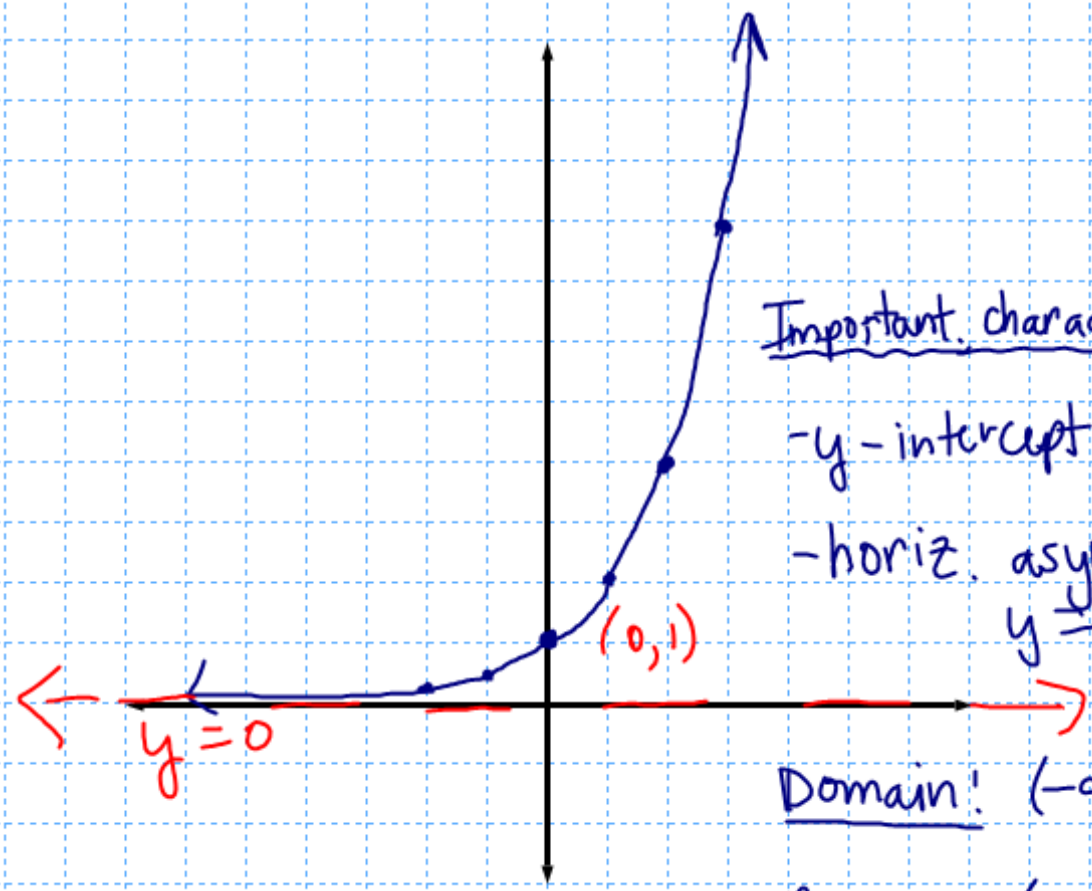
3.1

Exponential Functions $y = a^x$

$y = 2^x$

x	y
0	1
1	2
2	4
3	8
−1	$\frac{1}{2}$
−2	$\frac{1}{4}$

$2^{-1} = \frac{1}{2}$ $\quad 2^{-2} = \frac{1}{2^2} = \frac{1}{4}$



Important characteristics

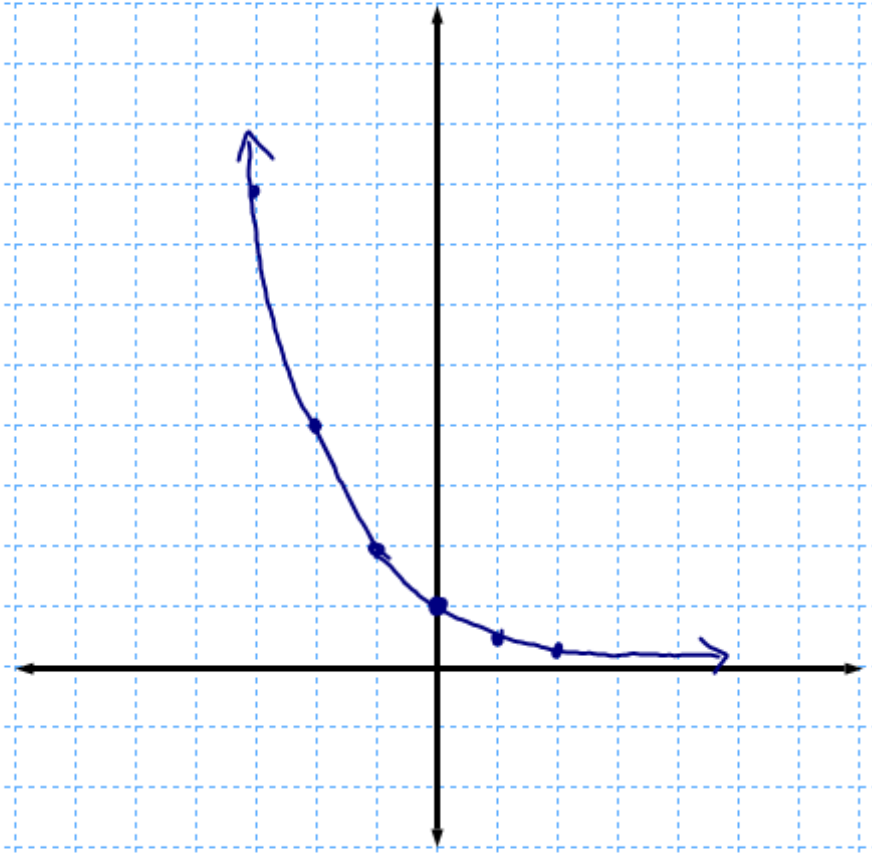
- y-intercept (0,1)
- horiz. asymptote $y = 0$

