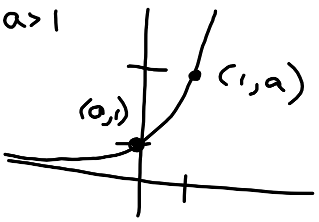
3.6	#15-39odd	Solving polynomial inequalities
	#47, 53-61odd	Solving rational inequalities
3.7:	#23-37 odd	Variation
4.1	#17-23 odd	prove f is one-to-one; prove g is not one-to-one
	#59-63 odd	determine if f is on-to-one and if so, determine its inverse
	#77-81 odd	sketch the inverse function by reflecting over y=x
	#83-87 odd	use composition to show that the functions are inverses
4.2	#5-10all	match an exponential function to its graph
	#11-41odd	sketch graphs of exponential functions using transformations
	#43a,b,c,45,47	compound interest word problems
4.3	#1-8all	sketch graphs of logarithmic functions
	#9-33odd	evaluate log expressions without a calculator
	#35-53 odd	convert between logarithmic and exponential expressions
	#69-77 odd	apply change of base formula & calculator to approximate log expressions
	#83-90 all	graph logarithmic functions using transformations

Properties of Exponential Functions

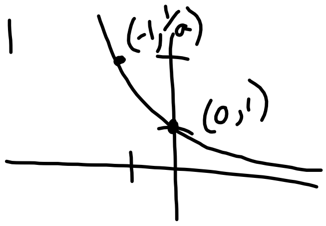
$f(x) = a^x$, $a > 0$, $a \neq 1$

- continuous
- one-to-one
- Domain: $(-\infty, \infty)$
- Range: $(0, \infty)$
- Horizontal asymptote: $y = 0$
- y-intercept: $(0, 1)$
- increasing if $a > 1$
- decreasing if $0 < a < 1$

$a > 1$



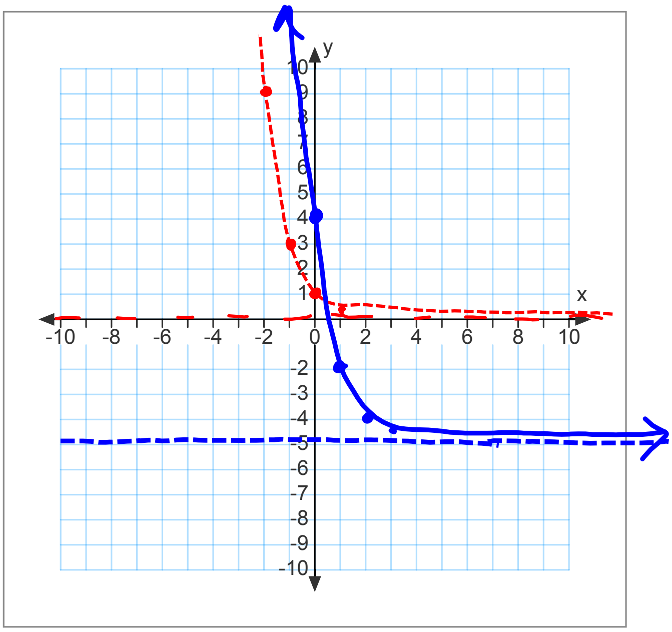
$0 < a < 1$



$$f(x) = \left(\frac{1}{3}\right)^{x-2} - 5$$

$\left(\frac{1}{3}\right)^{x}$

right 2
down 5



Application: Compound Interest

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

A = amount of money
P = principal (initial investment)
t = time in # of years
r = interest rate (decimal)
n = # of times interest is compounded per year

Example:
$100 @ 5% interest compounded quarterly for 1 year

$P = \$100$
$r = 0.05$
$n = 4$
$t = 1$

$$A = 100\left(1 + \frac{0.05}{4}\right)^{4 \cdot 1}$$

$\approx \$105.09$

If we invest \$1 at 100% interest for 1 year,

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

n		$A(n) = \left(1+\frac{1}{n}\right)^n$
1	annually	$\left(1+\frac{1}{1}\right)^1 = 2^1 = \$2$
2	semiannually	$\left(1+\frac{1}{2}\right)^2 = \frac{9}{4} = \$2.25$
4	quarterly	$\left(1+\frac{1}{4}\right)^4 = \$2.44$
12	monthly	$\left(1+\frac{1}{12}\right)^{12} = \$2.61$
365	daily	$\left(1+\frac{1}{365}\right)^{365} = \$2.71$
8760	hourly	$\left(1+\frac{1}{8760}\right)^{8760} = \$2.718$
-->		e

