9-3 Graphing using transformations

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

y-int

(GREATER THAN 1)

growth or decay

(smaller than 1)

g
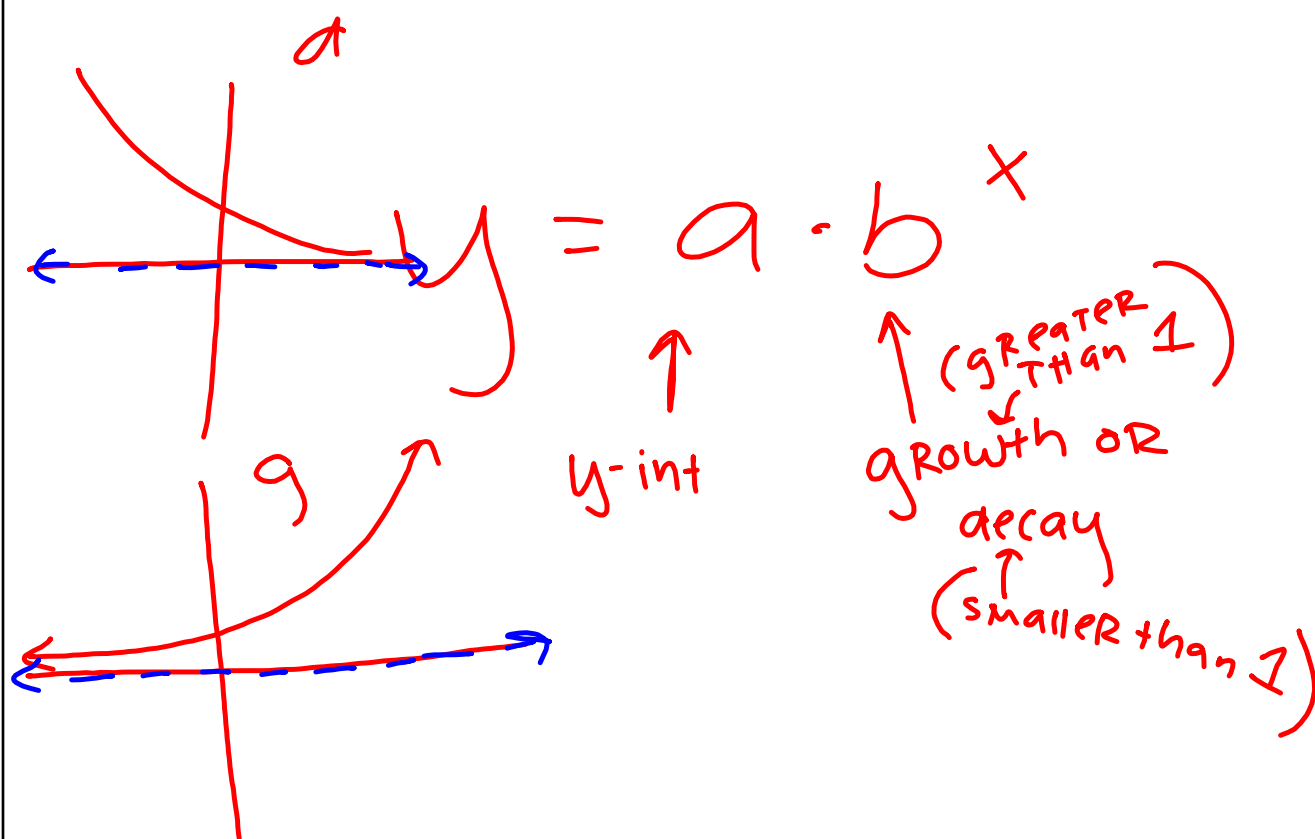
Make a table of values for the following parent functions

