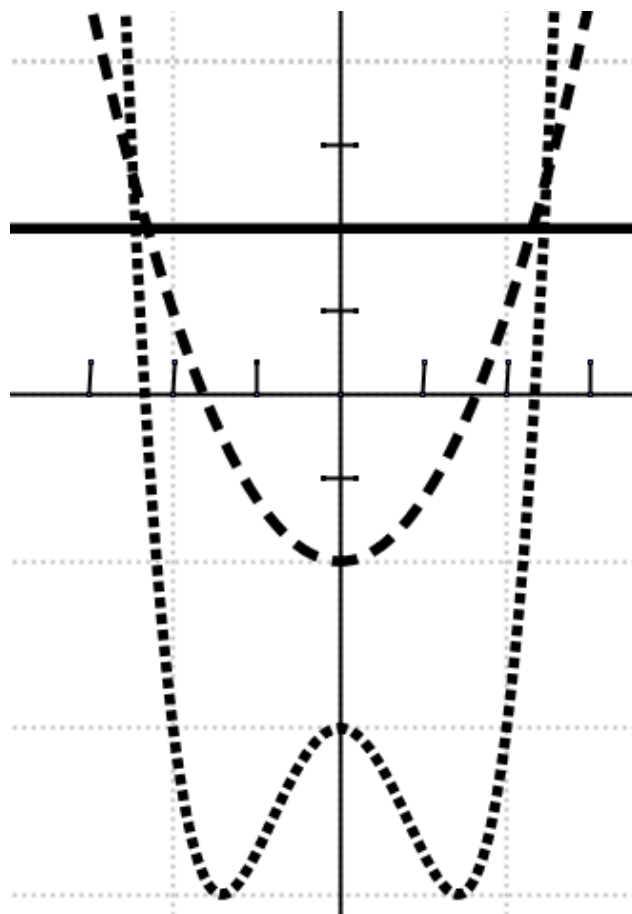
f_g: Hochzahl gerade

Symmetrisch zur
senkrechten Achse, $a \neq 0$

$$f(x) = a \cdot x^0 = a \quad \text{—————}$$

$$f(x) = a \cdot x^2 + b \quad \text{-----}$$

$$f(x) = a \cdot x^4 + b \cdot x^2 + c \quad \text{.....}$$



Funktionen 9. Schulst. 23/30

f_u : Hochz. ungerade

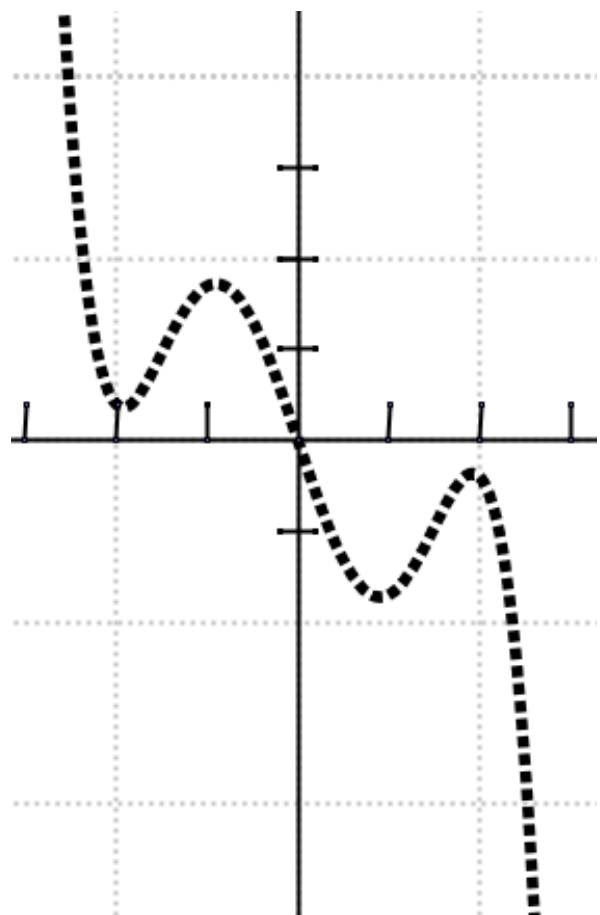
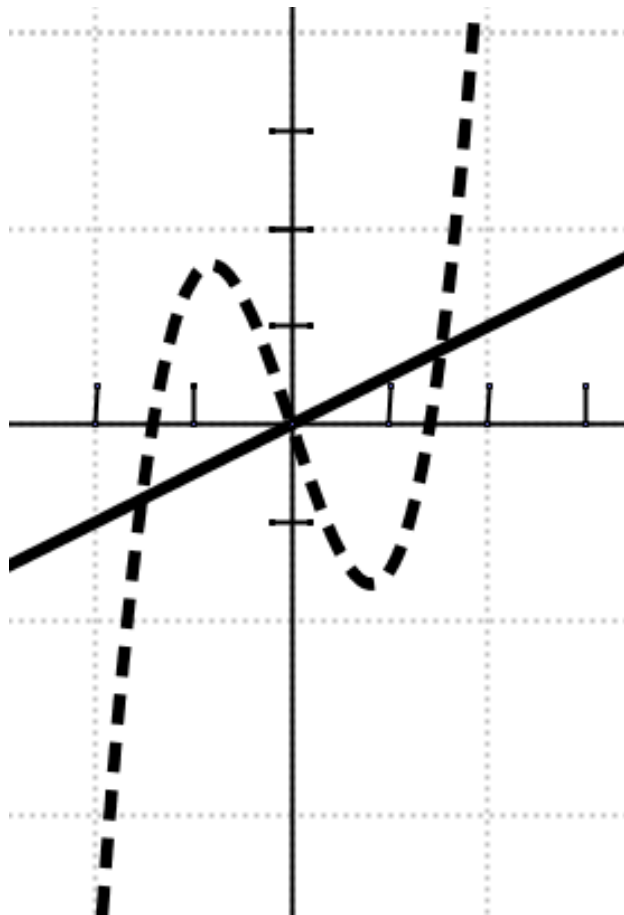
Symmetrisch zum

