

## Pre-Calculus 12 Exponential Functions

The function  $y = a^x$  is an exponential function.

**General Form:**  $f(x) = a^m$ , where  $a > 0$  and  $a \neq 1$

↑ exponent  
base

### Review Negative Exponent Law

*recall*  $a^{-n} = \frac{1}{a^n}$  or  $\frac{1}{a^{-n}} = a^n$

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

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

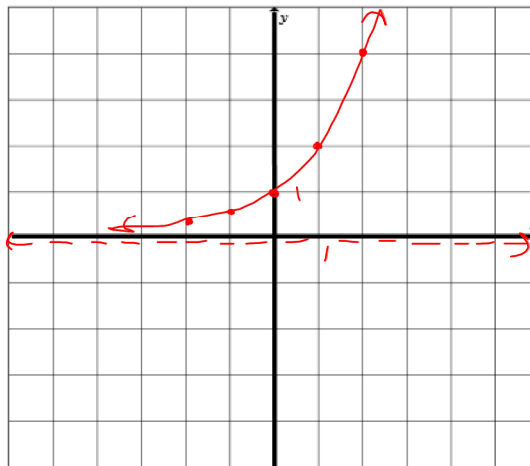
$\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^n$

$\left(\frac{2}{3}\right)^{-3} = \left(\frac{3}{2}\right)^3 = \frac{27}{8}$

$a^0 = 1$

**Ex. 1)** Sketch  $y = 2^x$

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



# Sketching Exponential Fcns.notebook

Ex. 2) Graph  $y = \left(\frac{1}{2}\right)^x$

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

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



**Properties:** (base graph)

a) Zero(s)

none

b) If function is increasing or decreasing  
 (behaviour from left to right)

$a > 1$  increases

$0 < a < 1$  decreases

c) y-intercepts

1

common point  
 (0, 1)

d) Equations of any asymptotes

$y = 0$

e) Domain

$(-\infty, \infty)$

f) Range

$(0, \infty)$

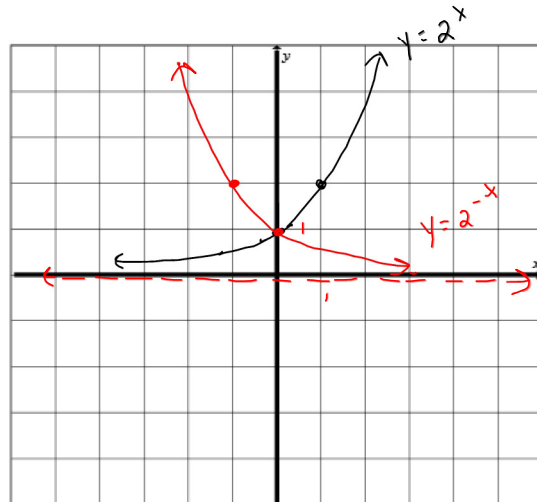
Ex. 3) Sketch  $y = 2^{-x}$

x	$y = 2^x$
0	1
1	2

You need a min of 2 pts

reflection over the y-axis

use table for these values  
 $y = 2^x$



# Sketching Exponential Fcns.notebook

Ex. 4) Use transformations to sketch

Recall:  
"b" must  
be factored  
out

$$y = 4^{-(x+2)}$$

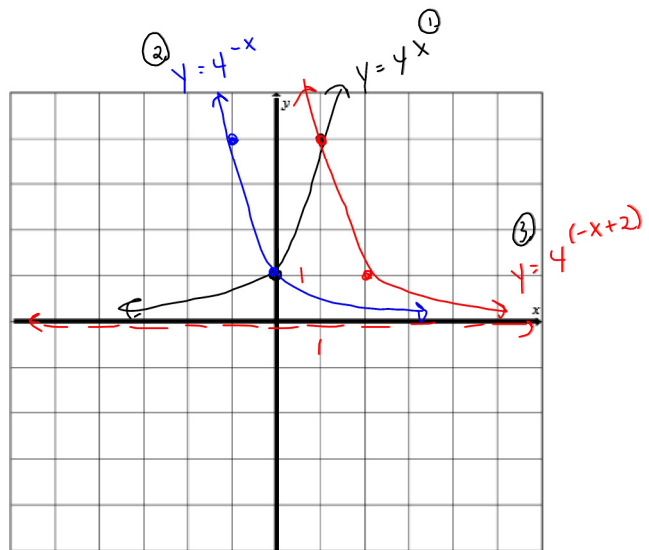
$$y = 4^{-(x-2)}$$

right 2

reflects  
over  
y-axis

$$y = 4^x$$

x	y
0	1
1	4



Ex. 5) Sketch  $y = -2 + 3^{x+1}$

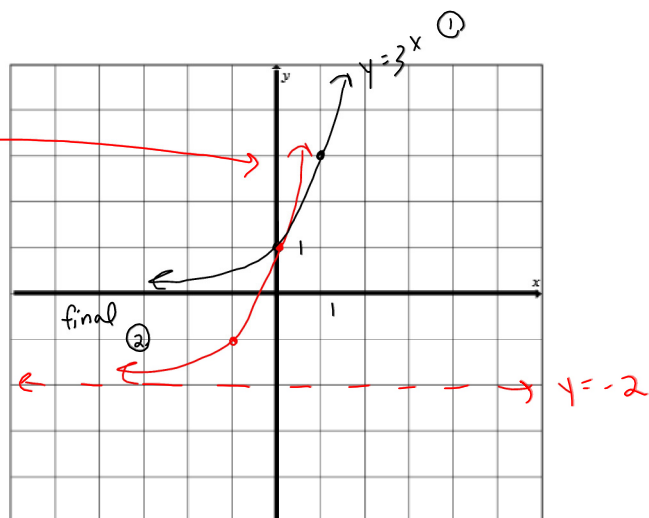
rewrite

$$y = 3^{x+1} - 2$$

left 1, down 2

$$y = 3^x$$

x	y
0	1
1	3



## Sketching Exponential Fcns.notebook

Ex. 6) Describe the transformations required to obtain the graph of  $y = -2(2^x)$

reflection over the x-axis  
vertical stretch by a factor of 2

pg. 354  
# 1, 2, 4,  
6a, b, 7