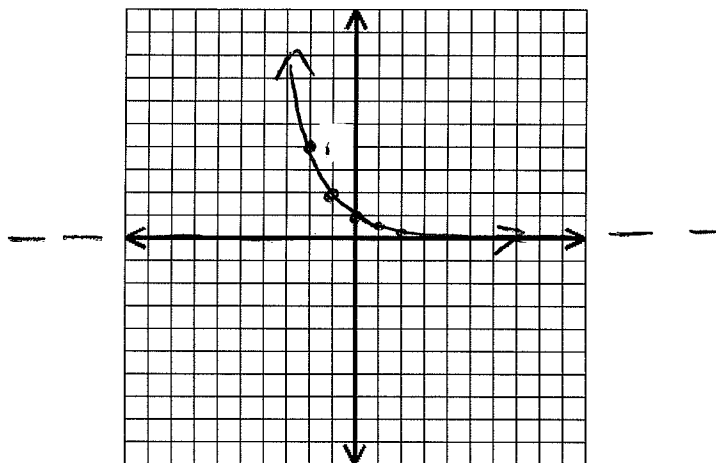


8.2 Exponential Decay

In lesson 8.1, you studied exponential growth functions. In this lesson, you will study *exponential decay functions*, which have the form $f(x) = ab^x$ where $a > 0$ and $0 < b < 1$.

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

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



Domain: $(-\infty, \infty)$ Range: $(0, \infty)$

Asymptote: $y = 0$ x-int: none y-int: $(0, 1)$

Ex 2) State whether the function is an exponential growth or exponential decay function.

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

decay

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

growth

c) $f(x) = 10(3)^{-x}$
 \downarrow
 $f(x) = 10\left(\frac{1}{3}\right)^x$

decay

d) $y = 2(0.5)^x$

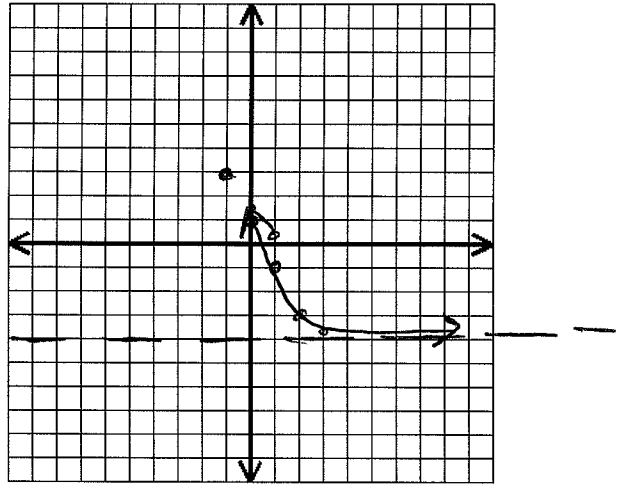
decay

* If $b < 1$ then decay
 If $b > 1$ then growth

Ex 3) Graph the function $y = \left(\frac{1}{3}\right)^{x-2} - 4$

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

x	y
-1	3
0	1
1	$\frac{1}{3}$



Describe the shift: right 2,
down 4

Domain: $(-\infty, \infty)$ Range: $(-4, \infty)$

Asymptote: $y = -4$ x-int:

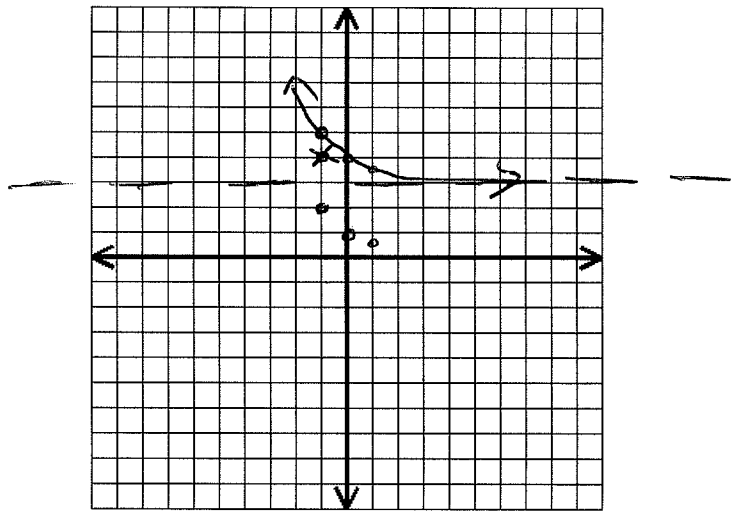
y-int: $(0, 5)$ ↑

look on calculator

Ex 4) Graph the function $y = \left(\frac{1}{2}\right)^x + 3$

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

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



Describe the shift: up 3

Domain: $(-\infty, \infty)$ Range: $(3, \infty)$

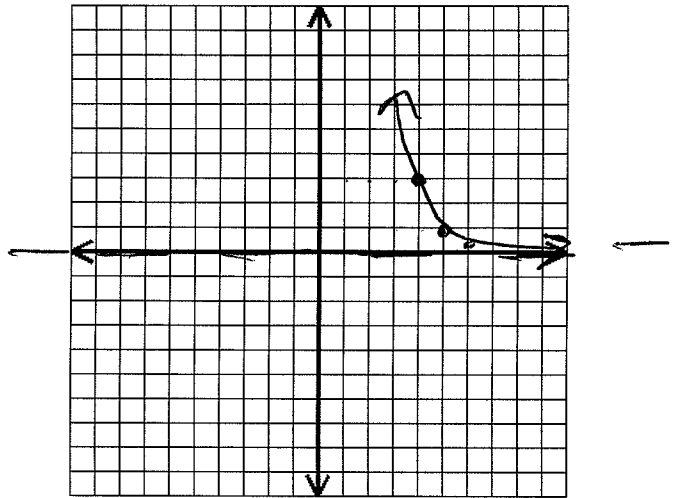
Asymptote: $y = 3$ x-int: none

y-int: $(0, 4)$

Ex 5) Graph the function $y = \left(\frac{1}{3}\right)^{x-5}$

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

x	y
-1	3
0	1
1	$\frac{1}{3}$



Describe the shift: right 5

Domain: $(-\infty, \infty)$ Range: $(0, \infty)$

Asymptote: $y = 0$ y-int: $(0, 243)$

Review:

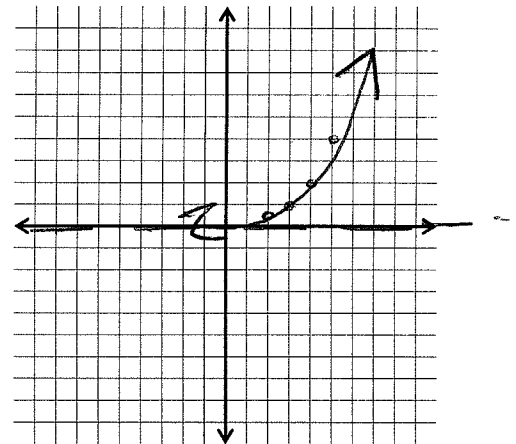
$$y = 2^{x-3}$$

Growth or Decay?

Asymptote: $y = 0$ x-int: none y-int: $(0, \frac{1}{8})$

Domain: $(-\infty, \infty)$ Range: $(0, \infty)$

Describe the shift: right 3



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

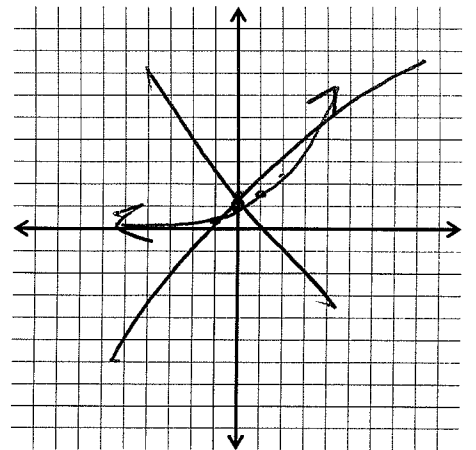
$(0, 1.25)$
or

Growth or Decay?

Asymptote: $y = -1$ x-int: $(-2, 0)$ y-int: $(0, \frac{5}{4})$

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

Describe the shift: left 2, down 1



I ignore!