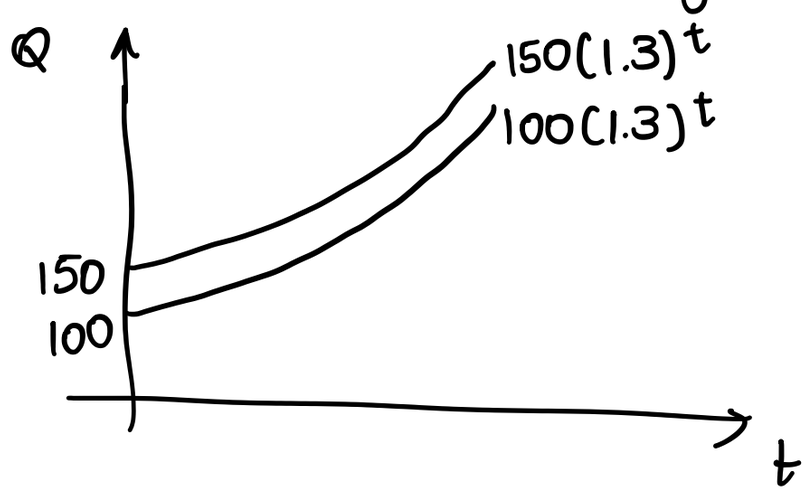
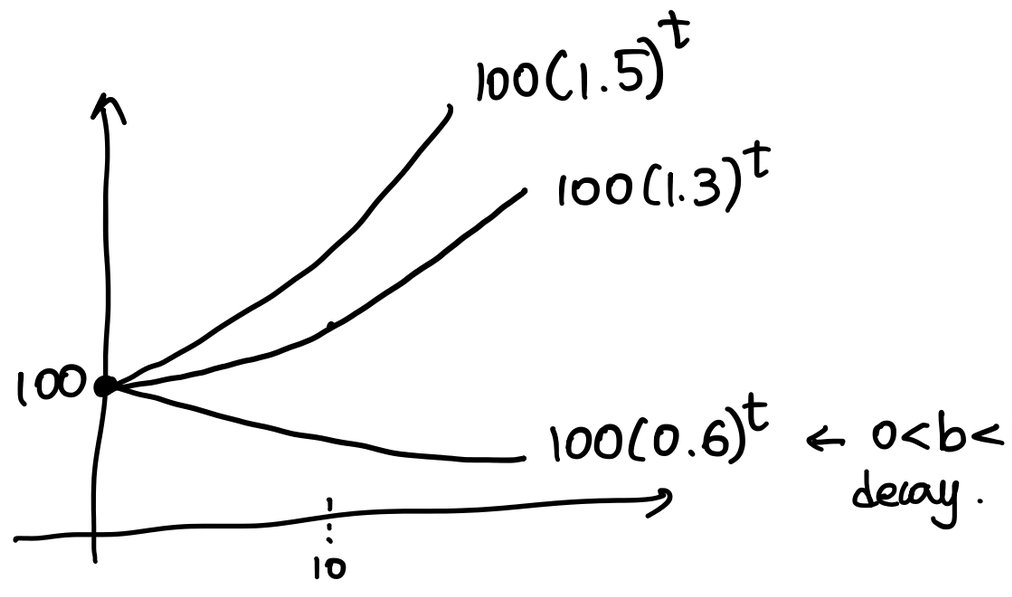
Graphs of exponential functions (sec 4.3)

Thursday, October 29, 2020 6:08 PM

Recall that the formula is $y = ab^t$.



growth factor is the same
and the initial amount is different.



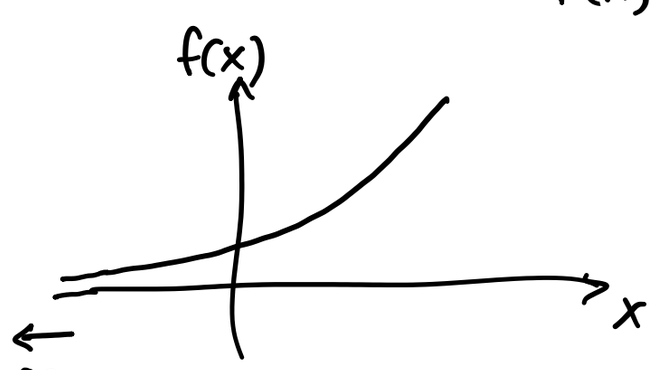
growth factor is different
and the initial amount is the same.