Ursprung, $a \neq 0$

$$f(x) = a \cdot x \quad \text{—————}$$

$$f(x) = a \cdot x^3 + b \cdot x \quad \text{-----}$$

$$f(x) = a \cdot x^5 + b \cdot x^3 + c \cdot x \quad \text{.....}$$

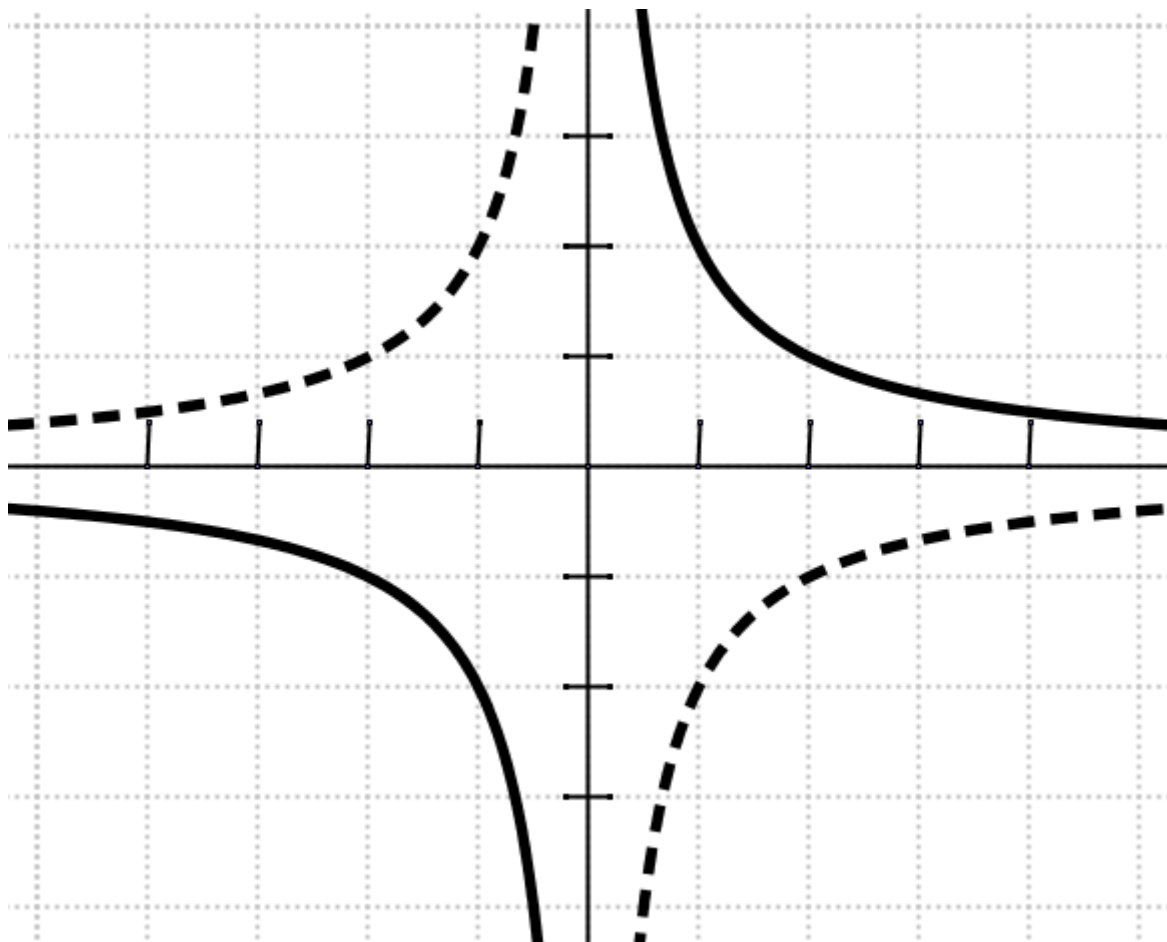


