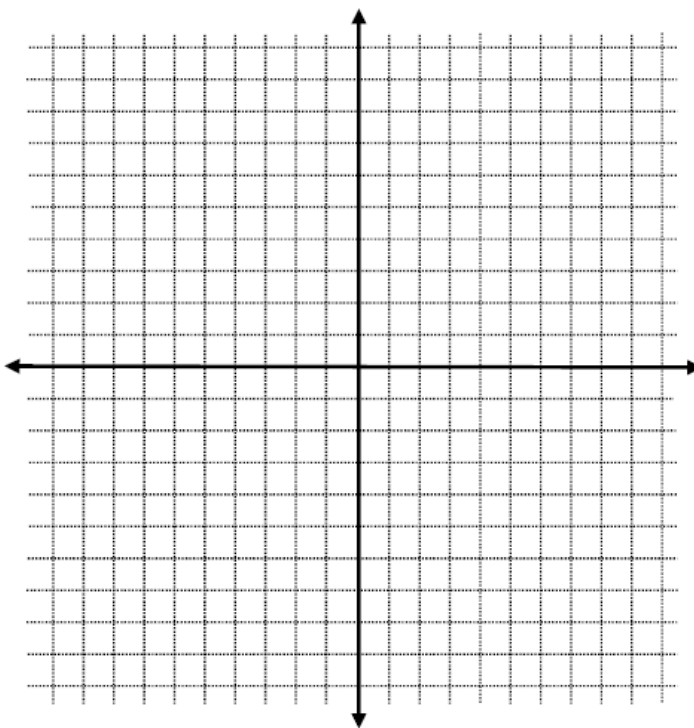


PRACTICE:

