$\boxed{\text{SECTION 6.3}}$

GRAPHING EXPONENTIAL FUNCTIONS

(basic shape)

$y = a \cdot b^x \rightarrow y = 2^x$

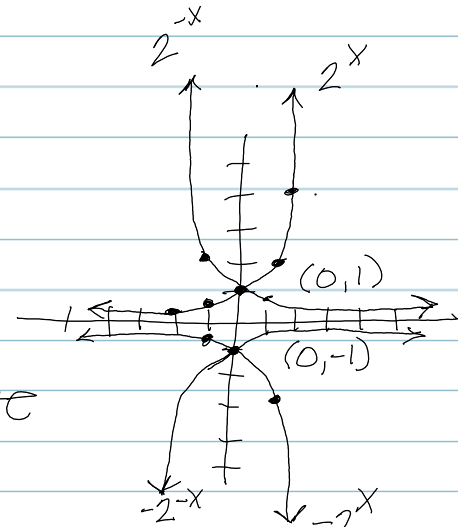
$y = 2^x$

X	Y
-2	$2^{-2} = \frac{1}{4}$
-1	$2^{-1} = \frac{1}{2}$
0	$2^0 = 1$
1	$2^1 = 2$
2	$2^2 = 4$

TO KNOW:

$$\boxed{\begin{array}{l} 2^0 = 1 \\ -2^0 = -1 \cdot 2^0 = -\cancel{2}\,1 \\ (-2)^0 = 1 \end{array}}$$

horizontal asymptote (HA)



$y = -2^x$

X	Y
-1	$-2^{-1} = -\frac{1}{2}$
0	$-2^0 = -1$
1	$-2^1 = -2$

$y = 2^{-x}$ (opposite reflection)

X	Y
-1	$2^{--1} = 2^1 = 2$
0	$2^{-0} = 1$
1	$2^{-1} = \frac{1}{2}$

$y = -2^{-x}$

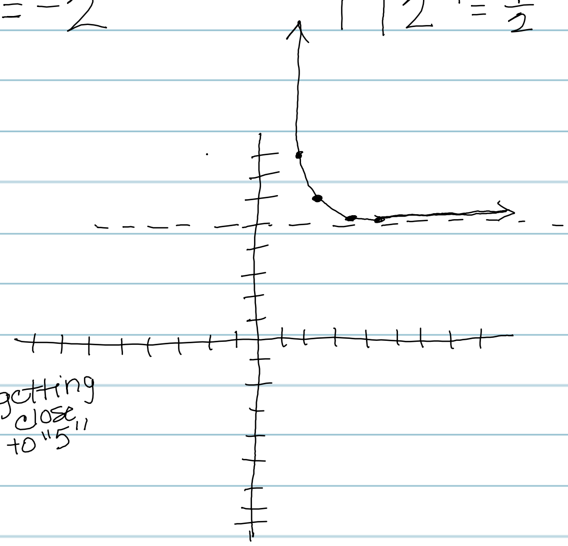
$y = 3^{2-x} + 5$ ← HA

X	Y
-1	32
0	14
1	8
2	6

3	$5\frac{1}{3}$
4	$5\frac{1}{9}$

} getting close to "5"