Funktionen 9. Schulst. 24/30

$$f_gebr1_1: f(x) = a/x$$

$a > 0$ mit $(1|a)$ —————

$a < 0$ mit $(-1|a)$ - - - - -



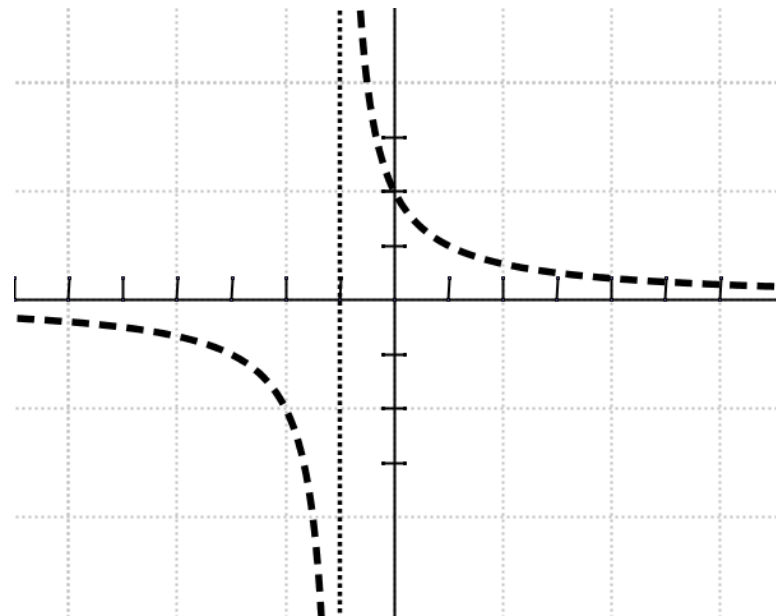
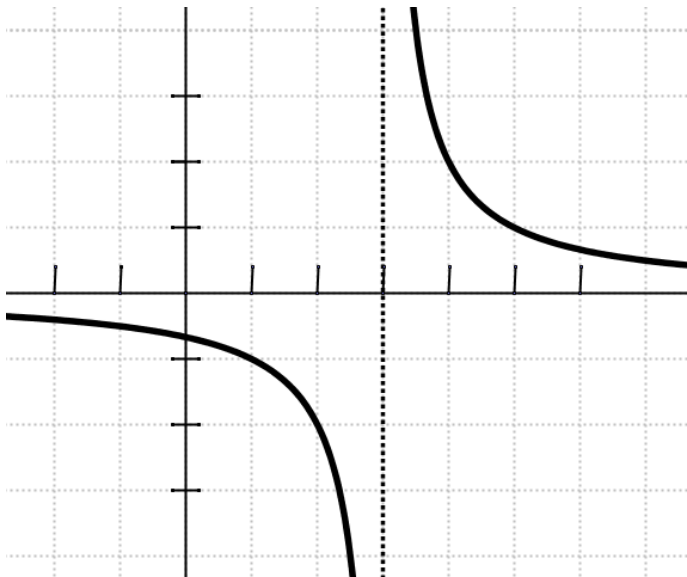
Funktionen 9. Schulst. 25/30

