

Graphing Exponential Functions

Name KEY

Graph $y = 2^x$. Label any intercepts and asymptotes.

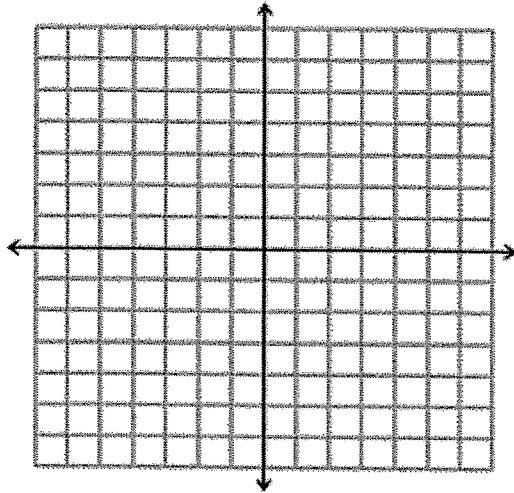
D: _____

R: _____

y-int: _____

asymptote: _____

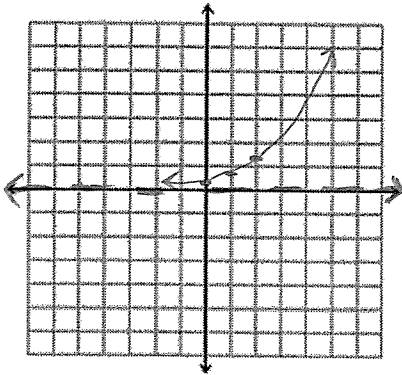
Increasing or Decreasing ?



1. Compare the following graphs to $y = 2^x$. Label the asymptote, y-intercept, and one additional point for each graph.

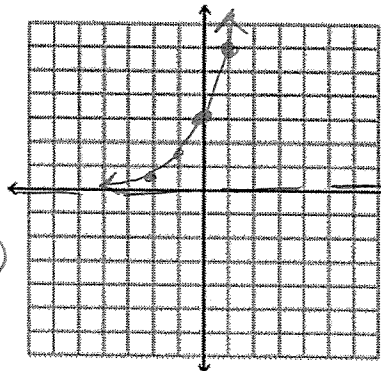
$y = \frac{1}{3} \cdot 2^x$

A: $y=0$
 $(0, \frac{1}{3})$
 $(1, \frac{2}{3})$



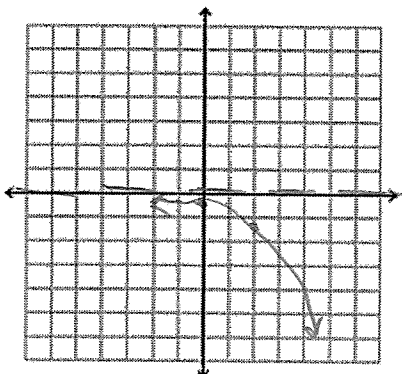
$y = 3 \cdot 2^x$

A: $y=0$
 $(0, 3)$ $(-1, \frac{1}{2})$
 $(1, 6)$



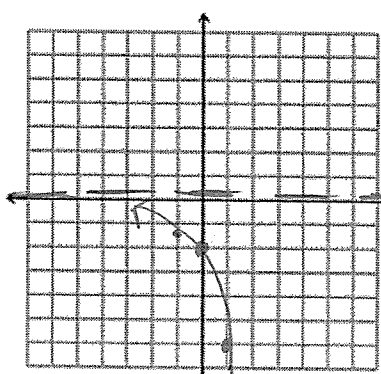
$y = -\frac{1}{3} \cdot 2^x$

A: $y=0$
 $(0, -\frac{1}{3})$
 $(2, -\frac{4}{3})$
 $(-1, -\frac{1}{6})$



$y = -3 \cdot 2^x$

A: $y=0$
 $(0, -3)$
 $(1, -6)$
 $(-1, -\frac{3}{2})$



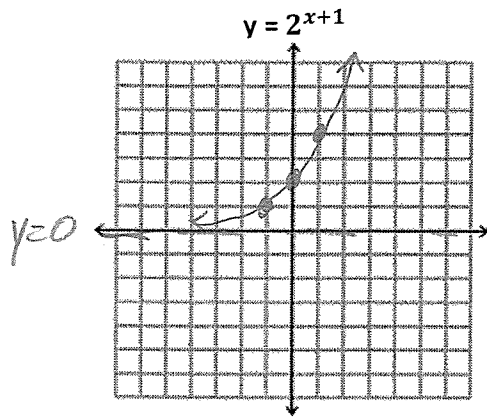
Describe the effect of a on the graph of $y = a \cdot 2^x$.

a is the y-intercept : $(0, a)$

When a is negative \rightarrow graph is reflection over the x-axis.