$= 3^{2-0} + 5$
$= 3^2 + 5$
$= 9 + 5$
$= 14$



D: $\mathbb{R}$
R: $(5, \infty)$

Ex: $y = 3(x-2)^2 + 8$

$(h,k) = (2,8)$

$y = x^2$

$(0,0)$

start $(0,0)$

shift $(2,8)$

(h,k) $(2,8)$

$$\boxed{y = a \cdot b^{x-h} + k}$$

$y = 3^{2-x} + 5$ $\quad 2-x=0$, $2=x$

$(2,5)$

Ex: #1

$y = 3^{2-x} + 5$

$y = 1 \cdot 3^{2-x} + 5$

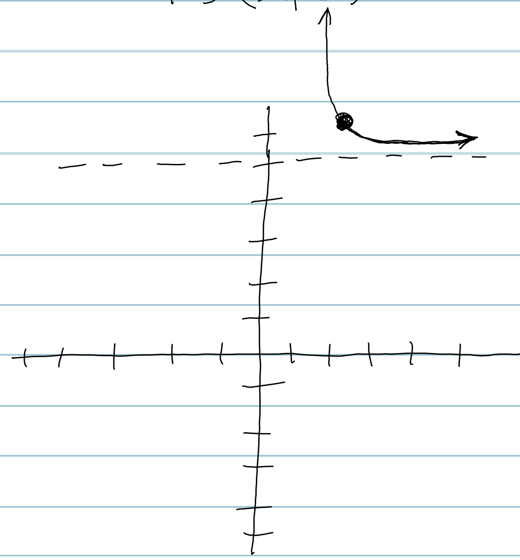
like: b^{-x} $\quad (0,1)$

start: $(0,1)$

(h,k) $\quad (2,5)$ $\to$ shift

$(2,6)$

HA: $y = k \to y = 5$



x	y
0	14

Ex: #2

$y = -4^{x+3} - 2$

like: $-b^{x}$ $\quad (0,-1)$

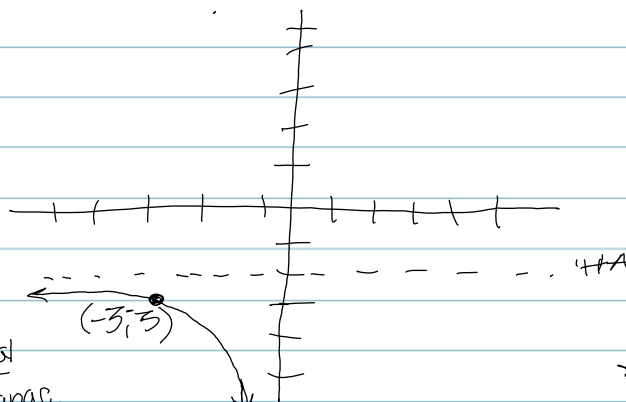
start: $(0,-1)$

(h,k) $\quad (-3,-2)$

$(-3,-3)$ ← central point (change is made)

HA: $y = -2$

$y = -1 \cdot 4^{x+3} - 2$



x	y
0	-66

D: $\mathbb{R}$

R: $(-\infty, -2)$

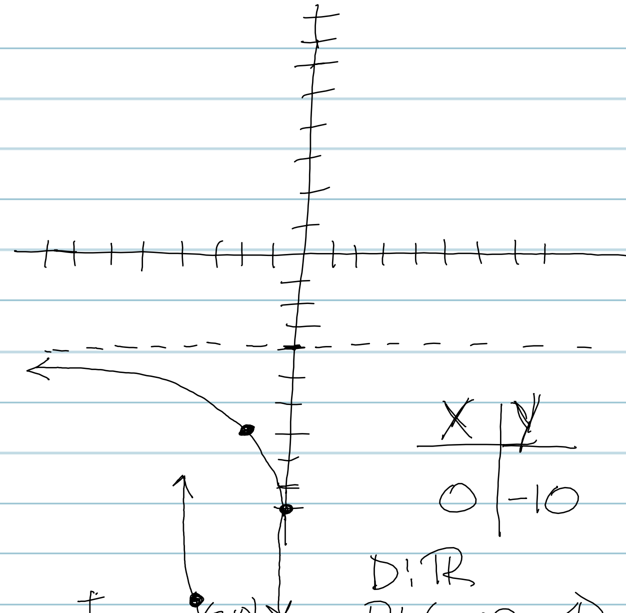
* use # for asymptote

$y = -3 \cdot 2^{x+1} - 4$

like: $-b^x$ (0,−1)

start: $(0,-1) \xrightarrow{-1(3)} (0,-3)$
(h,k) $(-1,-4)$
$(-1,-7)$
change point

HA: $y = k$
$y = -4$



X	Y
0	−10

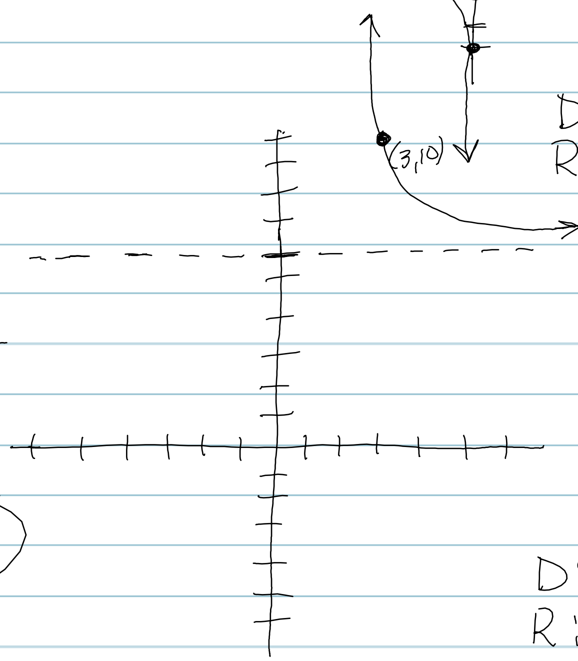
D: $\mathbb{R}$
R: $(-\infty, -4)$

$y = 4 \cdot 2^{3-x} + 6$

like: b^{-x} (0,1)

start: $(0,1) \rightarrow (0,4)$
(h,k) $(3,6)$: 3 6
$(3,10)$

HA: $y = k$
$y = 6$



X	Y
0	38

D: $\mathbb{R}$
R: $(6, \infty)$