Graphing Exponentials, continued.

Reminder: When $f(x) = a \cdot b^x$ is the function you are graphing, a is the initial value and the y-intercept. Why is that?

y-intercept is when $x = 0$ $\quad f(0) = a \cdot b^0$ $\quad f(0) = a$

Find the initial value/y intercept without graphing:

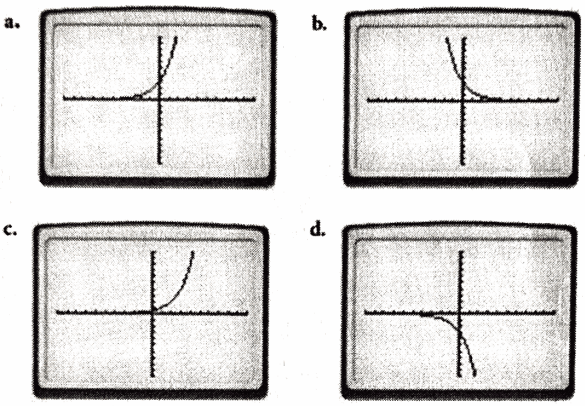
$y = 6(3)^x$ (6)

$y = -3(2)^x$ (-3)

$y = 4(5)^{x+3}$ $\quad y = 4(5)^3$ $\quad y = 500$ $\quad y = 4 \cdot 5^x \cdot 5^3 \rightarrow y = 500 \cdot 5^x$

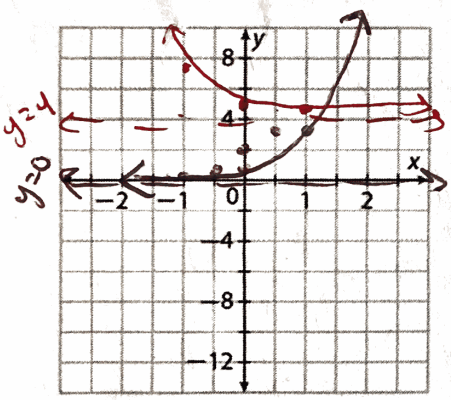
$y = -3(4)^{x-1}$ $\quad y = -3(4)^{-1}$ $\quad y = -\frac{3}{4}$ $\quad -3 \cdot 4^x \cdot 4^{-1}$ $\quad -\frac{3}{4} \cdot 4^x$

Match each equation to a graph.



1. $y = 3(2)^x$ A
2. $y = 0.5(2)^x$ C
3. $y = 3(0.5)^x$ B
4. $y = -3(2)^x$ D

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



$f(x) = (3)^{-x} + 4 \rightarrow 3^x$

a. Graph the parent function (include the asymptote).

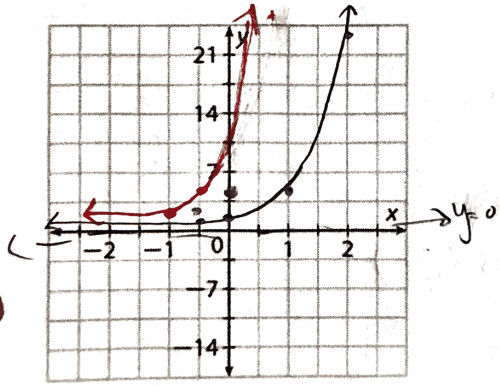
How is the parent function transformed?

Reflect over y
up 4

b. Graph the transformation (include the asymptote).

C. State the end behavior of the transformed function.

As $x \to \infty$ $f(x) \to 4$
As $x \to -\infty$ $f(x) \to \infty$



$f(x) = 2(5)^{x+1}$ $\quad 5^x$

a. Graph the parent function (include the asymptote).

How is the parent function transformed?

Vertical stretch by 2
shift left 1 unit

b. Graph the transformation (include the asymptote).

C. Change $f(x) = 2(5)^{x+1}$ to be in the form $f(x) = a \cdot b^x$ to highlight the y-intercept of the transformed function.

$2 \cdot 5^x \cdot 5^1$ $\quad 10 \cdot 5^x = f(x)$

Without graphing, identify the domain and range of the following. Hint: think about the parent function and how it was transformed.

a. $f(x) = 3(2)^x$ D: $(-\infty, \infty)$ R: $(0, \infty)$

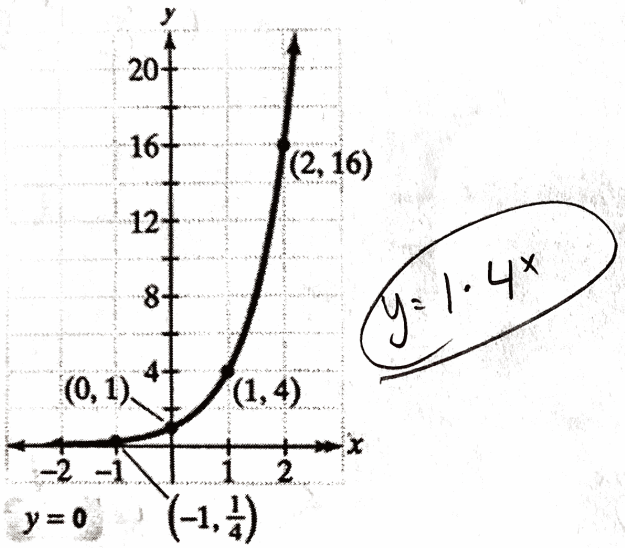
b. $f(x) = 7(0.4)^x$ D: $(-\infty, \infty)$ R: $(0, \infty)$