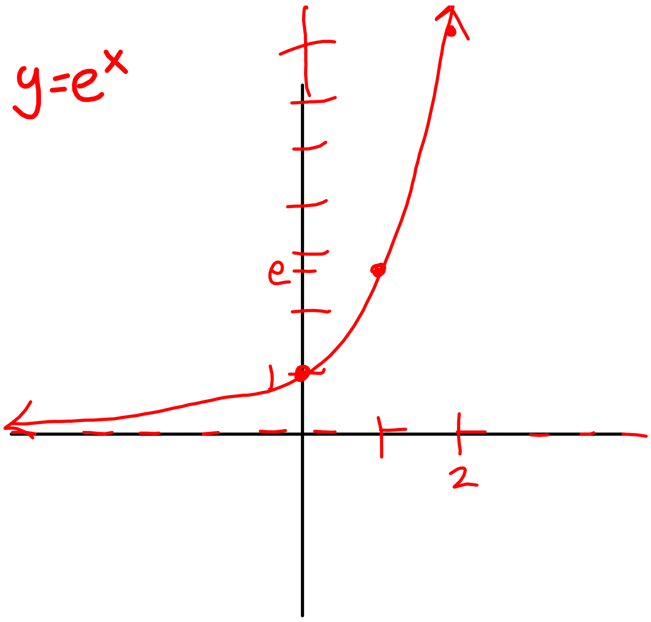
$e = 2.718$

$e^2 = e\hat{}2 \approx 7.389$

$e^{-0.23} \approx 0.7945$

$e\hat{}(-0.23)$

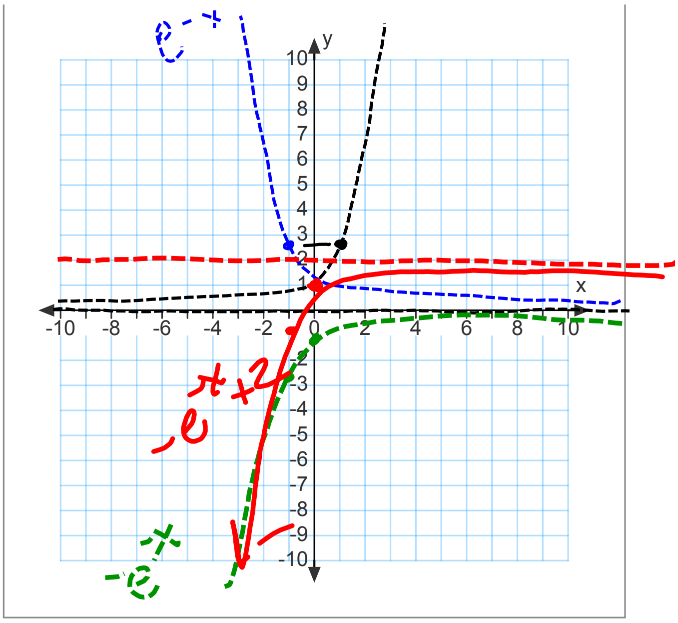
$y = e^x$



$y = -e^{-x} + 2$

e^{x}

e^{-x}



4.3 Logarithmic Functions

Inverses of Exponential Functions

$f(x) = 2^{x}$

$y = 2^{x}$

$x = 2^{y}$

y = the power to which we raise 2 to get x

$f^{-1}(x) =$ ___ " ___

$f^{-1}(x) = \log_2 x$ "log, base 2, of x"

$$\log_2 8 = 3 \iff 2^3 = 8$$

3 is the power to which we raise 2 to get 8

Simplify/evaluate:

$\log_{10} 1000 = \boxed{3}$

$\log_{10} 0.001 = \boxed{-3}$

$\log_3 27 = 3$

$\log_5 1 = 0$

$\log_6 6 = 1$

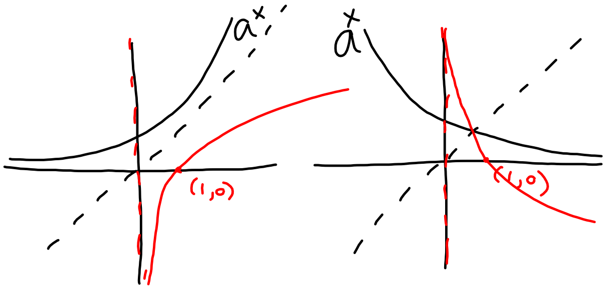
$10^{\boxed{3}} = 1000$

$10^{\square} = 0.001 = \frac{1}{1000}$

For $f(x)=a^x$, the inverse function is
$f^{-1}(x)=\log_a x$.
$y=\log_a x$ is the number y such that $x=a^y$, where $x>0$ and a is a positive constant other than 1.