Graph the functions

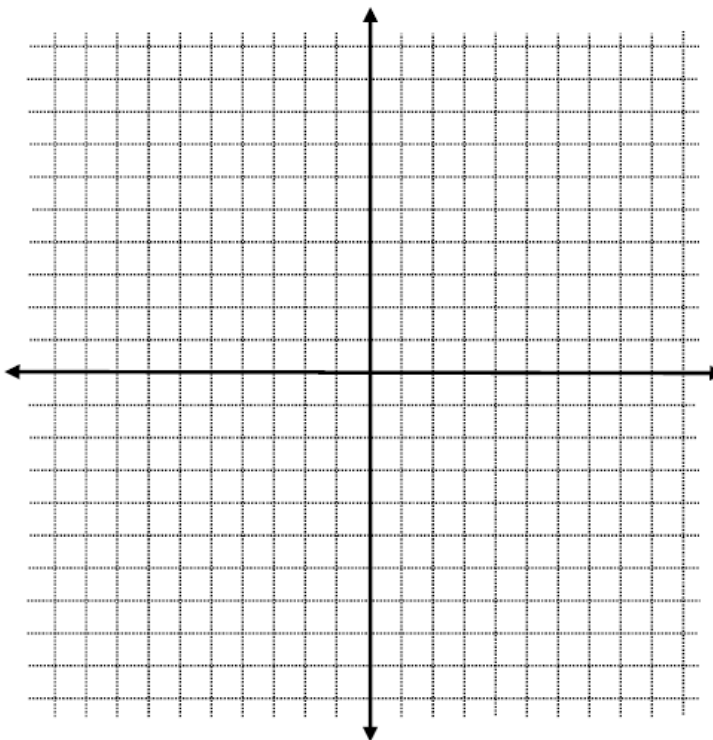
1. $f(x) = 4^x$

x	y
-3	
-2	
-1	
0	
1	
2	
3	

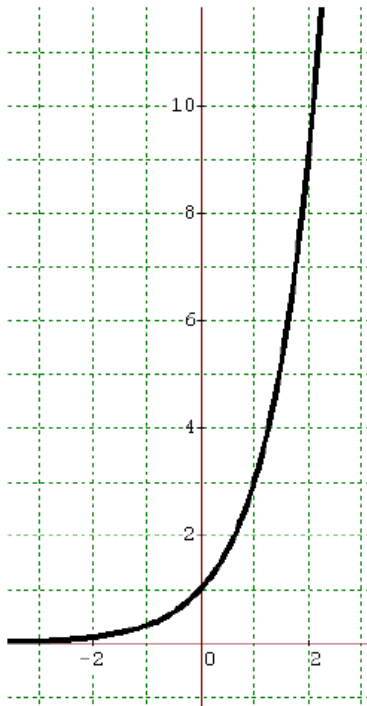


2. $f(x) = 1.25^x$

x	y
-3	
-2	
-1	
0	
1	
2	
3	



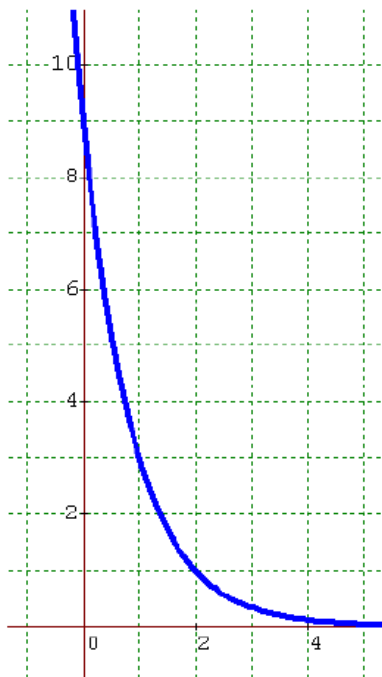
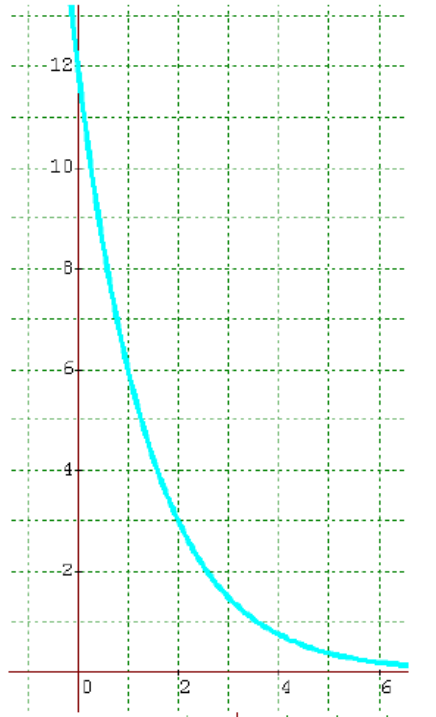
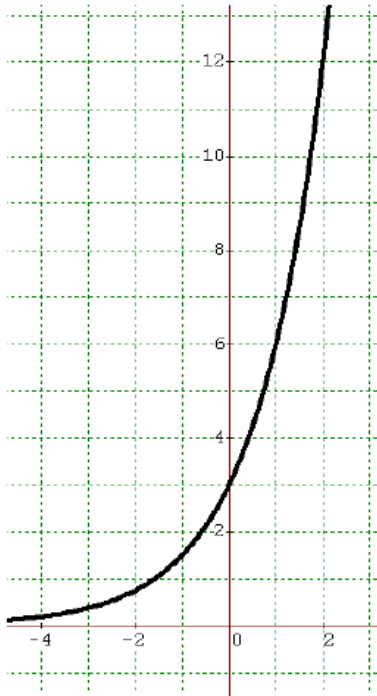
Determine the equation of equation of each exponential function below



PROCESS

- 1) Locate 3-4 definite points on the graph, circle and name them.
- 2) On your calculator, press STAT - EDIT
- 3) Enter all "x" values into L1 and all "y" values into L2
- 4) Press STAT - CALC - choose 0:ExpReg. Hit enter all the way through until the screen changes
- 5) Copy the equation onto your paper and substitute the values of "a" and "b"

Determine the equation of equation of each exponential function below



Exponential Growth and Decay

1] Given $y = 3^x$, evaluate y when $x = 3$.

2] Given $y = 3^x$, evaluate y when $x = -2$.