$y = 2^x$

x	y	
0	1	$= 2^0$
1	2	$= 2^1$
2	4	$= 2^2$
3	8	$= 2^3$

$y = 3^x$

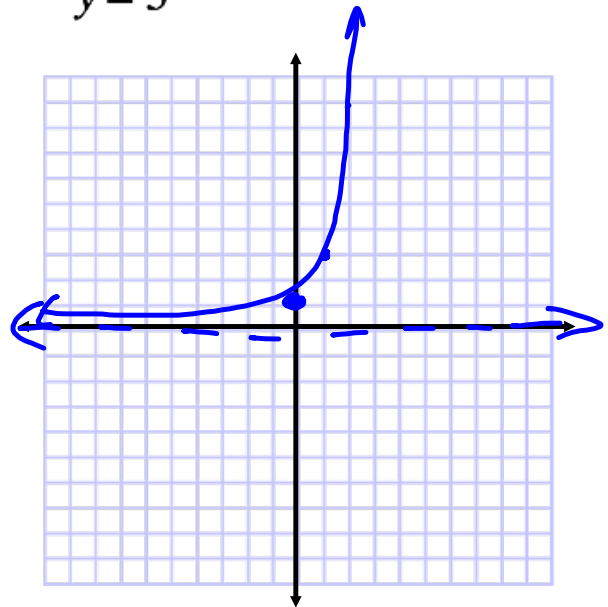| x	y	
0	1	3^0
1	3	3^1
2	9	3^2
3	27	3^3

The common points for each table are **(0,1) and (1,b)**.
Where b is the base.

Now graph each parent function

$y = 2^x$
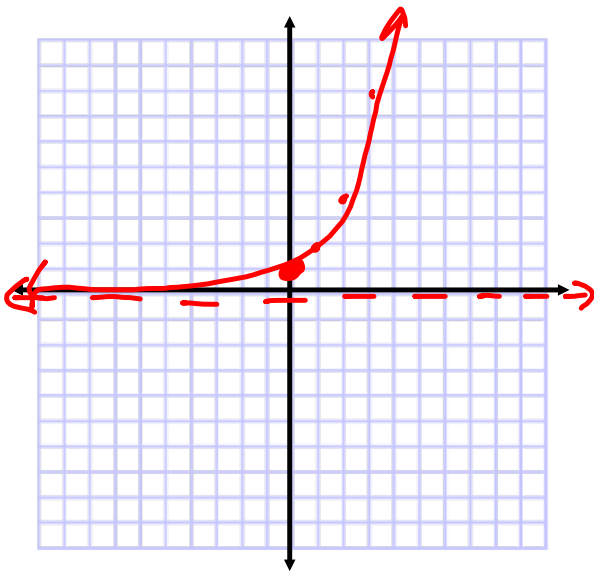
$y = 3^x$

Calculator Activity

Graph both functions and state the similarities and differences between their graphs

Graph $y=2^x$ and $y=2^{x+3}$

Left 3

$y=0$

both have asymptote

Graph $y=3^x$ and $y=3^{x-4}$

Right 4

asymptote $y=0$
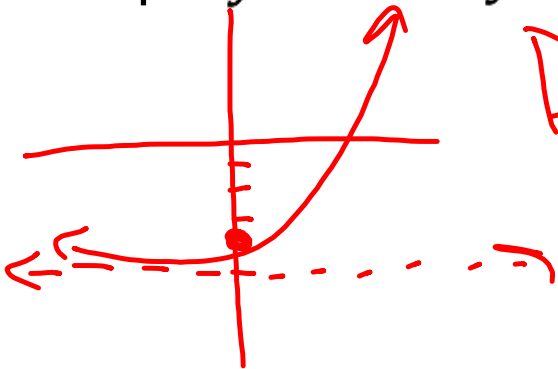
Calculator Activity

Graph both functions and state the similarities and differences between their graphs

Graph $y = 4^x$ and $y = 4^x + 2$

Up 2

$y = 2$

Graph $y = 3^x$ and $y = 3^x - 5$

Down 5

Vertical shifts

$$y = b^x + \underline{UP}$$

adding a number to the function means to shift the graph up

$$y = b^x - \underline{down}$$

subtracting a number from the function means to shift the graph down

Horizontal shifts — X's lie!