$$f_gebr1_2: f(x) = a/(x + b)$$

$$a > 0, b < 0$$



$$a > 0, b > 0$$

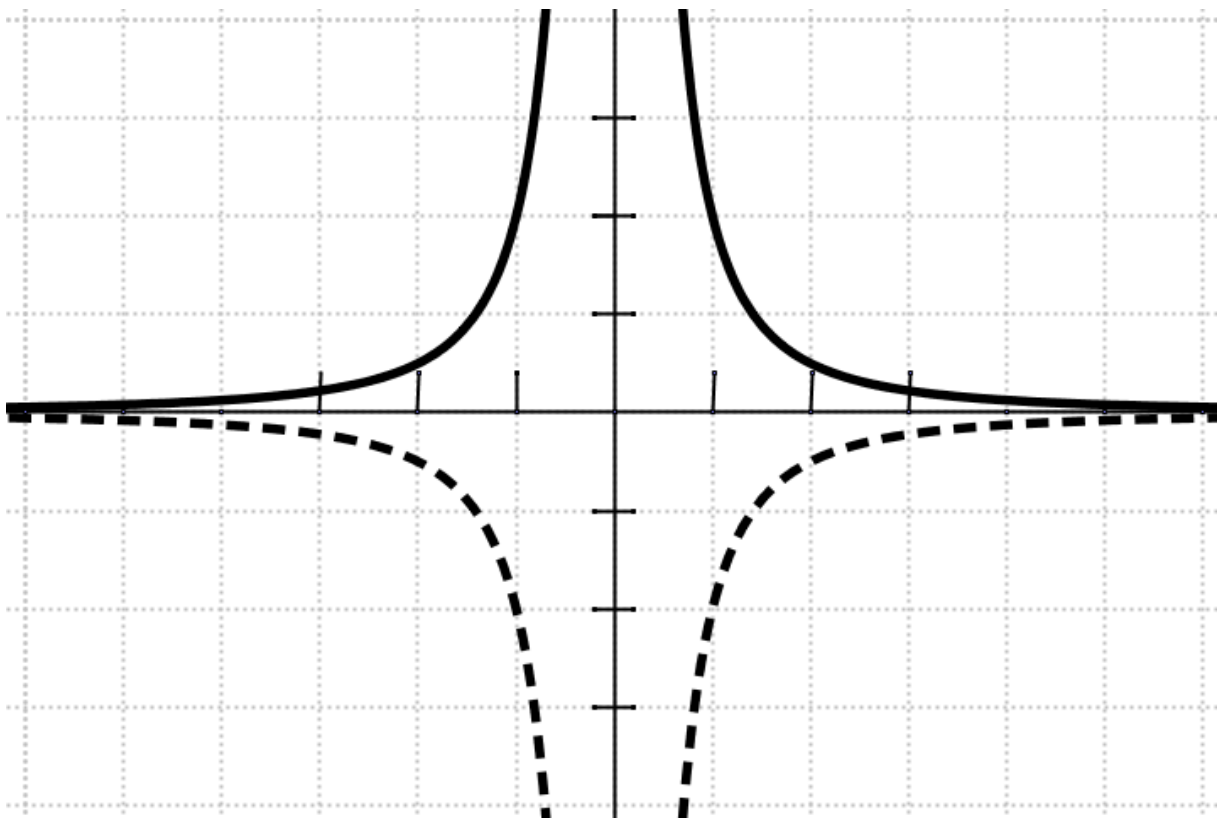


Funktionen 9. Schulst. 26/30

$$f_gebr2_1: f(x) = a/x^2$$

$a > 0$: 

