

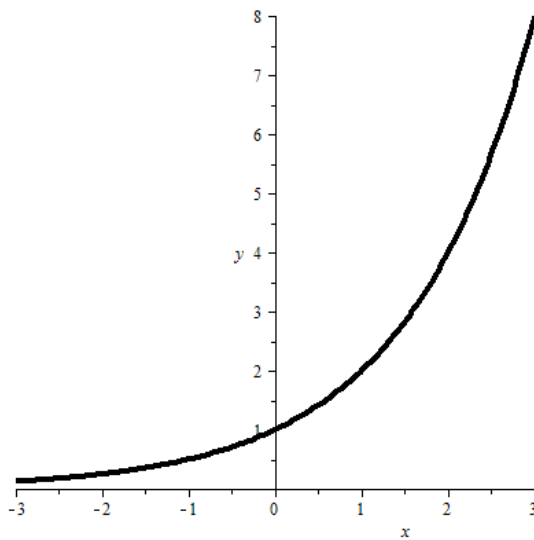
# Exponentialfunktion

## Definition

f: $D \rightarrow \mathbb{R}$	$(D \subseteq \mathbb{R})$
$x \mapsto y = f(x) = c \cdot a^x$	$(a \in \mathbb{R}^+ \setminus \{1\}, c \in \mathbb{R} \setminus \{0\})$
$a > 1$ : exponentielles <b>Wachstum</b>	
$a < 1$ : exponentieller <b>Zerfall</b>	

## Graf

1.  $y = f(x) = 2^x$  ( $c = 1, a = 2$ )

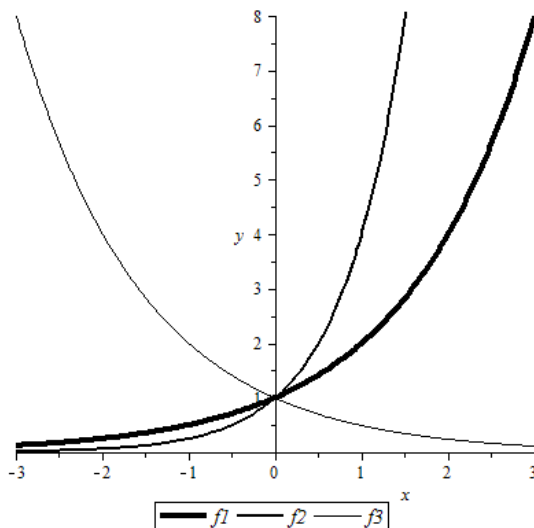


2. Parameter **a** (**a verändern**, c konstant halten)

$y = f_1(x) = 2^x$  ( $c = 1, a = 2$ )

$y = f_2(x) = 4^x$  ( $c = 1, a = 4$ )

$y = f_3(x) = \left(\frac{1}{2}\right)^x$  ( $c = 1, a = \frac{1}{2}$ )

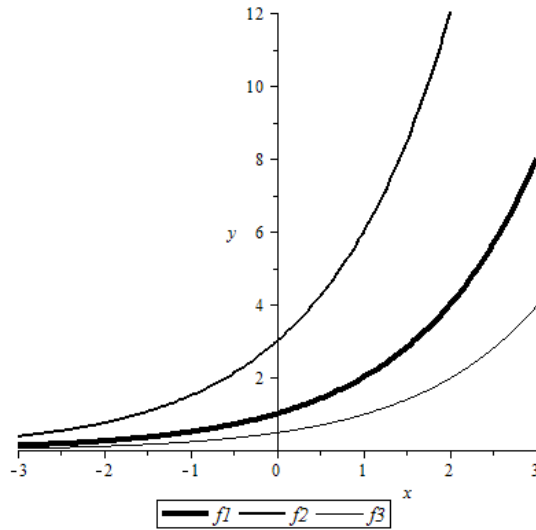


3. Parameter **c** (c verändern, a konstant halten)

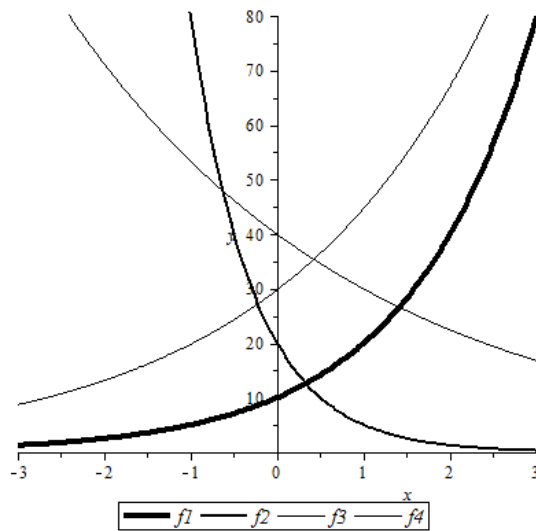
$y = f_1(x) = 2^x$  (c = 1, a = 2)

$y = f_2(x) = 3 \cdot 2^x$  (c = 3, a = 2)

$y = f_3(x) = \frac{1}{2} \cdot 2^x$  (c =  $\frac{1}{2}$ , a = 2)



4.  $y = f_1(x) = 10 \cdot 2^x$  (c = 10, a = 2)  
 $y = f_2(x) = 20 \cdot 0.25^x$  (c = 20, a = 0.25)  
 $y = f_3(x) = 40 \cdot 0.75^x$  (c = 40, a = 0.75)  
 $y = f_4(x) = 30 \cdot 1.5^x$  (c = 30, a = 1.5)



## Beispiele

### 1. Zinseszins (exponentielles **Wachstum**)

$$K_n = K_0 \cdot q^n$$

$K_0$  = Anfangskapital  
 $K_n$  = Kapital nach n Zinsperioden  
 $n$  = Anzahl Zinsperioden (häufig: 1 Zinsperiode = 1 Jahr)  
 $q$  = Zins-/Wachstumsfaktor =  $1 + i$  ( $i > 0$ ,  $q > 1$ )  
 $i$  = Zinssatz pro Zinsperiode

Bsp.:  $K_0 := 1000$  CHF,  $i := 2\% = 0.02 \Rightarrow q = 1.02 \Rightarrow K_n = 1000 \cdot 1.02^n$  CHF

### 2. Preisindex (exponentieller **Zerfall**)

$$P(t) = P_0 \cdot q^t$$

$P_0$  = Anfangspreis / anfängliche Kaufkraft  
 $P(t)$  = Preis / Kaufkraft zum Zeitpunkt t (häufig: t = Anzahl Jahre)  
 $q$  = Zerfallsfaktor =  $1 + i$  ( $i < 0$ ,  $q < 1$ )

Bsp.:  $P_0 := 100$  CHF,  $i := -3\% = -0.03 \Rightarrow q = 0.97 \Rightarrow P(t) = 100 \cdot 0.97^t$  CHF