$$y = b^{x+}Left$$

adding a number to the exponent means to shift the graph to the *left*

$$y = b^{x-}Right$$

subtracting a number from the exponent means to shift the graph to the *right*

Remember to do the opposite of what the value by x says! X's ALWAYS LIE

State the transformations for the following functions

$$y = 2^x + 1$$

$$y = (3)^{x-4}$$

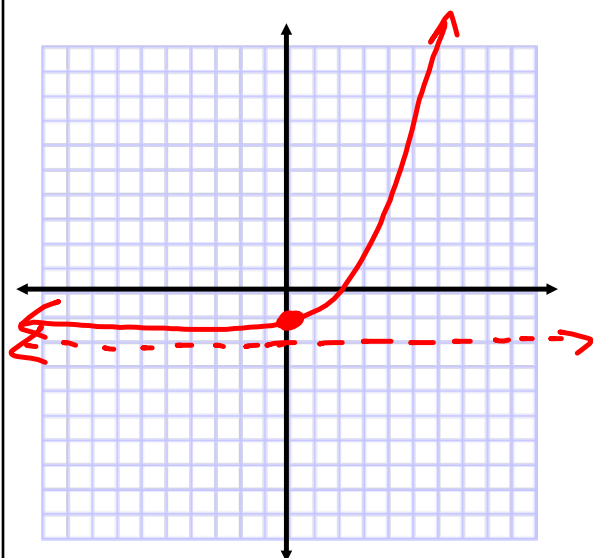$$y = \left(\frac{1}{4}\right)^x + 3$$

UP 1

Right 4

UP 3

Graphing Vertical and Horizontal Shifts:

- Determine how your graph is shifting

- Graph your asymptote (UP or down only)

- Move the parent function key points of (0,1) ~~the~~ the
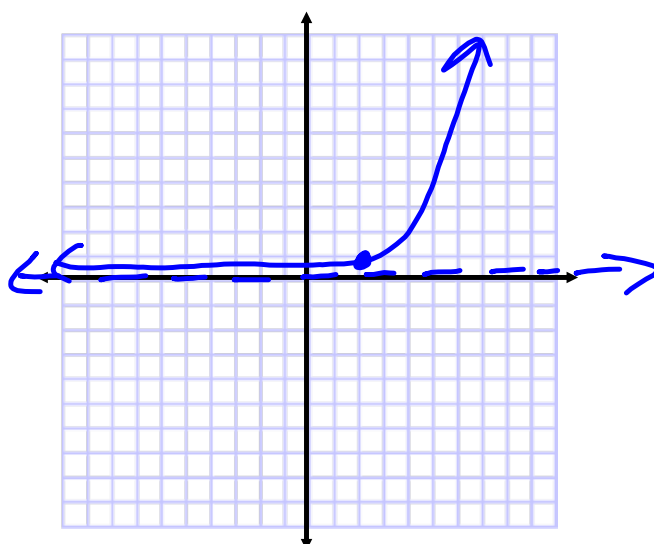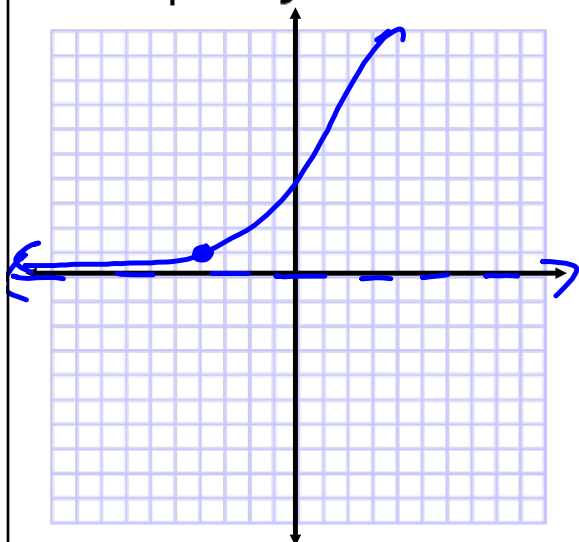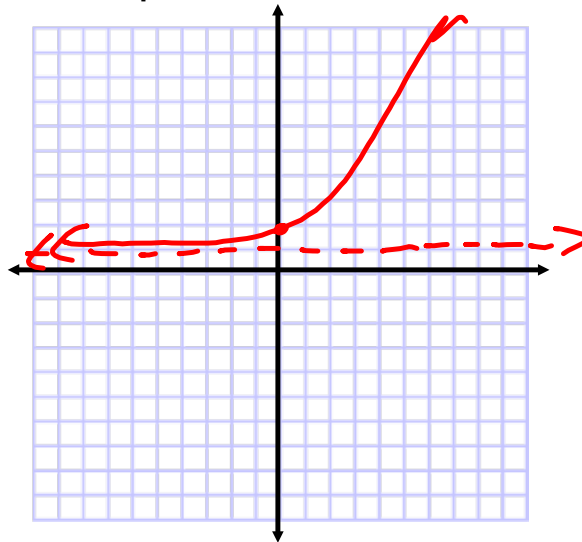amount and direction of the shift

Graph $y = 2^x - 2$

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

down 2

growth

Right 2

gRowth

Graph $\quad y=3^{x+4}$

Graph $\quad y=3^{x}+1$

Left 4
gRowth

UP 1
g

State the transformations for the following functions

$$y = 2^{x-1} + 3 \qquad y = 3^{x-2} - 5 \qquad y = \left(\frac{1}{2}\right)^{x+3} - 2$$