Ignoring the signs : When $|a|$ is bigger \rightarrow vertical stretch \rightarrow steeper.
 $|a|$ is smaller \rightarrow vertical shrinkage \rightarrow less steep.

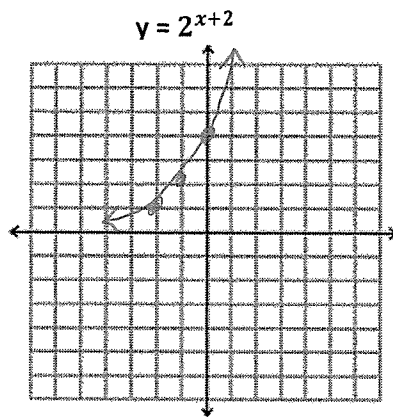
2. Compare the following graphs to $y = 2^x$. Label the asymptote, y-intercept, and one additional point for each graph.



A: $y=0$

(0, 2) (-1, 1)

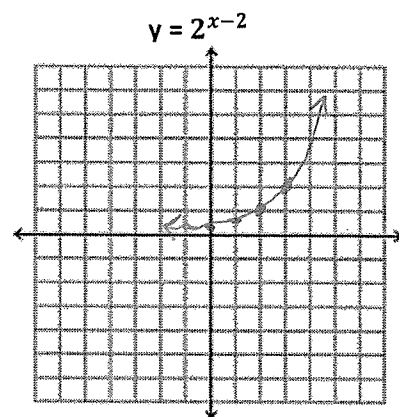
(1, 4)



A: $y=0$

(0, 4) (-1, 2)

(1, 8) (-2, 1)



A: $y=0$

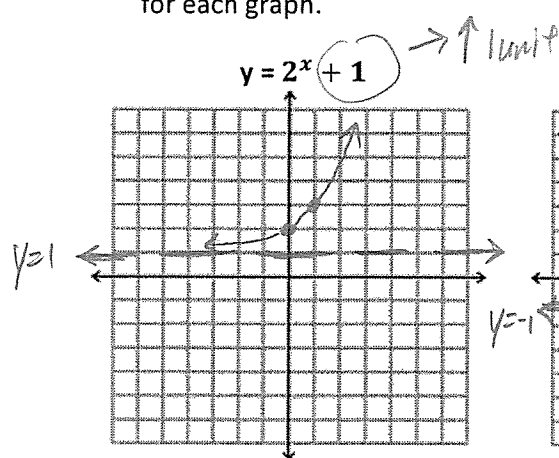
(0, 1/4) (2, 1)

(1, 1/2) (3, 2)

Describe the effect of h on the graph of $y = 2^{x-h}$.

"h" shifts the parent graph left/right. "-h" shifts to the right h units
 "th" shifts to the left.

3. Compare the following graphs to $y = 2^x$. Label the asymptote, y-intercept, and one additional point for each graph.

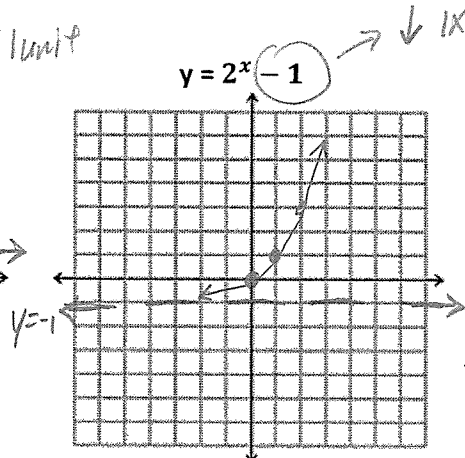


A: $y=1$

(-1, 1 1/2)

(0, 2) (-2, 1 1/4)

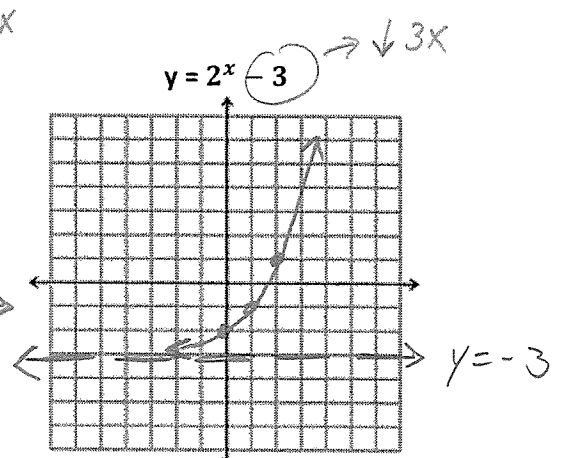
(1, 3)



A: $y=-1$

(0, 0)

(1, 1)



A: $y=-3$

(0, -2)

(1, -1)

Describe the effect of k on the graph of $y = 2^x + k$.

K shifts the graph (see y-int.) up/down y-axis:

+k ↑ k units

-k ↓ k units.