Domain: $(-\infty, \infty)$

Range: $(0, \infty)$

$$y = 2^{-x} = \left(\frac{1}{2}\right)^{x}$$

x	y
0	1
1	1/2
2	1/4
−1	2
−2	4
−3	8



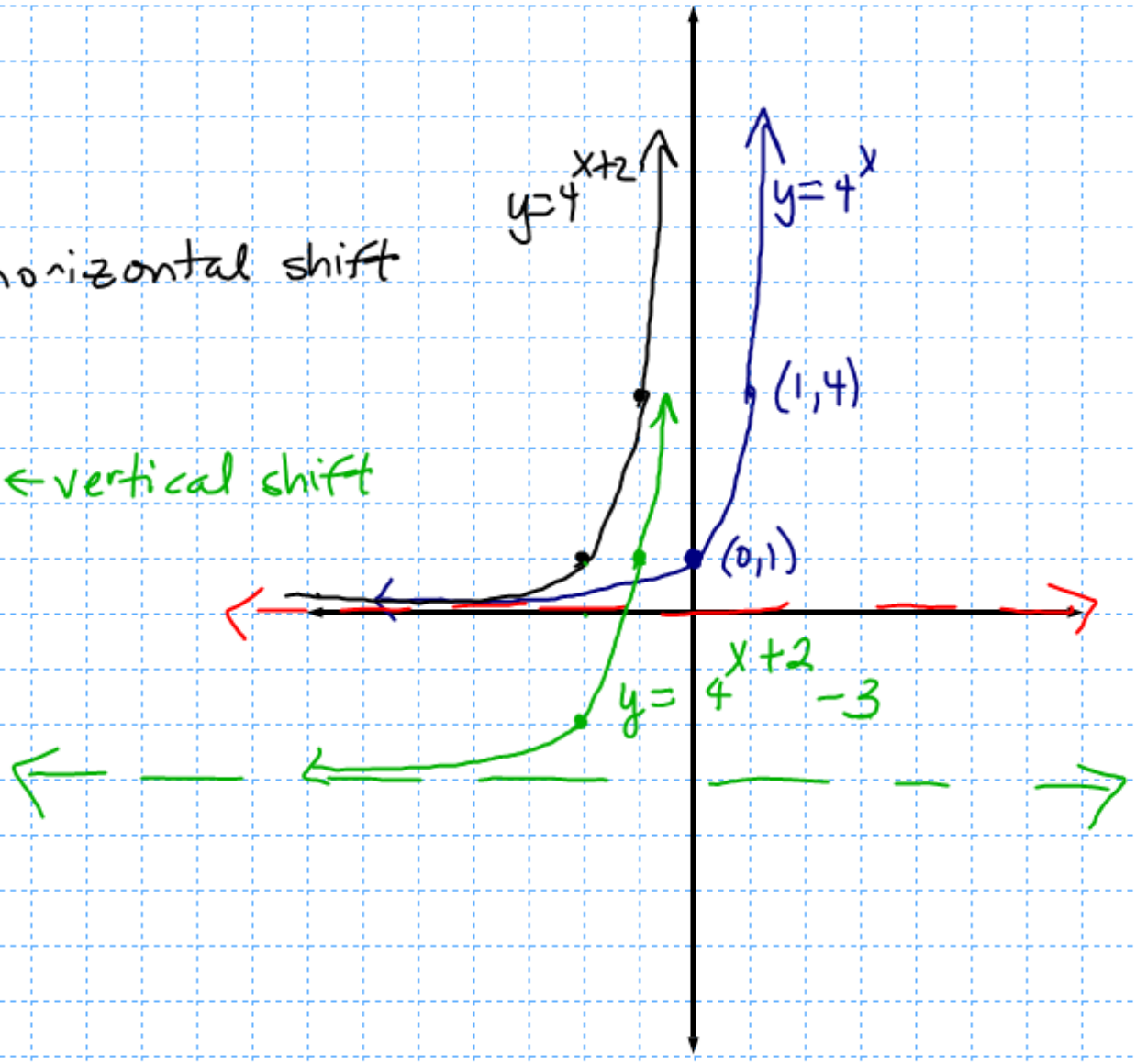
$$\left(\frac{1}{2}\right)^{-1} = \left(\frac{2}{1}\right)^{1}$$