The horizontal line $y=k$ is a <u>horizontal asymptote</u> of a function $f(x)$, if the function values get arbitrarily close to k as x gets large. We use the following notation

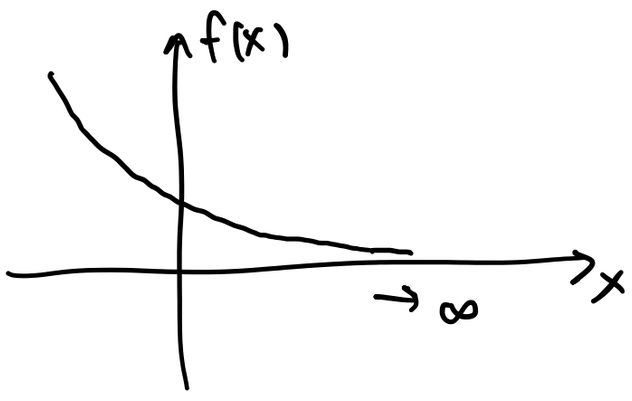
$f(x) \to k$ as $x \to \infty$

"approaches"

or $f(x) \to k$ as $x \to -\infty$



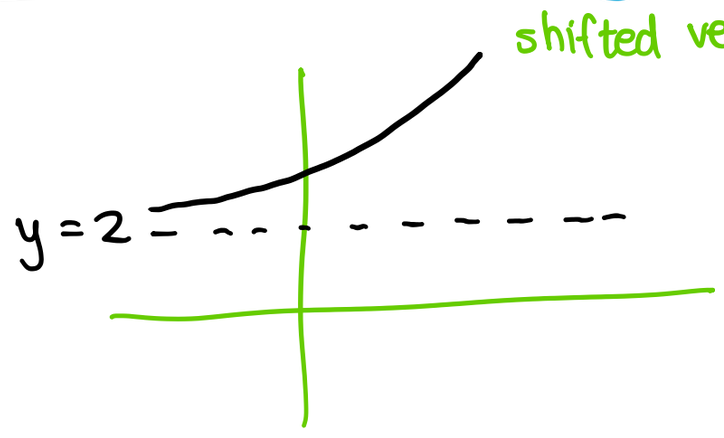
$f(x) \to 0$ as $x \to -\infty$



$f(x) \to 0$ as $x \to \infty$

<u>Example</u> $y = 2 + 3^x$. What is the horizontal asymptote as $x \to -\infty$?

shifted version of 3^x



The horizontal asymptote is $\boxed{y=2}$

<u>Example</u>. For the exponential function $a(R) = 7 \cdot 2^{-3R+4}$. Find

a) growth factor
b) percentage growth rate
c) initial value.

$y = ab^R$

Write $7 \cdot 2^{-3R+4}$ in the form $a \cdot b^R$ where a is the initial value and b is the growth factor.

$$7 \cdot 2^{-3R+4} = 7 \cdot 2^{-3R} 2^4 \qquad (a^{x+y} = a^x a^y)$$
$$= 7 \cdot 2^{-3R} (16)$$
$$= 112 \cdot 2^{-3R}$$
$$= 112 (2^{-3})^R \qquad ((a^x)^y = a^{xy})$$
$$= 112 \left(\frac{1}{2^3}\right)^R$$
$$= 112 \left(\frac{1}{8}\right)^R = a(b)^R$$

(b: growth factor)

a) growth factor is $\frac{1}{8}$

b) perc. growth rate $b = 1+r \Rightarrow r = b-1 \Rightarrow r = \left(\frac{1}{8} - 1\right) 100\,\%$

c) initial value is 112.