3] Which ordered pair represents the y -intercept for the function $y = 2^x$?

a) (0,0)

b) (0, 1)

c) (0, 2)



4] The graph of $y = 2^x$ lies in which Quadrants?

a) I, II

b) I, III

c) I, IV



5] The graph of $y = 2^x$ contains which of these points?

a) (0,0)

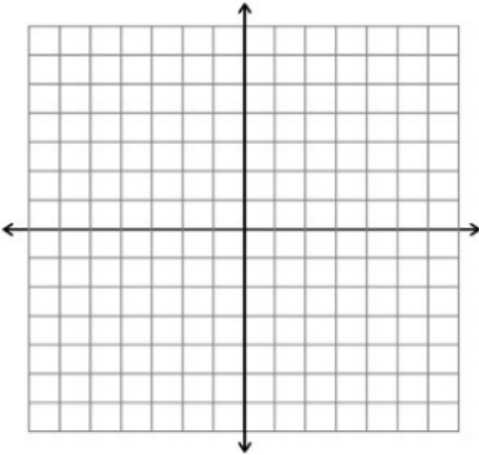
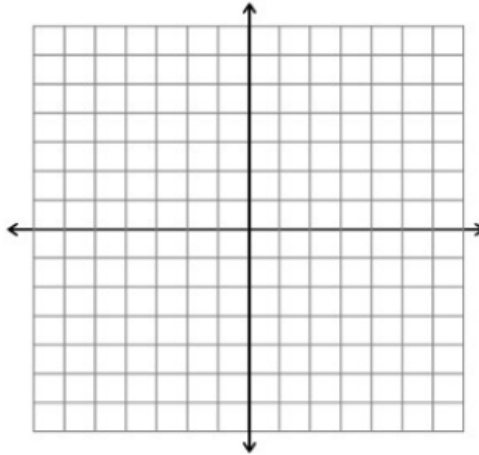


b) (0, 1)

c) (0, 2)



Exponential Functions

$y = a \cdot b^x$

Exponential Growth	Exponential Decay																				
<p>Graph: $y = 2^x$</p> 	<p>Graph: $y = 0.5^x$</p> 																				
 <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <thead> <tr> <th style="width: 50px; text-align: center;">x</th> <th style="width: 50px; text-align: center;">y</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">-1</td> <td></td> </tr> <tr> <td style="text-align: center;">0</td> <td></td> </tr> <tr> <td style="text-align: center;">1</td> <td></td> </tr> <tr> <td style="text-align: center;">2</td> <td></td> </tr> </tbody> </table>	x	y	-1		0		1		2		 <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <thead> <tr> <th style="width: 50px; text-align: center;">x</th> <th style="width: 50px; text-align: center;">y</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">-1</td> <td></td> </tr> <tr> <td style="text-align: center;">0</td> <td></td> </tr> <tr> <td style="text-align: center;">1</td> <td></td> </tr> <tr> <td style="text-align: center;">2</td> <td></td> </tr> </tbody> </table>	x	y	-1		0		1		2	
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-1																					
0																					
1																					
2																					
x	y																				
-1																					
0																					
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2																					
<p>Growth $b > 1$</p>	<p>Decay $0 \leq b \leq 1$</p>																				

Exponential Growth vs. Decay:

Example:

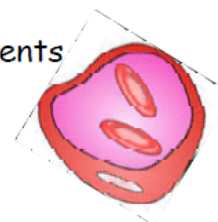
Would the graph of $y = 0.5^x$ show exponential growth or exponential decay?

Example:

Would the graph of $y = 1.5^x$ show exponential growth or exponential decay?

Exponentials in the Real World?

Many real world phenomena can be modeled by functions that describe how things grow or decay as time passes. Examples of such phenomena include the studies of populations, bacteria, the AIDS virus, radioactive substances, electricity, temperatures and credit payments



Exponential Growth:	Exponential Decay:
$y = a(1 + r)^x$	$y = a(1 - r)^x$
Ingredients: a = initial amount before measuring growth/decay r = growth/decay rate (often a percent) ! IMPORTANT → convert to a decimal ! x = number of time intervals that have passed (years)	

Growth Example:

A bank account balance, b , for an account starting with s dollars, earning an annual interest rate, r , and left untouched for n years can be calculated as $b = s(1 + r)^n$ (an exponential growth formula). Find a bank account balance to the *nearest dollar*, if the account starts with \$100, has an annual rate of 4%, and the money left in the account for 12 years.

