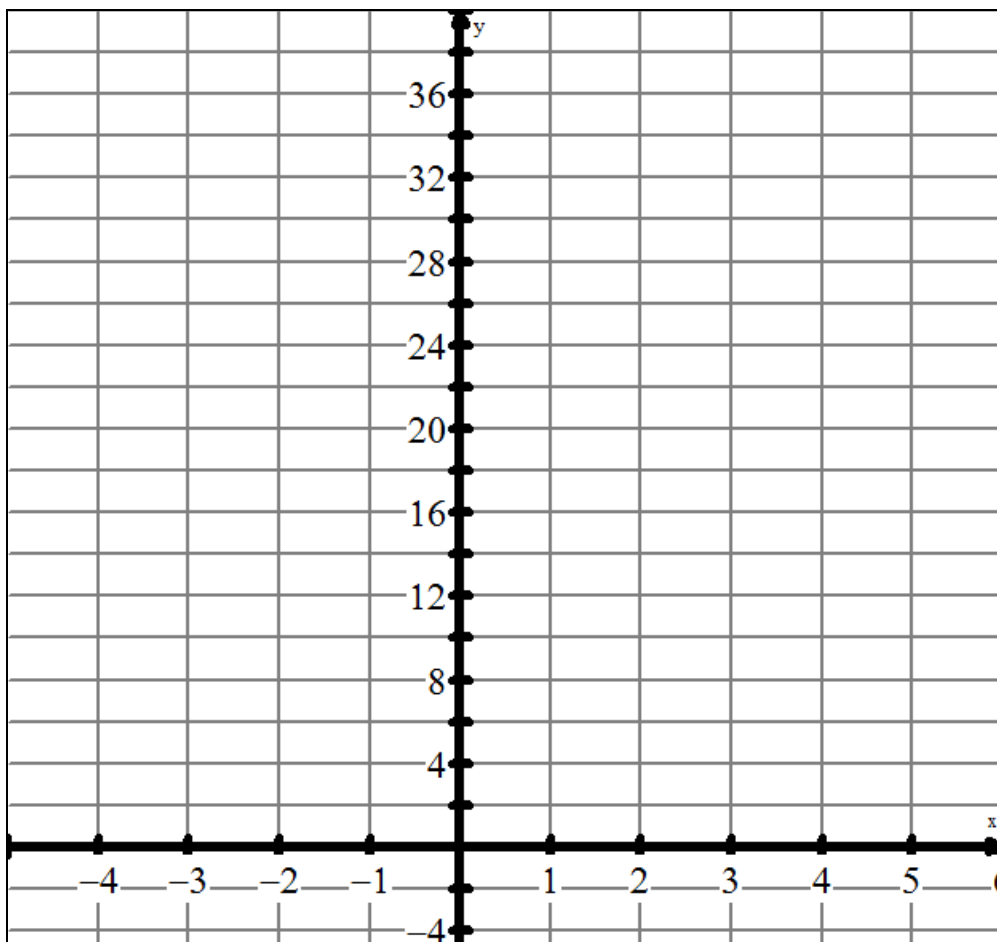


## (A) Lesson Objectives

- a. generate graphs and data tables of Exp Fcns using TI-84
- b. analyze the graphs & data to identify key features on the graphs including the familiar intercepts, domain, range, and the new concepts of increase/decrease, asymptotes
- c. understand the role of the parameters a,b in the equation  $f(x) = ab^x$

## (B) Graphs of Exponential Functions - Investigation #1

- a. Use your TI-84 to graph the function  $f(x) = 2^x$ . Then sketch the graph on the attached grid. Include a data table as well.



x	f(x)
-5	
-4	
-3	
-2	
-1	
0	
1	
2	
3	
4	
5	

NEW IDEA: Asymptote →

- b. Is the graph of the function INCREASING or DECREASING. Explain your answer.
- c. Using your table on the TI-84, as the value of  $x$  gets very large, what happens to the values (output) of  $2^x$ ?
- d. Using your table on the TI-84, as the value of  $x$  gets very small, what happens to the value of  $2^x$ ?
- e. Will the value of  $2^x$  ever equal 0? Explain your answer.
- f. Are there any values of  $x$  that would make  $2^x$  undefined? Explain your answer.
- g. State the domain and range for  $f(x) = 2^x$ .
- i. Domain:
- ii. Range:
- h. At what RATE does the function  $f(x) = 2^x$  increase. Explain how you know.

### (C) Graphs of Exponential Functions - Investigation #2

a. Use your TI-84 to graph the function  $g(x) = 3^x$ . Then sketch the graph on the attached grid AS WELL AS graphing  $f(x) = 2^x$ . Prepare a data table for  $g(x)$ .

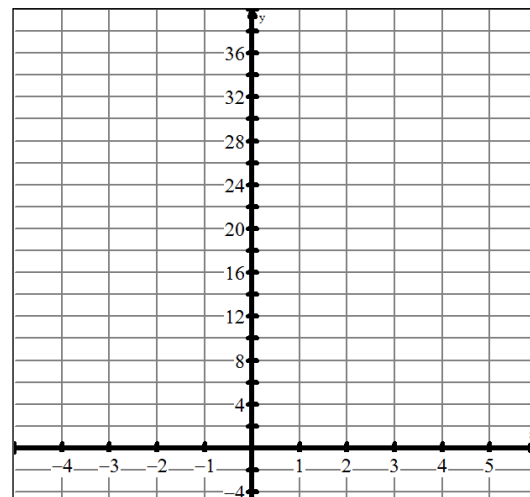
b. Is the graph of the function INCREASING or DECREASING. Explain your answer.

c. At what RATE is the function changing? Explain your answer.

d. How does the graph of  $y = 3^x$  compare to the graph of  $y = 2^x$ ?

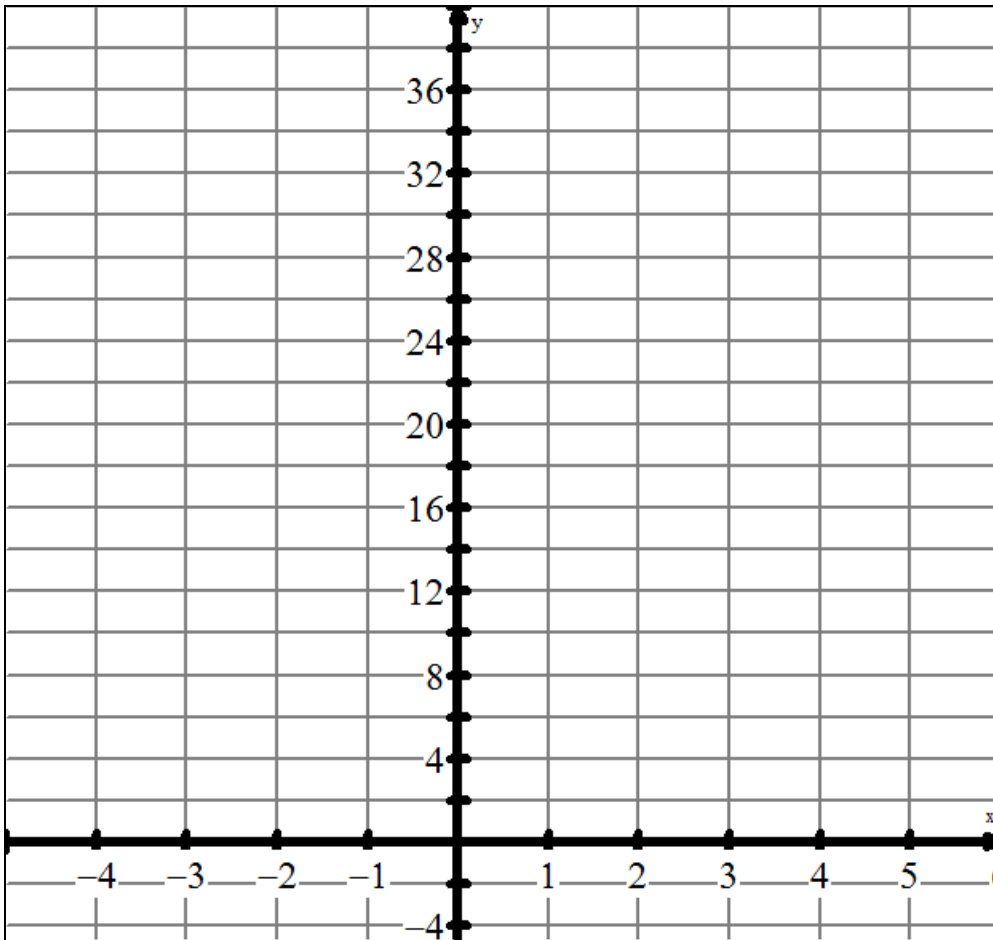
e. Given the general form  $f(x) = b^x$  (where  $b > 1$ ), what effect does increasing the value of "b" have upon the graph? GRAPHICALLY, test your conjecture.

f. What effect does decreasing the value of "b" have upon the graph? GRAPHICALLY, test your conjecture.



(D) Graphs of Exponential Functions - Investigation #3

- a. Use your TI-84 to graph the function  $f(x) = 0.5^x$ . Then sketch the graph on the attached grid. Include a data table as well.



x	f(x)
-5	
-4	
-3	
-2	
-1	
0	
1	
2	
3	
4	
5	

NEW IDEA → Asymptote

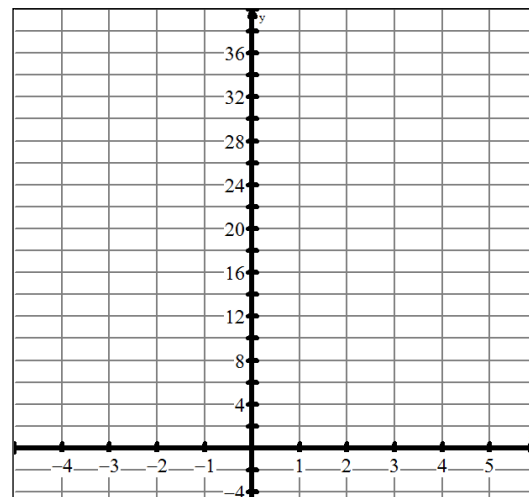
# Graphs of Exponential Functions | Lesson 14

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- b. Is the graph of the function INCREASING or DECREASING. Explain your answer.
- c. Using the TI-84, as the value of  $x$  gets very large, what happens to the values (output) of  $0.5^x$ ?
- d. Using your table on the TI-84, as the value of  $x$  gets very small, what happens to the value of  $0.5^x$ ?
- e. Will the value of  $0.5^x$  ever equal 0? Explain your answer.
- f. Are there any values of  $x$  that would make  $0.5^x$  undefined? Explain your answer.
- g. State the domain and range for  $f(x) = 0.5^x$ .
- i. Domain:
- ii. Range:
- h. How does the graph of  $f(x) = (0.5)^x$  compare to the graph of  $f(x) = 2^x$ ?

(E) Graphs of Exponential Functions - Investigation #4

a. Use your TI-84 to graph the function  $g(x) = 0.8^x$ . Then sketch the graph on the attached grid AS WELL AS graphing  $f(x) = 0.5^x$ . Prepare a data table for  $g(x)$ .



b. Is the graph of the function INCREASING or DECREASING. Explain your answer.

c. At what RATE is the function changing? Explain your answer.

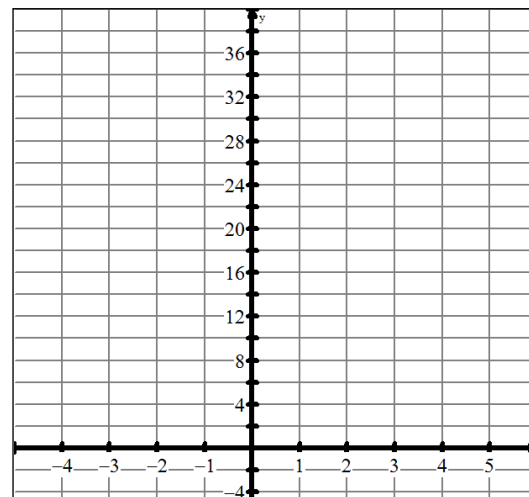
d. How does the graph of  $y = 0.8^x$  compare to the graph of  $y = 0.5^x$ ?

e. Given the general form  $f(x) = b^x$  (where  $0 < b < 1$ ), what effect does increasing the value of "b" have upon the graph? GRAPHICALLY, test your conjecture.

f. What effect does decreasing the value of "b" have upon the graph? GRAPHICALLY, test your conjecture.

### (F) Graphs of Exponential Functions - Investigation #5

a. Use your TI-84 to graph the function  $h(x) = 4 \times 2^x$ . Then sketch the graph on the attached grid AS WELL AS graphing  $f(x) = 2^x$ . Prepare a data table for  $h(x)$ .



b. Is the graph of the function INCREASING or DECREASING. Explain your answer.

c. At what RATE is the function changing? Explain your answer.

d. Using your table on the TI-84, as the value of  $x$  change, what are the values (output) of  $h(x)$  and  $f(x)$  DIFFERENT?

e. How does the graph of  $h(x) = 4 \times 2^x$  compare to the graph of  $f(x) = 2^x$ ?

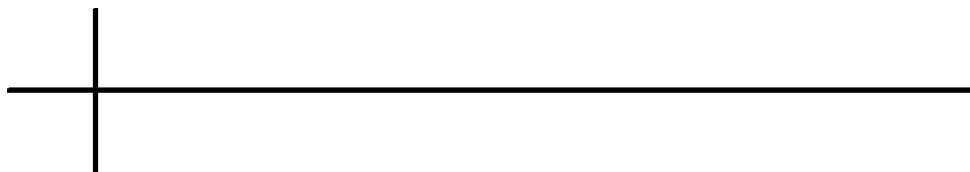
f. How would the graph of  $h(x) = \frac{1}{4} \times 2^x$  compare to the graph of  $f(x) = 2^x$ . GRAPHICALLY, test your conjecture.

g. What effect does decreasing the value of "a" have upon the graph? GRAPHICALLY, test your conjecture.

# Graphs of Exponential Functions | Lesson 14

(G) Applications of Exponential Graphs - The bacterial levels in the Pasig River start off with 4800 bacteria/mL and grow at a daily rate of 10% per day.

- Define your variables and then write an equation modeling this situation.
- State a reasonable domain and range for this context.
- Use your GDC to prepare a data table for this situation.



- Sketch the graph from your GDC, labeling the  $x_{\min}$ ,  $x_{\max}$ ,  $y_{\min}$ ,  $y_{\max}$ .

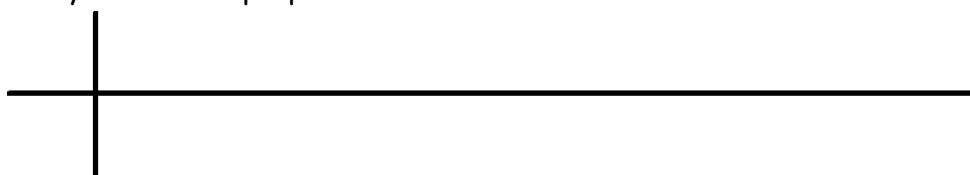


- How many bacteria/mL will there be after one WEEK?
- How many complete days will it take before the concentration of bacteria (bacteria/mL) first exceeds 20,000 bacteria/mL?

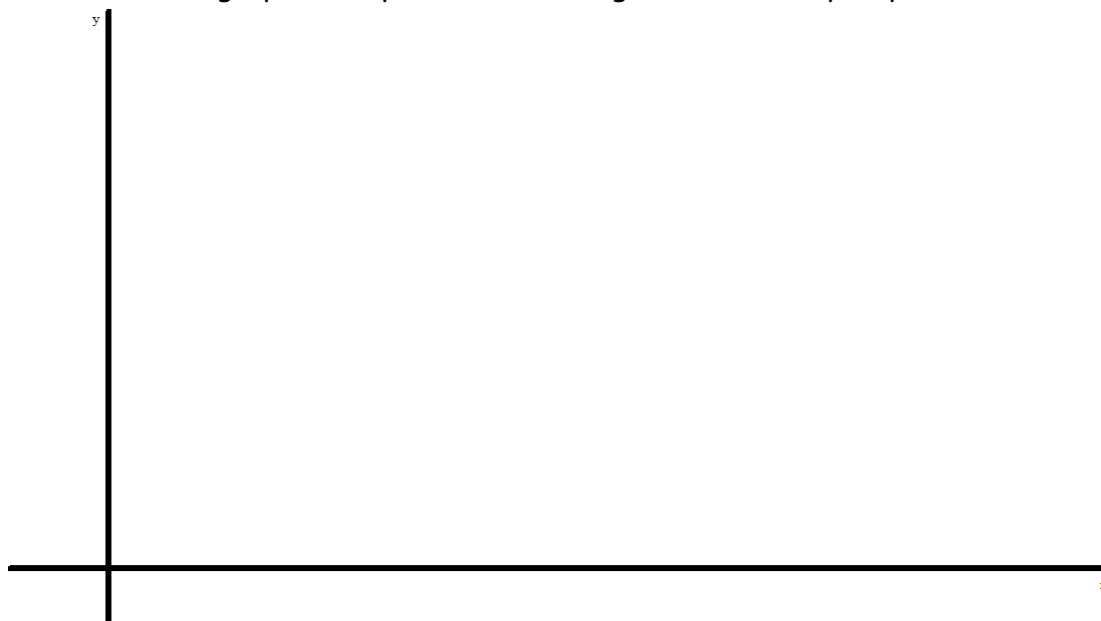


(H) Applications of Exponential Graphs - The pollution control filters at a Water Filtration Plant are effectively decreasing the bacterial levels in the Pasig River. After a rainstorm, the concentration of bacteria started at 10,000 bacteria/mL and is being decreased at a daily rate of 10% per day.

- a. Define your variables and then write an equation modeling this situation.
- b. State a reasonable domain and range for this context.
- c. Use your GDC to prepare a data table for this situation.



- d. Sketch the graph from your GDC, labeling the  $x_{\min}$ ,  $x_{\max}$ ,  $y_{\min}$ ,  $y_{\max}$ .



- e. How many bacteria/mL will there be after one WEEK?
- f. How many complete days will it take before the concentration of bacteria (bacteria/mL) first falls below the safety level of 2,000 bacteria/mL?

## **(I) Consolidation/Application of Key Ideas:**

a. Given the 2 functions  $f(x) = 5 \times 1.25^x$  and  $f(x) = 2 \times 1.75^x$

i. Which function is starting with a higher initial amount? Explain how you know.

ii. Which function is growing at a faster rate? Explain how you know.

iii. Where do they intersect?

b. LIMITATIONS of  $f(x) = ab^x$ .

i. What would happen if the value of  $b$  was negative?

ii. Explain WHY you think "it" would happen.

iii. Test your conjecture.

(J) HW →

<http://www.kutasoftware.com/FreeWorksheets/Alg2Worksheets/Graphing%20Exponential%20Functions.pdf>