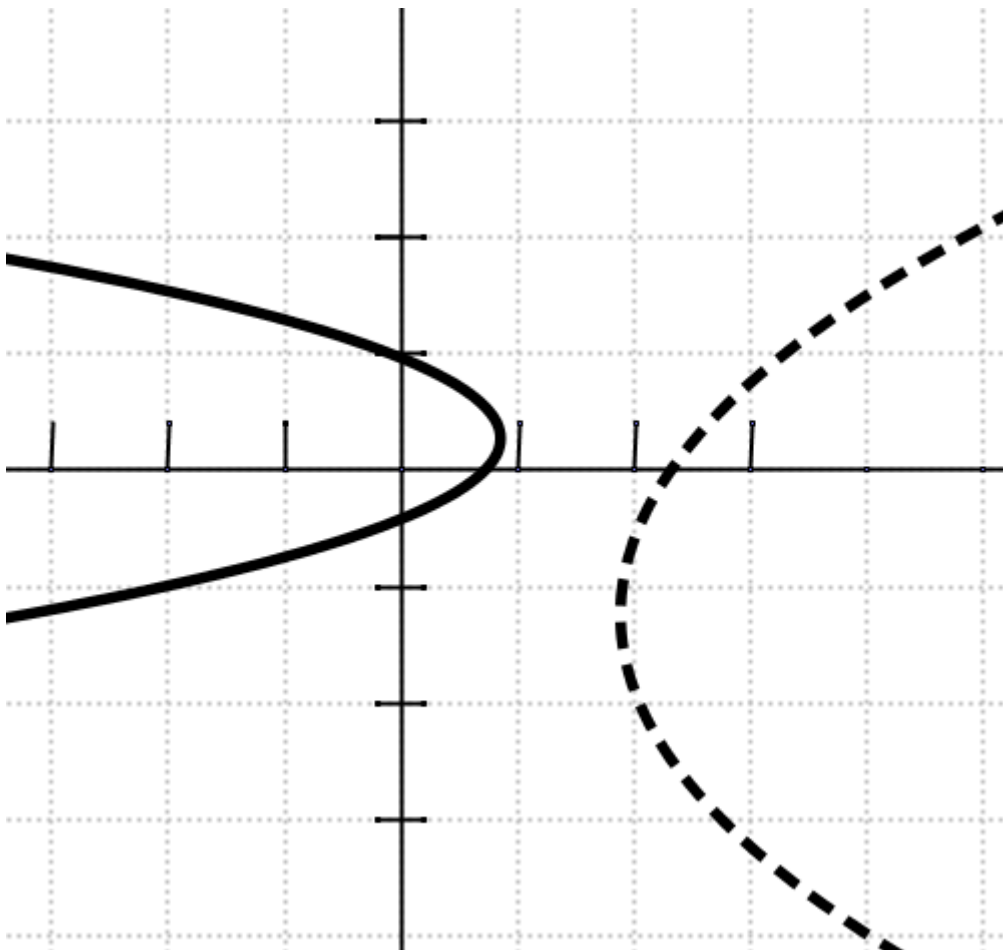
$a < 0$: 