"K" is your asymptote (also shifted): $y=k$

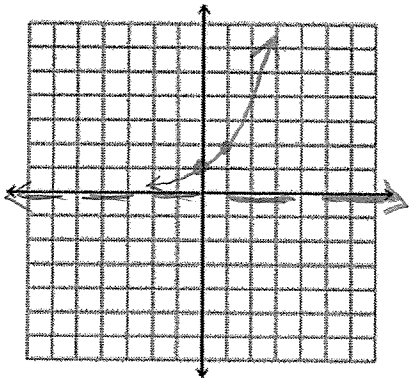
4. Graph each of the following. Label the asymptote, y-intercept, and one additional point for each graph.

$$y = 2^x$$

$$A: y = 0$$

$$(0, 1)$$

$$(1, 2)$$

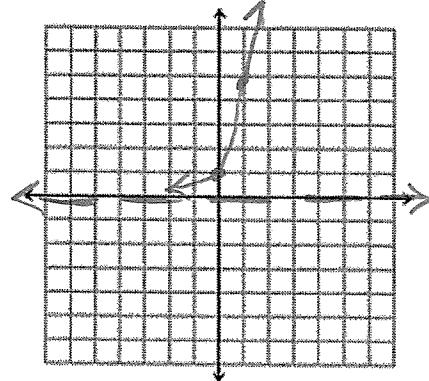


$$y = 5^x$$

$$A: y = 0$$

$$(0, 1)$$

$$(1, 5)$$



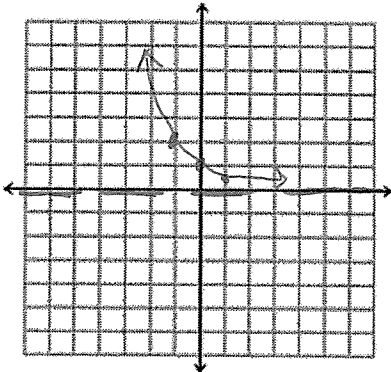
$$y = \left(\frac{1}{2}\right)^x$$

$$A: y = 0$$

$$(0, 1)$$

$$\left(1, \frac{1}{2}\right)$$

$$(-1, 2)$$



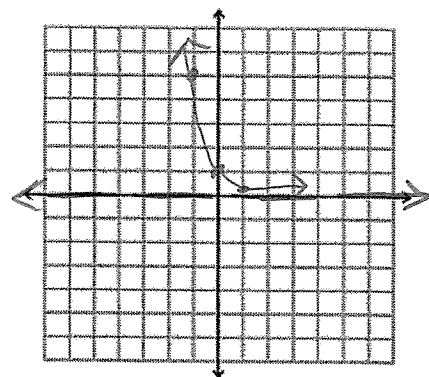
$$y = \left(\frac{1}{5}\right)^x$$

$$A: y = 0$$

$$(0, 1)$$

$$\left(1, \frac{1}{5}\right)$$

$$(-1, 5)$$



Describe the graph of $y = b^x$ when $b > 1$ and when $0 < b < 1$ (increasing/decreasing?). What point do all of the graphs have in common?

When b , the base, is bigger (and $b > 1$) \rightarrow the graph is steeper "increasing".

When $0 < b < 1$, graph is decreasing.

All graphs have in common: y-intercept

b^x and $\left(\frac{1}{b}\right)^x$ are reflections over y-axis

5. Compare the following graph to $y = 2^x$. Label the asymptote, y-intercept, and one additional point.

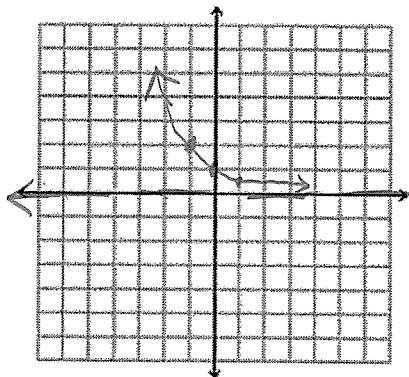
$$y = 2^{-x}$$

$$y\text{-int. } (0, 1)$$

$$\left(1, \frac{1}{2}\right)$$

$$\left(2, \frac{1}{4}\right)$$

$$(-1, 2)$$



$$asym: y = 0$$

How do the graphs of $y = 2^x$ and $y = 2^{-x}$ compare?

They are reflections of each other, over the y-axis.

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

6. Describe the transformations of each function from the parent graph of $y = 2^x$ then sketch each graph without a graphing calculator. Find the domain, range, y-intercept, and asymptote.

a) $y = 2^{x+4} - 15$

Transformations:

D: _____

R: _____

y-int: _____

asymptote: _____

Increasing or Decreasing ?

b) $y = -3(2^x) + 5$

Transformations:

D: _____

R: _____

y-int: _____

asymptote: _____

Increasing or Decreasing ?