

## Exponential Function- AGAIN

A function of the form:  $y = ab^x$   
 where  $a \neq 0$ ,  $b > 0$ , and  $b \neq 1$   
 It is a nonlinear function.

### Exponential Growth (8.5)

$y = ab^x$  where  $a > 0$  and  $b > 1$   
 (rises from left to right)

### Exponential Decay (8.6)

$y = ab^x$  where  $a > 0$ , and  $0 < b < 1$   
 (falls from left to right)

Tell whether the table represents an exponential function. If so, write a rule.

$y = ab^x$   
 function change

x	-2	-1	0	1	2
y	25	5	1	1/5	1/25

$\times \frac{1}{5}$   $\times \frac{1}{5}$

1.

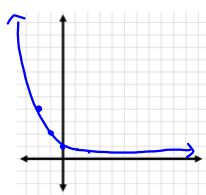
Change:

$a = 1$   
 $b = \frac{1}{5}$

So...  $y = 1 \cdot \frac{1}{5}^x$

Graph the function; identify its domain and range

2.  $y = (1/2)^x$      $D: \mathbb{R}$      $R: y > 0$



x	-2	-1	0	1	2
y	4	2	1	1/2	1/4

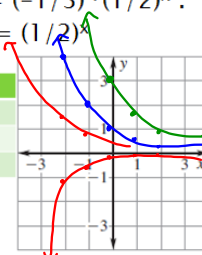
$(\frac{1}{2})^2$      $(2)^2$   
 $(\frac{1}{2})^{-1}$   
 $(\frac{1}{2})^0$   
 $(\frac{1}{2})^1$   
 $(\frac{1}{2})^2$

## Multiple Graphs

3. Graph  $y = 3 \cdot (1/2)^x$  and  $y = (-1/3) \cdot (1/2)^x$ .  
 Compare with the graph of  $y = (1/2)^x$

x	-2	-1	0	1	2
$y = (1/2)^x$	4	2	1	1/2	1/4
$y = 3(1/2)^x$	12	6	3	1.5	3/4
$y = (-1/3)(1/2)^x$	-4/3	-2/3	-1/3	-1/6	-1/12

Vertical stretch  
 Reflected over x-axis  
 Vertical stretch

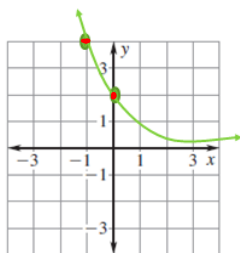


## Exponential Growth or Decay

Tell whether the graph represents exponential growth or decay. Then write a rule for the function.

4. a. Growth or decay?

b.  $a = 2$   
 find  $b = \frac{1}{2}$   
 $y = 2(\frac{1}{2})^x$



## Exponential Decay Model

$y = a(1-r)^t$  where  $a$ =initial amount,  
 $r$ =decay rate,  $t$ =time

5. You purchase a cell phone for \$125. The value of the phone decreases by 20% annually.

- Write a function that models the value of the cell phone over time.
- Use the function to predict the value of the phone after 3 years.

$y = 125(1-0.2)^x$   
 $y = 125(0.8)^3$   
 $y = 125(0.512)$   
 $y = \$64$