objective: To identify types of exponential functions and graph with transformations

2/26/19

parent function: $f(x) = b^x$ or $y = b^x$ (b=base $b>1$) ✓

1.) Exponential Growth: $b > 1$

$y = 2^x$

$y = 3^x$

$y = 1.5^x$

2.) Exponential Decay: $0 < b < 1$

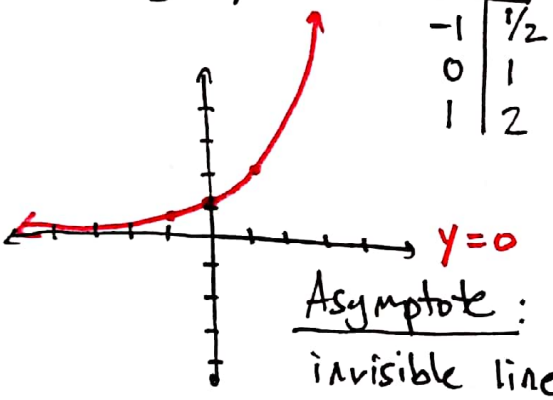
$y = \left(\frac{1}{2}\right)^x$

$y = (0.35)^x$

$y = \left(\frac{3}{4}\right)^x$

a.) $y = 2^x$

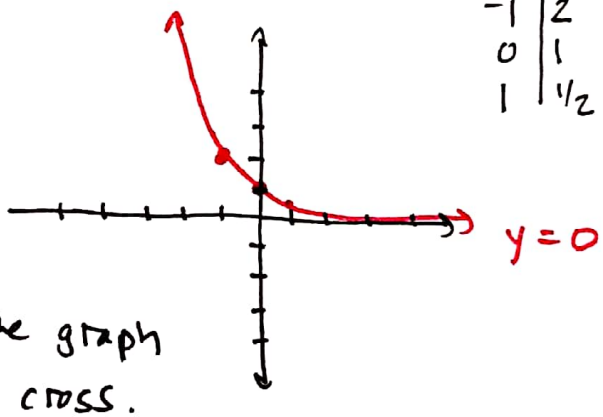
x	y
-1	1/2
0	1
1	2



Asymptote: An invisible line that the graph will never touch or cross.

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

x	y
-1	2
0	1
1	1/2



Transformations of Exponential Functions

$y = a(b)^{x-h} + k$

1.) $a < 0$ (neg) horizontal reflection (flips upside down, below asymptote)

2.) $a > 1$ vertical stretch (steeper)

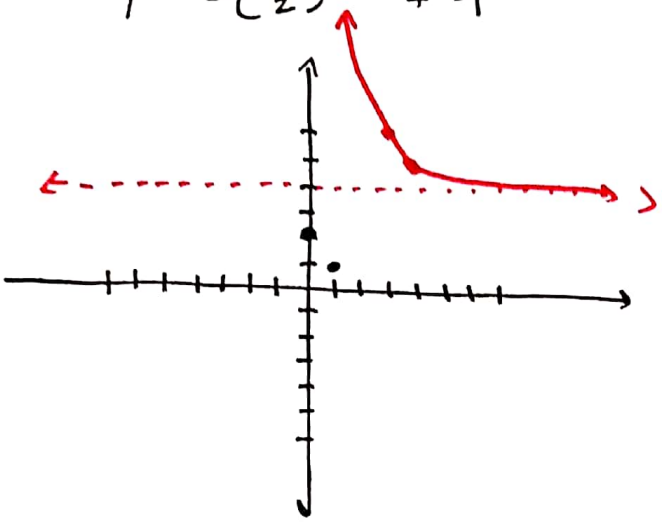
$0 < a < 1$ vertical shrink or compression (flatter)

3.) 'h' horizontal translation or shift (opp sign)

4.) 'k' vertical translation or shift

Example 1:

$y = 2\left(\frac{1}{2}\right)^{x-3} + 4$



Steps:

1.) Plot helper points by avoiding h and k.

$y = 2\left(\frac{1}{2}\right)^{x}$ (0,), (1,)

(0, 2), (1, 1)

2.) shift horizontally by h using opposite sign and vertically by k.

3.) graph asymptote at $y = k$

$y = 4$

Example 2:

$y = -1 \cdot 2^{x+3} - 4$ ⟶ $y = -2^{x}$ (0, -1), (1, -2)

$h = -3$ $k = -4$

Asymptote: $y = -4$

★ when a is negative graph is below asymptote