Graph:

$$g(x) = 4^x$$

$$f(x) = 4^{x+2}$$ ← horizontal shift

$$h(x) = 4^{x+2} - 3$$ ← vertical shift



NATURAL BASE

X	1	10	100	1,000	10,000	100,000
$\left(1+\frac{1}{x}\right)^x$	2	2.5937	2.7048	2.7169	2.7181	2.7183

e

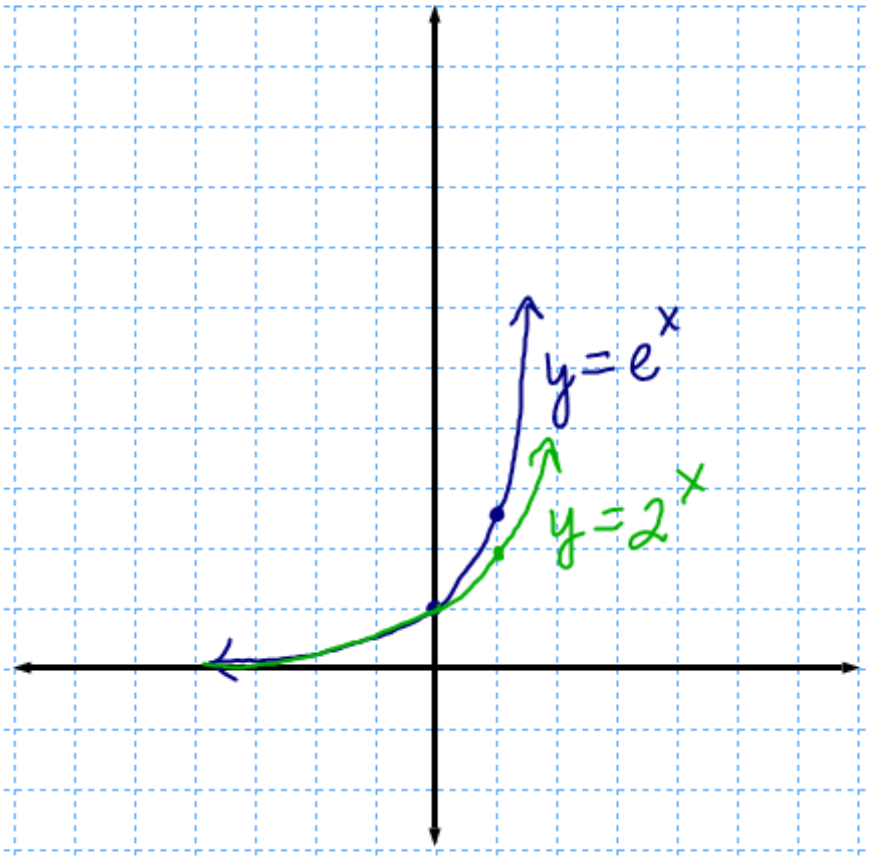
$$\left(1+\frac{1}{1}\right)^{1}\left(1+\frac{1}{10}\right)^{10}\left(1+\frac{1}{100}\right)^{100}\left(1+\frac{1}{1000}\right)^{1000}\left(1+\frac{1}{10,000}\right)^{10,000}\left(1+\frac{1}{100,000}\right)^{100,000}$$

$e \approx 2.71828\ldots\ldots$

Euler

$y = e^x$

x	y
0	1
1	2.78



Compound Interest Formula

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

A= the amount in the account after ***t*** years

P = principal (beginning value)

r = the annual interest rate

n = number of pay periods per year

n = 1 annual

n = 2 semi-annual

n = 4 quarterly

n = 12 monthly

n = 52 weekly

n = 365 daily

An investment of $5,000 is made into an account that pays 6% annual interest for 10 years. Find the amount in the account if the interest is compounded:

$P = 5000$, $r = .06$ $t = 10$

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

1. Annually $n = 1$ $A = 5000\left(1 + \frac{.06}{1}\right)^{1(10)}$ $A = \$8,954.24$
2. Quarterly $n = 4$ $A = 5000\left(1 + \frac{.06}{4}\right)^{40}$ $A = \$9,070.09$
3. Monthly $n = 12$ $A = 5000\left(1 + \frac{.06}{12}\right)^{120}$ $A = \$9,096.98$
4. Daily $n = 365$ $A = 5000\left(1 + \frac{.06}{365}\right)^{3650}$ $A = \$9,110.14$
5. Compounded continuously

$$A = Pe^{rt}$$

$A = 5000e^{.06(10)}$ $A = \$9,110.59$