Funktionen 9. Schulst. 27/30

keine Funktionen

mehr y -Werte zu einem x

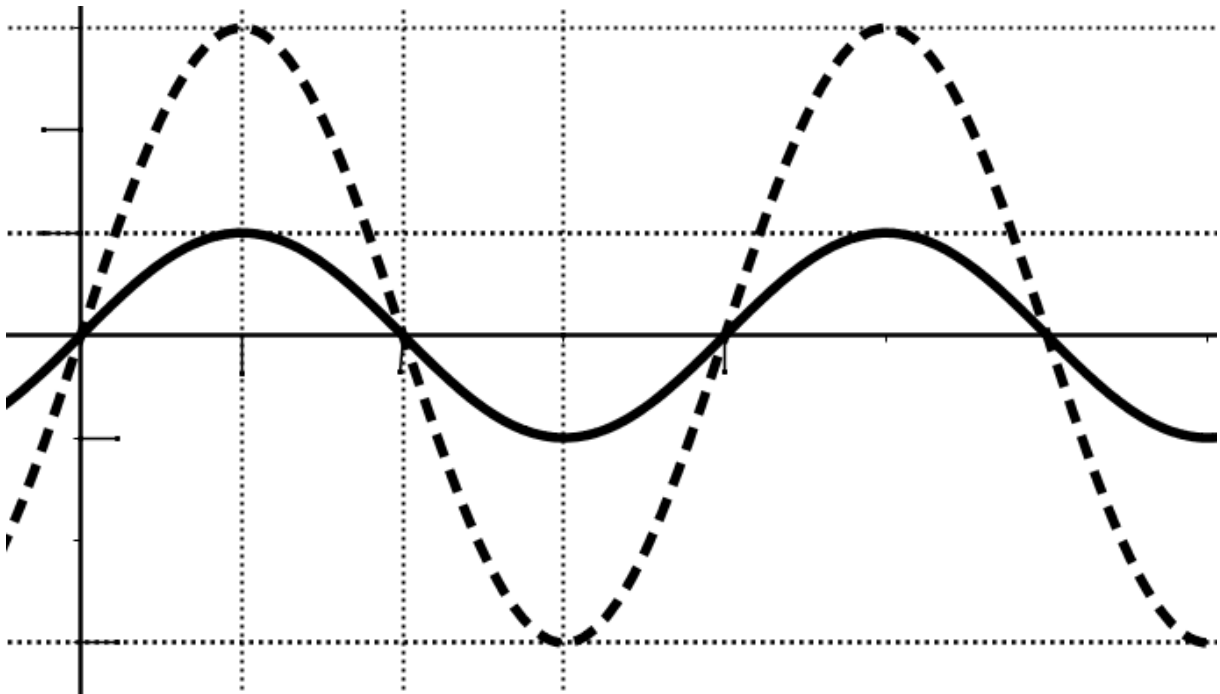


Funktionen 9. Schulst. 28/30

$$f_{\sin}: f(x) = a \cdot \sin(x)$$

$a = 1:$ 

$a = 3:$ 

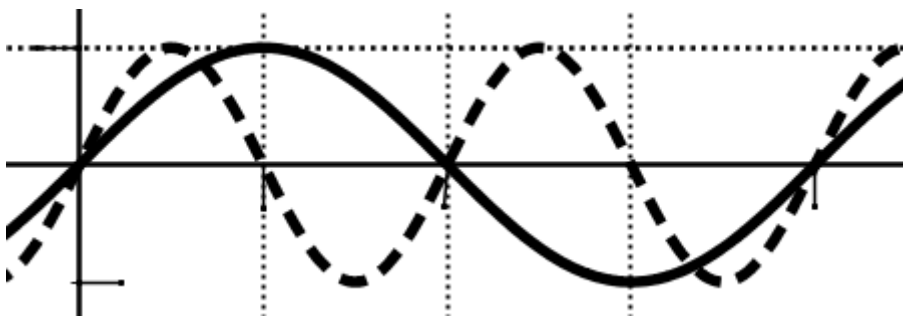


Funktionen 9. Schulst. 29/30

$$f_{\text{sin}}: f(x) = \sin(b \cdot x)$$

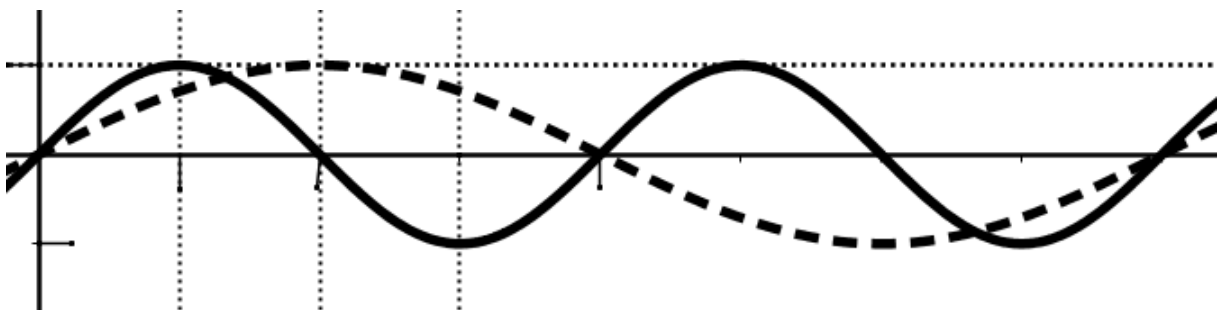
$b = 1:$ _____

$b = 2:$ - - - - -



$b = 1:$ _____

$b = 1/2:$ - - - - -



Funktionen 9. Schulst. 30/30

EK_1

$P(\cos(\alpha) | \sin(\alpha))$ •