UP 3
Right 1
growth

Right 2
Down 5
g

Left 3
Down 2
decay

State the domain and range of each graph.

$$y = 2^{x+1} + 4$$

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

UP 4
Left 1
  growth
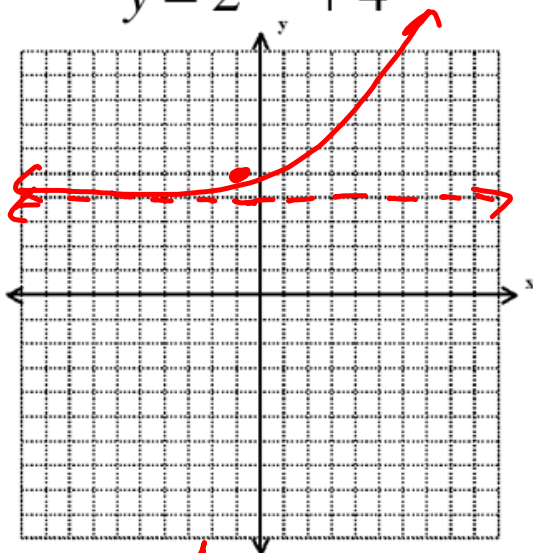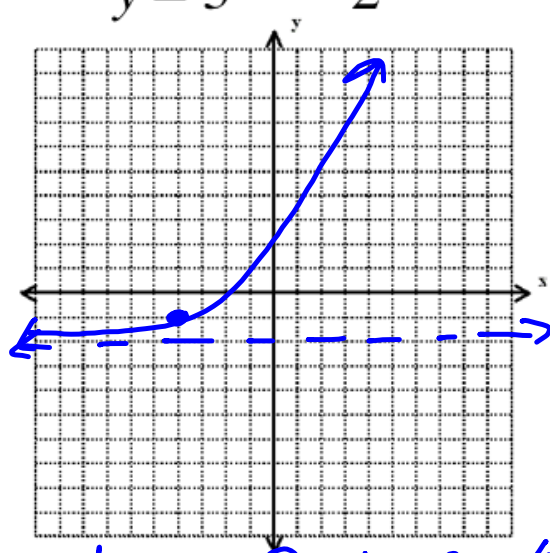
down 2, Left 4
    9

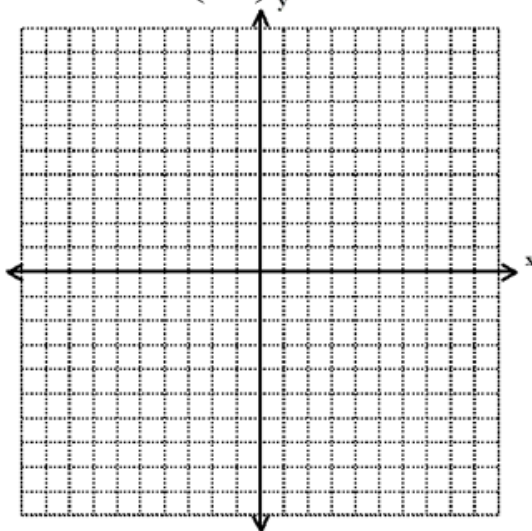D:$(-\infty, \infty)$ R:$(4, \infty)$ D:$(-\infty, \infty)$ R:$(-2, \infty)$
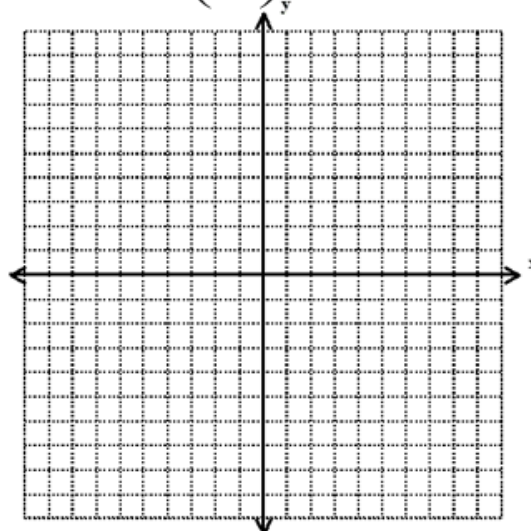
State the domain and range of each graph.

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

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

D: R:

D: R: