

Exponential Functions

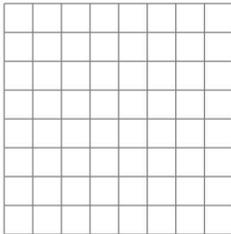
1) Complete each table for the exponential function. In each table, what do you notice about the values of x ? What do you notice about the values of y ?

x	$y = 16(2)^x$
0	
1	
2	
3	
4	
5	

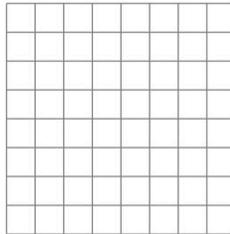
x	$y = 16(2)^x$
0	
2	
4	
6	
8	
10	

5. Sketch the graph of each exponential function. Does each graph have the characteristics you described in Question 4? Explain your reasoning.

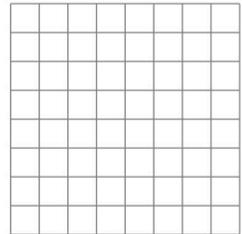
a. $y = 2^x$



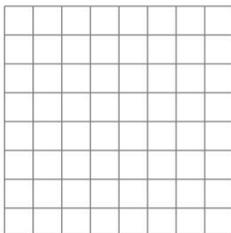
b. $y = 2(3)^x$



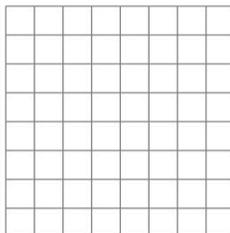
c. $y = 3(1.5)^x$



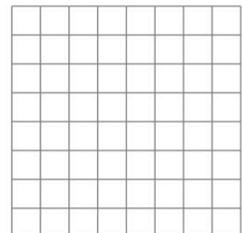
d. $y = \left(\frac{1}{2}\right)^x$



e. $y = 3\left(\frac{1}{2}\right)^x$



f. $y = 2\left(\frac{3}{4}\right)^x$



In Exercises 1–3, determine whether the equation represents an exponential function. Explain.

1. $y = -6^x$

2. $y = 5(1)^x$

3. $y = 7x^3$

In Exercises 4 and 5, determine whether the table represents an exponential function. Explain.

1.

x	y
1	8
2	4
3	2
4	1

2.

x	y
1	3
2	7
3	11
4	15

3.

x	y
-1	12
0	9
1	6
2	3

4.

x	y
-1	0.125
0	0.5
1	2
2	8

Half-Life

- 1) A hospital prepared a 100-mg supply of technetium-99m, which has a half-life of 6 hours. Use the table below to help you understand how much of technetium-99m is left at the end of each 6-hour interval for 36 hours. Use this to help write an exponential function to find the amount of technetium-99m that remains after 75 hours.

The amount of technetium-99m is reduced by one half each 6 hours as shown in the table below. Fill in the missing information in the table and in the equation below.

Number of 6-hour Intervals	0	1	2	3	4	5	6
Number of Hours Elapsed	0	6		18	24		36
Amount of Technetium-99m (mg)	100	50	25			3.13	

The amount of technetium-99m is an exponential function of the number of half-lives. The initial amount is ____ mg. The decay factor is _____. One half-life equals 6 hours.

Write an explicit equation if x = the number of 6-hour intervals. $Y =$ _____

If x = the number of hours elapsed, then the number of 6-hour intervals (of half-lives) $= \frac{1}{6}x = \frac{x}{6}$.

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

After 75 hours, about _____ mg of technetium-99 remains.

- 2) Arsenic-74 is used to locate brain tumors. It has a half-life of 17.5 days. Write an exponential decay function for a 90-gram sample. Use the function to find the amount remaining after 6 days. (Hint: Make a table to help you understand the data.)

- 3) Phosphorus-32 is used to study a plant's use of fertilizer. It has a half-life of 14.3 days. Write the exponential decay function of a 50-mg sample. Find the amount of phosphorus-32 remaining after 84 days.

- 4) Iodine-131 is used to find leaks in water pipes. It has a half-life of 8.14 days. Write the exponential decay function for a 200-mg sample. Find the amount of iodine-131 remaining after 72 days.

- 5) Some radioactive ore which weighed 20 grams 200 years ago has been reduced to 12 grams today.
 - a. Use exponential regression on your calculator to write an exponential decay function in order to find the solution.
 - b. Based on your equation, what is the half-life of this radioactive ore?
 - c. Based on your half-life, write another exponential equation for the data in which the base of the exponent is $\frac{1}{2}$.
 - d. How much will be left in 400 years?