

Writing Function Rules for Exponential Growth and Decay

Before: You graphed exponential growth and decay functions

SWBAT:

Write functions rules for exponential growth + Decay

The general form of an exponential function is $f(x) = ab^x$

The a value is also called the starting amount
when $x=0$ (y-intercept)

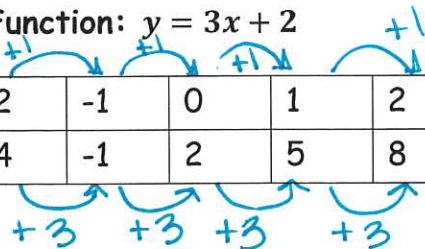
What do the b values mean....

for growth? b value is greater than 1 ($b > 1$)

for decay? b value is a fraction and between 0 and 1
($0 < b < 1$)

Linear Function: $y = 3x + 2$

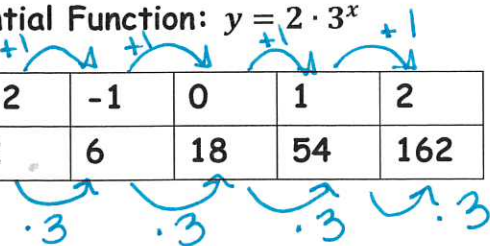
x	-2	-1	0	1	2
y	-4	-1	2	5	8



$f(x) = ab^x$

Exponential Function: $y = 2 \cdot 3^x$

x	-2	-1	0	1	2
y	2	6	18	54	162



A table is exponential if you multiply by the same number each time.

$a = 18$
 $b = 3$ $f(x) = 18 \cdot 3^x$

Examples (From a table): Tell whether the function is exponential. If so, write a rule for the function

x	-2	-1	0	1	2
y	2	4	8	16	32

.2 .2 .2 .2
exponential
 $f(x) = 8 \cdot 2^x$

x	-2	-1	0	1	2
y	16	10	4	-2	-8

-6 -6 -6 -6
linear

$a=2$
 $b=3$

x	-2	-1	0	1	2
y	$\frac{2}{9}$	$\frac{2}{3}$	2	6	18

.3 .3 .3 .3
exponential $f(x) = 2 \cdot 3^x$

x	-2	-1	0	1	2
y	125	25	5	1	$\frac{1}{5}$

$\cdot \frac{1}{5} \cdot \frac{1}{5} \cdot \frac{1}{5} \cdot \frac{1}{5}$
exponential $f(x) = 5 \cdot \left(\frac{1}{5}\right)^x$

Steps:

- 1.) Find the a value - the a value is where $x=0$ also known as the y intercept $(0,a)$.
- 2.) Pick two consecutive points on the line.
- 3.) Draw a box chart and put the points in order (you should have 3 points in the chart)
- 4.) Find the multiplier - b value
 - a. Ask yourself: (y value) times what number gives me (the next y value)?
- 5.) Plug a and b into the form $f(x) = a \cdot b^x$

Example 1: Write an equation for the function:

- 1.) find the a value: $a = 5$
- 2.) Pick 2 points on the graph:

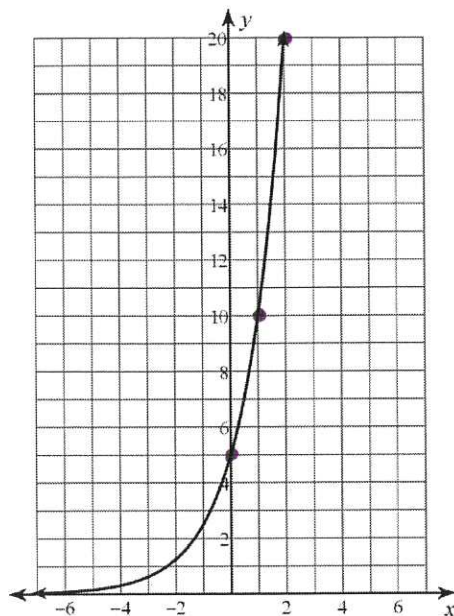
x	0	1	2
y	5	10	20

- 3.) find the multiplier (b): 10 times what number gives me 20?

$$\frac{10b}{10} = \frac{20}{10}$$

$$b = 2$$

- 4.) Plug:
 $f(x) = 5 \cdot 2^x$



Example 2: Write an equation for the function:

- 1.) $a = 2$

- 2.)

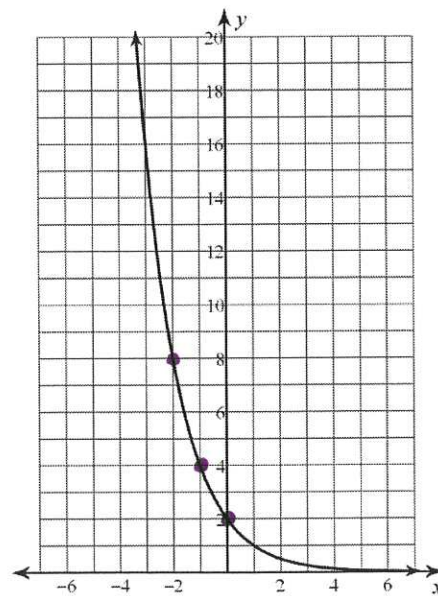
x	-2	-1	0
y	8	4	2

- 3.) find b: 8 times what # gives me 4?

$$\frac{8b}{8} = \frac{4}{8}$$

$$b = \frac{1}{2}$$

- 4.) $f(x) = 2 \cdot \left(\frac{1}{2}\right)^x$



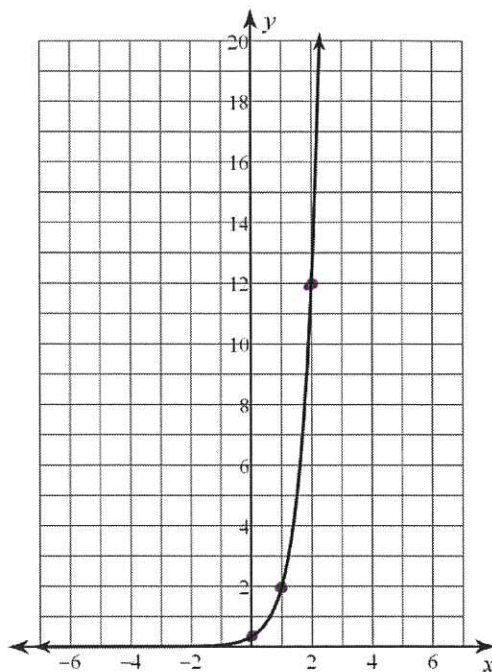
Example 3: Write an equation for the function:

1.) find $a = \frac{1}{3}$

2.) Plot 2 points

3. Draw box

x	0	1	2
y	$\frac{1}{3}$	2	12



4. find the multiplier (b)

2 times what # gives me 12?

$$\frac{2b}{2} = \frac{12}{2}$$

$$b = 6$$

$$f(x) = \frac{1}{3} \cdot 6^x$$