c. $f(x) = -2(0.6)^x$ D: $(-\infty, \infty)$ R: $(-\infty, 0)$

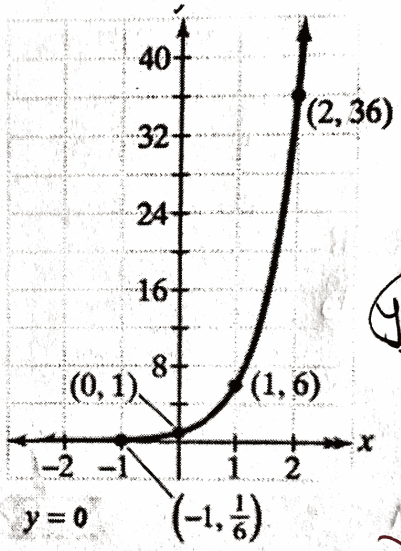
d. $f(x) = -3(4)^x$ D: $(-\infty, \infty)$ R: $(-\infty, 0)$

e. $f(x) = 2(22)^x$ D: $(-\infty, \infty)$ R: $(0, \infty)$

Write the equation of each exponential function.



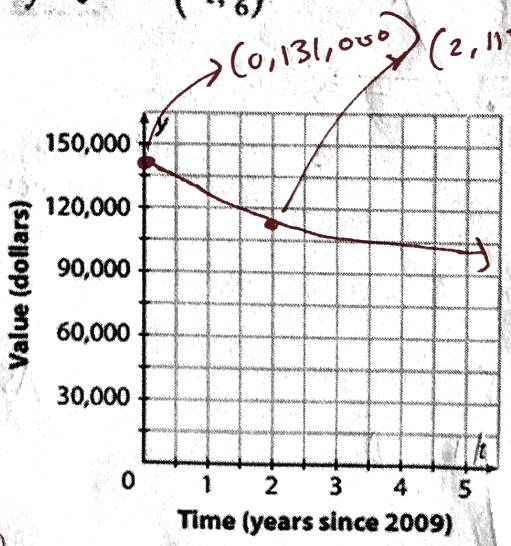
$y = 1 \cdot 4^x$



$y = 1 \cdot 6^x$

A house is losing value at a rate of 5.4% per year. In 2009, the house was worth \$131,000. Find the value of the house in 2019.

$f(t) = 131{,}000(.946)^t$



Find the average rate of change on the interval [0, 2]. → x values

(0, 131,000)
(2, 117,234)

$\frac{117{,}234 - 131{,}000}{2 - 0} =$

-6883

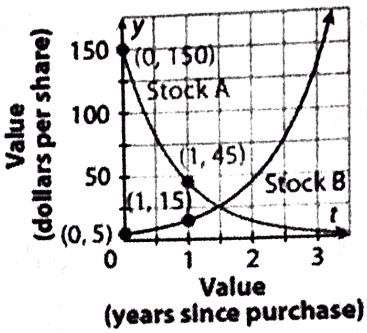
For the function $f(x) = 6(0.8)^x$ - find the average rate of change on the interval $[4, 8]$.

(4, 2.4576) (8, 1.00663296)

≈ -0.36

Graphing Exponentials Homework (Day 4)

1. The graph shows the value of two different shares of stocks over the period of 4 years since they were purchased. The values have been changing exponentially. Use the graphs provided to write the equations of the functions. Then describe and compare the behaviors of both functions.

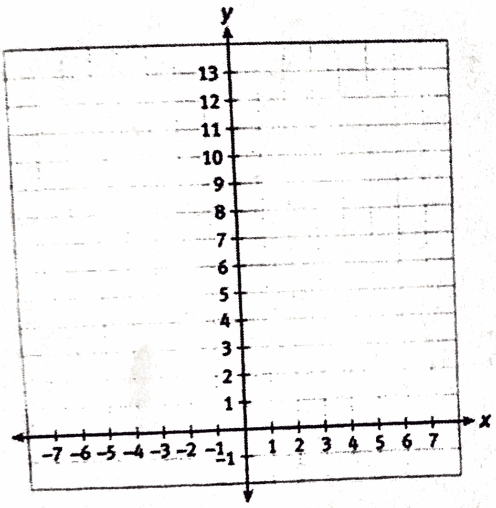


2. **Explain the Error** A student was asked to find the value of a $2500 item after 4 years. The item was depreciating at a rate of 20% per year. What is wrong with the student's work?

$2500(0.2)^4$

$4

3. **Make a Conjecture** The value of a certain car can be modeled by the function $y = 18000(0.76)^t$, where t is time in years. Will the value of the function ever be 0?



4. $f(x) = 3(2)^{x-2}$

a. Graph the parent function (include the asymptote).

How is the parent function transformed?

b. Graph the transformation (include the asymptote).

c. Change $f(x) = 3(2)^{x-2}$ to be in the form $f(x) = a \cdot b^x$ to highlight the y-intercept of the transformed function.

5. A house in Nashville is worth $250,000 in 2018 and is increasing in value at a rate of 8.5% per year.

a. Write a function for this situation.

b. Find the average rate of change on the interval [0, 3].

c. What does this mean in terms of the situation?

Graphing Exponentials Homework (Day 4)

6. Match each function to a graph.

$$f(x) = 3^x, g(x) = 3^{x-1}, h(x) = 3^x - 1,$$
$$F(x) = -3^x, G(x) = 3^{-x}, H(x) = -3^{-x}.$$