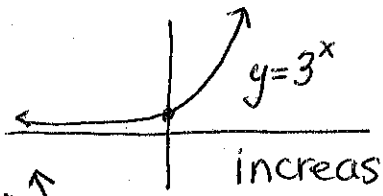
Math 12F - class notes
Chapter 7.

7.1 7.2 7.3 **Exponential Functions**

exponential function: $y = (b)^x$

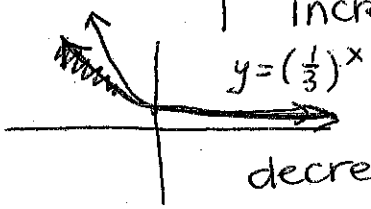
$b > 1$



* $y > 0$ and $x = 0$; $y = 1$

or $a(b)^x \Rightarrow x = 0$, $y = a$

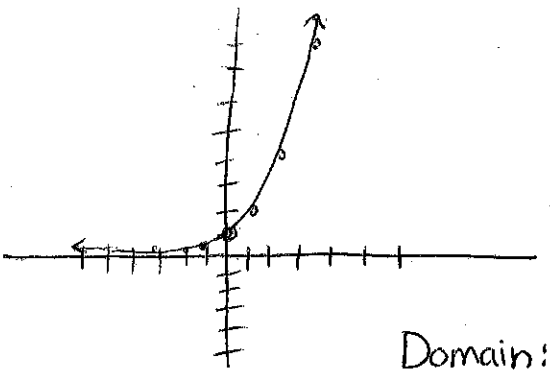
$0 < b < 1$



increasing or growth — **To graph** - use a table of values:

$f(x) = 2^x$

x	y
-3	$2^{-3} = \frac{1}{2^3} = \frac{1}{8}$
-2	$2^{-2} = \frac{1}{2^2} = \frac{1}{4}$
-1	$2^{-1} = \frac{1}{2}$
0	$2^0 = 1$
1	$2^1 = 2$
2	$2^2 = 4$
3	$2^3 = 8$

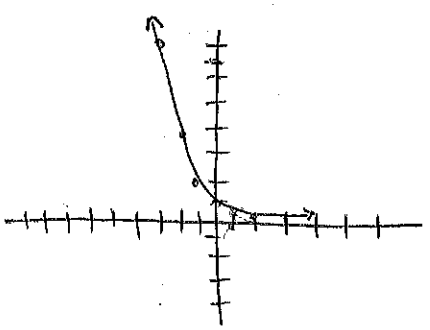


Domain: $x \in R$
Range: $y > 0$

decreasing or regression

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

x	y
-3	$(\frac{1}{2})^{-3} = (\frac{2}{1})^3 = 8$
-2	$(\frac{1}{2})^{-2} = (\frac{2}{1})^2 = 4$
-1	$(\frac{1}{2})^{-1} = (\frac{2}{1})^1 = 2$
0	$(\frac{1}{2})^0 = 1$
1	$(\frac{1}{2})^1 = \frac{1}{2}$
2	$(\frac{1}{2})^2 = \frac{1}{4}$
3	$(\frac{1}{2})^3 = \frac{1}{8}$



7.4 Logarithmic Functions

$y = a \log_b x$ $\quad b>0,\ b\neq 1$ $\quad a\neq 0$

* logarithmic functions are the inverse of exponential functions.

log	exponent
$x>0$	$y>0$
$y=0$, $x=1$	$x=0$, $y=1$

$y = \log_4 16 \longrightarrow 4^y = 16$

$y = 2$

To graph: ① change into exponent ② flip x & y values

$y = \log_2 x \Rightarrow$ ① $2^y = x \Rightarrow y = 2^x$

$y = 2^x$

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

$y>0$

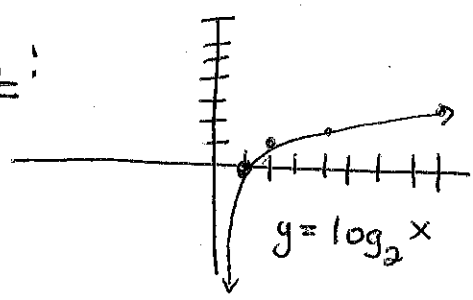
② flip →

$y = \log_2 x$

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

$x>0$

graph:



To graph using calculator: $y = a\log_b x$

GRAPH → draw

$y = 5\log x$ ← * can only be done with $b=10$ (written without b)

* increasing → $a > 1$
* decreasing → $a < 0$

Natural Log ln

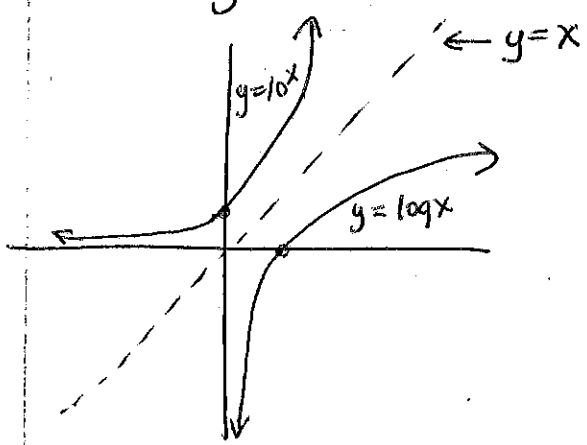
* this is a log with base e

$e = 2.718\ldots$ so $-4\ln x = -4\log_{2.718} x$

⇒ graph same as above but use ln instead of log.

$y = \log x$

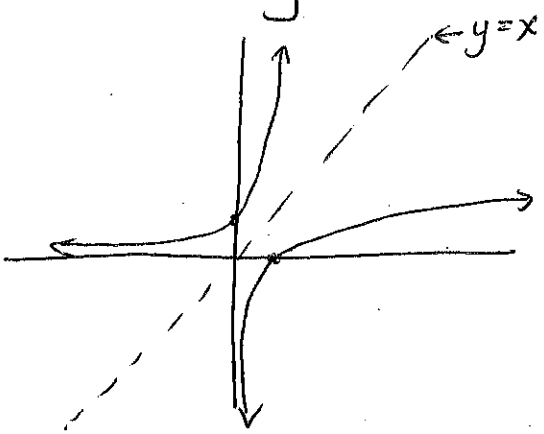
$y = 10^x$



* reflection on $y=x$

$y = \ln x$

$y = e^x$



* reflection on $y=x$