Decay Example:

Daniel's Print Shop purchased a new printer for \$35,000. Each year it depreciates (loses value) at a rate of 5%. What will its approximate value be at the end of the fourth year?

- A) \$33,250.00 B) \$30,008.13 C) \$28,507.72 D) \$27,082.33

1] Cassandra bought an antique dresser for \$500. If the value of her dresser increases 6% annually, what will be the value of Cassandra's dresser at the end of 3 years to the nearest dollar?

2] The value, y , of a \$15,000 investment over x years is represented by the equation, $y = 15000(1.2)^{\frac{x}{3}}$. What is the profit (interest) on a 6-year investment?

- 1) \$6,600
- 2) \$10,799
- 3) \$21,600
- 4) \$25,799

3] The New York Volleyball Association invited 64 teams to compete in a tournament. After each round, half of the teams were eliminated. Which equation represents the number of teams, t , that remained in the tournament after r rounds?

- 1) $t = 64(r)^{0.5}$
- 2) $t = 64(-0.5)^r$
- 3) $t = 64(1.5)^r$
- 4) $t = 64(0.5)^r$

4] In a science fiction novel, the main character found a mysterious rock that decreased in size each day. The table below shows the part of the rock that remained at noon on successive days.

Day	Fractional Part of the Rock Remaining
1	1
2	$\frac{1}{2}$
3	$\frac{1}{4}$
4	$\frac{1}{8}$

Which fractional part of the rock will remain at noon on day 7?

- 1) $\frac{1}{128}$
- 2) $\frac{1}{64}$
- 3) $\frac{1}{12}$
- 4) $\frac{1}{14}$

Exponential Growth and Decay

Growth:

$$y = a(1 + r)^x$$

Decay:

$$y = a(1 - r)^x$$

a = initial **amount** before measuring growth/decay

r = **growth/decay rate** (often a percent)

x = number of **time** intervals that have passed

1) Given the equation $y = 225(1.23)^x$

- a) Does this equation represent growth or decay?
- b) What is the rate of growth or decay?
- c) What is the initial value?
- d) Evaluate for $x = 2$

2) Given the equation $y = 154(1.06)^x$

- a) Does this equation represent growth or decay?
- b) What is the rate of growth or decay?
- c) What is the initial value?

3) Given the equation $y = 35(0.57)^x$

- a) Does this equation represent growth or decay?
- b) What is the rate of growth or decay?
- c) What is the initial value?
- d) Evaluate for $x = 3$

For each word problem, write the exponential equation to model the situation.

4) A zombie infection in Yonkers Public Schools grows by 15% per hour. The initial group of zombies was a group of 4 freshmen. How many zombies are there after 6 hours.

5) Ryan is saving for his college tuition. He has \$2,550 in a savings account that pays 6.25% annual interest.

6) Cars depreciate in value over time. A used car was purchased for \$12,329 this year. Each year the car's value decreases 8.5%.

7) Jeremiah owns a side business detailing cars. His first year he made \$10,500 and each of the following years his profit increased 9%.

8) There are 128 teams entered in a basketball tournament. Half of the teams are eliminated each round. How many teams are left after 4 rounds?

9) Bacteria in a dirty glass triple every year. If there are 25 bacteria to start, how many are in the glass after 1 day?

10) The population of a city with 750,000 is devastated by an unknown virus that kills 20% of the population per day. How many people are left after a week?

11) There are 1,750,235 acres of forest in northwestern Idaho. One-half percent of the forest is destroyed by pollution every year. How many acres are left after 65 years?

12) A new iPhone is estimated to lose 25% of its value every six months after its purchase. How much is the value of an iPhone that costs \$799 after someone has owned it for 2 years?

13) A recent college grad accepts a job at Google Inc. The job has a salary of \$50,000 and is guaranteed an annual pay increase of 3%. What will their salary be after 7 years?