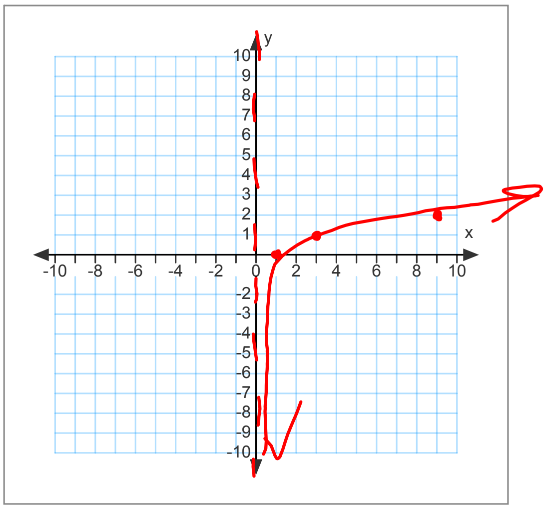
log graphs:
vertical asymptote @ $x=0$

x-int: $(1,0)$
domain: $(0,\infty)$
range: $(-\infty,\infty)$

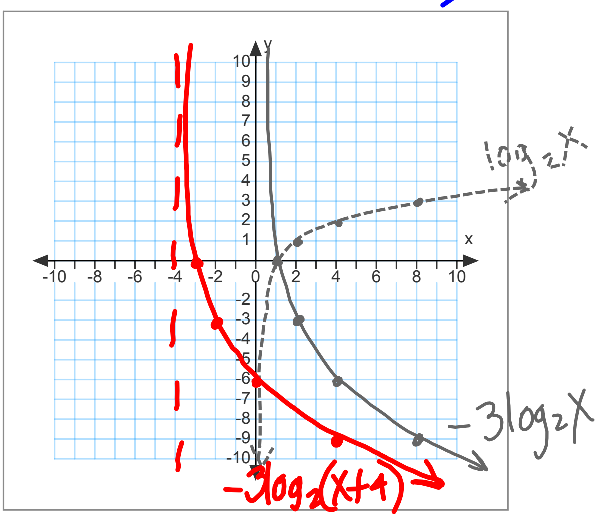


$a>1$ $0<a<1$

$y=\log_3 x$



$y=-3\log_2(x+4)$



$\log_a 1 = 0$

&

$\log_a a = 1$

for any base a

$\log_a x = y \longleftrightarrow a^y = x$

$32 = 2^x \longleftrightarrow \log_2 32 = x$

$\log_2 64 = x \longleftrightarrow 2^x = 64$

$\boxed{\log}$ on your calculator

is $\log_{10} x$

"common log"

$\boxed{\ln}$ is $\log_e x$

"natural log"

4.3-4.4 Logarithmic Functions, Graphs, & Properties

$\log_2 64 = \boxed{6}$

$\ln e^2 = \log_e e^2 = \boxed{2}$

$\log_{81} 3 = \boxed{\frac{1}{4}}$

$81^{1/4} = \sqrt[4]{81}$

$\ln 1 = \log_e 1 = \boxed{0}$

$\ln e = \log_e e = \boxed{1}$

$\ln \sqrt[3]{e} = \log_e e^{1/3} = \boxed{\frac{1}{3}}$

Change of Base Formula

$$\log_b M = \frac{\log_a M}{\log_a b}$$

$$\log_6 7 = \frac{\log 7}{\log 6} = \frac{\ln 7}{\ln 6}$$

$$\log_8 32 = \frac{\log_2 32}{\log_2 8} = \boxed{\frac{5}{3}}$$

$$= \frac{\ln 32}{\ln 8}$$

$$\log_{27} 81 = \frac{\log_3 81}{\log_3 27} = \boxed{\frac{4}{3}}$$