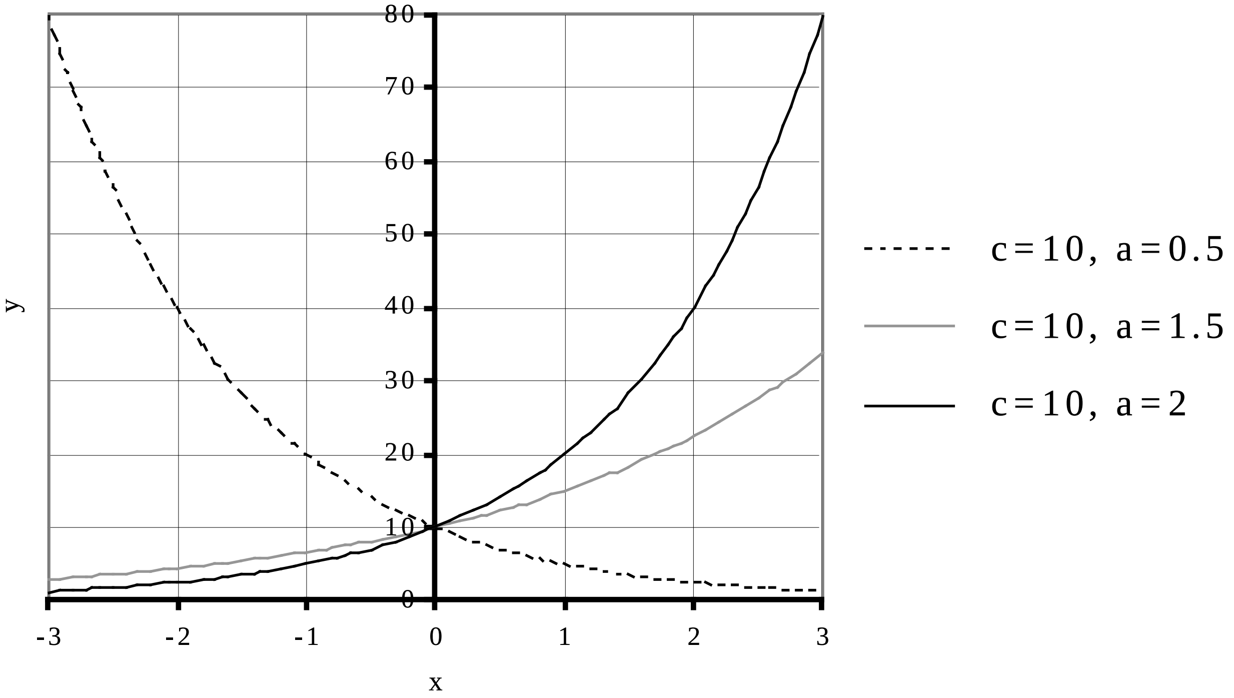
Exponential function

Definition

f: $\mathbb{R} \rightarrow \mathbb{R}$ $x \rightarrow y = f(x) = c \cdot a^x$ 　　(a $\mathbb{R}^+ \backslash \{1\}$, c $\mathbb{R} \backslash \{0\}$) a>1: exponential **growth** a<1: exponential **decay**

Graph



Examples

1. Compound interest (exponential **growth**)

$C_n = C_0 \cdot q^n$ 　　C_0 = initial capital
C_n = capital after n compounding periods
n = number of compounding periods (typically: 1 compounding period = 1 year)
q = growth factor = 1 + r (q>1)
r = interest rate per compounding period

Ex.: 　$C_0 := 1000$, $r := 2\% = 0.02$ 　$q = 1.02$ 　$C_n = 1000 \cdot 1.02^n$

2. Consumer price index (exponential **decay**)

$P(t) = P_0 \cdot q^t$ 　　P_0 = initial purchasing power
P(t) = purchasing power at time t (typically: t in years)
q = decay factor (q<1)

Ex.: 　$P_0 := 100$, $q := 0.97$ 　$P(t) = 100 \cdot 0.97^t$