

Advanced Algebra w/ Trig

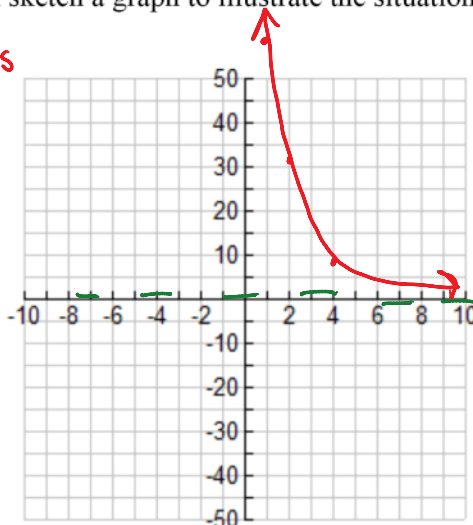
7.2 Exponential Decay

Name: _____

1. In order to represent Team USA in the Winter Olympics in Sochi, American skiers must qualify for the games. There are 128 skiers to begin with and after each round of qualifiers, half of the skiers are eliminated.

- a. Complete the table and then sketch a graph to illustrate the situation. Then write an equation to represent the function.

x → round	$f(x)$ → # of skiers
0	128
1	64
2	32
3	16
4	8



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

$$y = 128 \cdot \left(\frac{1}{2}\right)^x$$

- b. How many skiers will there be after five rounds of qualifiers?

5	4
6	2
7	1
8	1/2

$$y = 128 \left(\frac{1}{2}\right)^5 = 4 \text{ skiers}$$

Recall the exponential function formula:

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

↑ y-int. ↓ multiplier

2. Write the equations of the following exponential functions represented in tables.

a.

x	y
0	64
1	32
2	16
3	8
4	4
5	2

$a = 64$

$\frac{1}{2}$

Equation:

$$y = 64 \left(\frac{1}{2}\right)^x$$

b.

x	y
-3	6400
-2	1600
-1	400
0	100
1	25
2	6.25

$\frac{1}{4}$

Equation:

$$y = 100 \left(\frac{1}{4}\right)^x$$

c.

x	y
-2	10.368
-1	8.64
0	7.2
1	6
2	5
3	4.167

Equation:

$$y = 7.2 (.833)^x$$

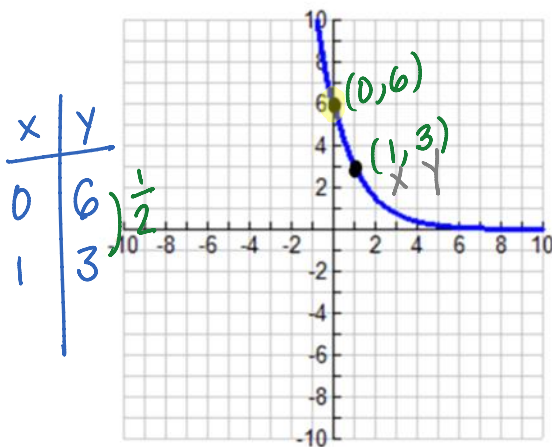
$$y = 64\left(\frac{1}{2}\right)^x$$

$$y = 7.2(.833)^x$$

GENERALIZING EXPONENTIAL FUNCTIONS: $y = a \cdot b^x$

growth $b > 1$ decay $0 < b < 1$

3. Find the function of the exponential based on the graph below.



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

$$3 = 6 \cdot b^1$$

$$\frac{3}{6} = \frac{6b}{6}$$

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

$$y = 6\left(\frac{1}{2}\right)^x$$

4. Find a function of the exponential based on the table below.

x	-6	-5	-4	-3	-2	-1	0
f(x)	64	16	4	1	0.25	$\frac{1}{16}$	$\frac{1}{64}$

Arrows indicate the relationship between consecutive x-values and f(x) values: $\frac{1}{4}$ from 64 to 16, $\frac{1}{4}$ from 16 to 4, $\frac{1}{4}$ from 4 to 1, $\frac{1}{4}$ from 1 to 0.25, $\frac{1}{4}$ from 0.25 to $\frac{1}{16}$, and $\frac{1}{4}$ from $\frac{1}{16}$ to $\frac{1}{64}$.

$$y = \frac{1}{64} \left(\frac{1}{4}\right)^x$$

5. Determine if the following functions represent exponential growth or decay.

a. $y = 0.2\left(\frac{3}{4}\right)^x$

D

b. $y = (1.2)^x$

G

c. $y = 3 \cdot \left(\frac{5}{4}\right)^x$

G

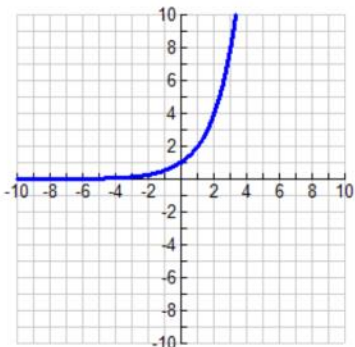
d. $y = \left(\frac{3}{2}\right)^{-x} = \left(\frac{2}{3}\right)^x$

decay

6. Match the exponential function with its corresponding graph below.

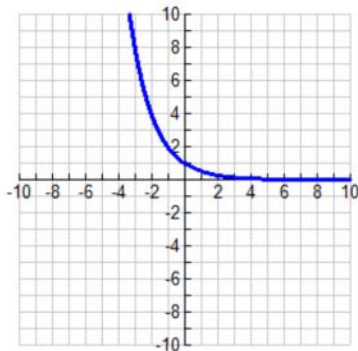
a. $f(x) = 2^x$ I

$y = 1 \cdot 2^x$ I.



b. $g(x) = -2^x$ III.

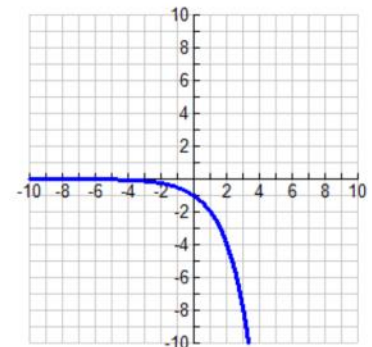
II.

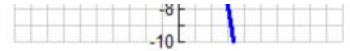
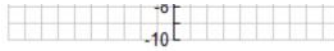
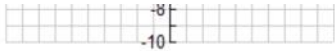


c. $h(x) = \frac{1}{2}^x$ II.

d. $j(x) = \frac{1}{2}^{-x}$ I.

III. 2^x





7. You purchase a cell phone for \$125. The value of the cell phone decreases by about 20% annually. How much would the cell phone be worth after 6 years? Will the value ever be \$0? *no!*

$$y = a \cdot b^x \quad \text{or} \quad y = a(1-r)^x$$

$$y = 125(1-.2)^x$$

$$y = 125(0.8)^x$$

$$y = 125(0.8)^6$$

$$y = \boxed{\$32.77}$$