Name ____ Date __________

6.1 Exponential Growth and Decay Functions
For use with Exploration 6.1

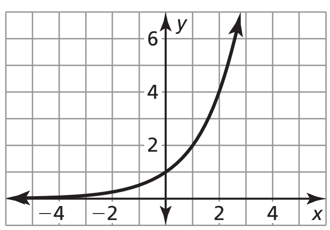
Essential Question What are some of the characteristics of the graph of an exponential function?

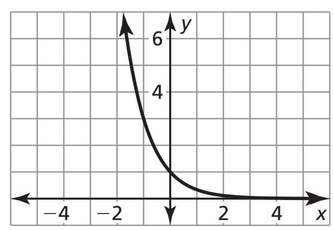
1 EXPLORATION: Identifying Graphs of Exponential Functions

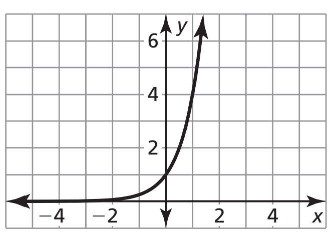
Work with a partner. Match each exponential function with its graph. Use a table of values to sketch the graph of the function, if necessary.

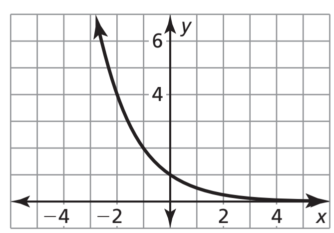
a. $f(x) = 2^x$ **b.** $f(x) = 3^x$ **c.** $f(x) = 4^x$

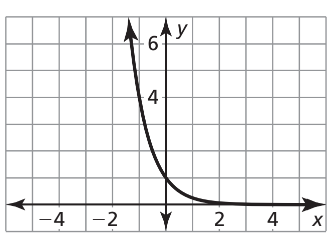
d. $f(x) = \left(\frac{1}{2}\right)^x$ **e.** $f(x) = \left(\frac{1}{3}\right)^x$ **f.** $f(x) = \left(\frac{1}{4}\right)^x$

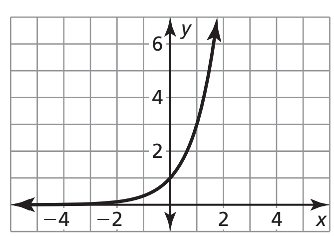
A.


B.


C.


D.


E.


F.


2 EXPLORATION: Characteristics of Graphs of Exponential Functions

Work with a partner. Use the graphs in Exploration 1 to determine the domain, range, and y-intercept of the graph of $f(x) = b^x$, where b is a positive real number other than 1. Explain your reasoning.

Communicate Your Answer

3. What are some of the characteristics of the graph of an exponential function?

4. In Exploration 2, is it possible for the graph of $f(x) = b^x$ to have an x-intercept? Explain your reasoning.

Name ______________________________ Date __________

6.1 Notetaking with Vocabulary
For use after Lesson 6.1

In your own words, write the meaning of each vocabulary term.

exponential function

exponential growth function

growth factor

asymptote

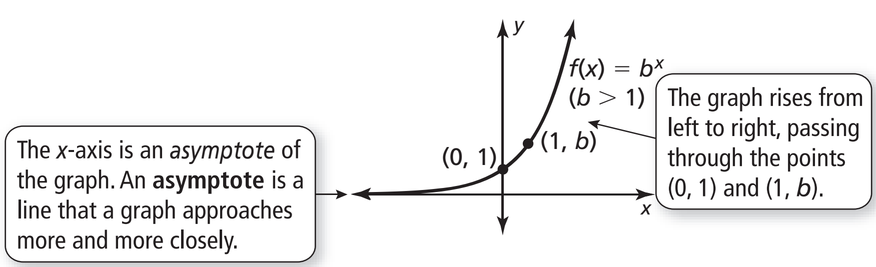
exponential decay function

decay factor

Core Concepts

Parent Function for Exponential Growth Functions

The function $f(x) = b^x$, where $b > 1$, is the parent function for the family of exponential growth functions with base b. The graph shows the general shape of an exponential growth function.



The domain of $f(x) = b^x$ is all real numbers. The range is $y > 0$.

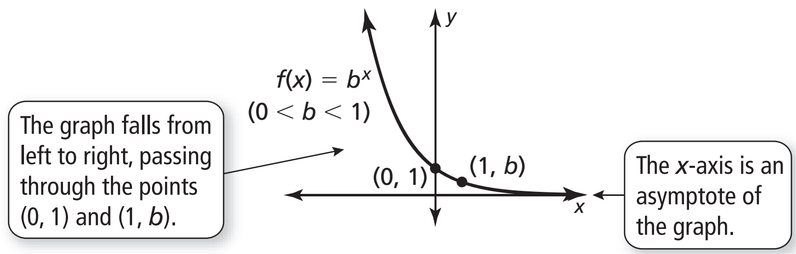
Notes:

Name____ Date__________

6.1 Notetaking with Vocabulary (continued)

Parent Function for Exponential Decay Functions

The function $f(x) = b^x$, where $0 < b < 1$, is the parent function for the family of exponential decay functions with base b. The graph shows the general shape of an exponential decay function.



The domain of $f(x) = b^x$ is all real numbers. The range is $y > 0$.

Notes:

Compound Interest

Consider an initial principal P deposited in an account that pays interest at an annual rate r (expressed as a decimal), compounded n times per year. The amount A in the account after t years is given by

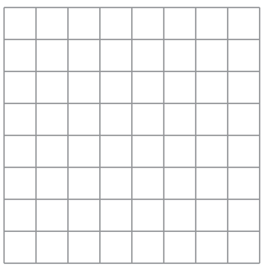
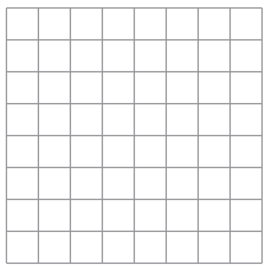
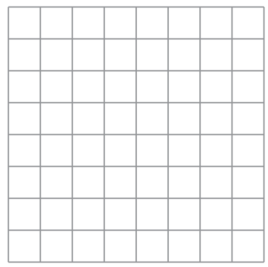
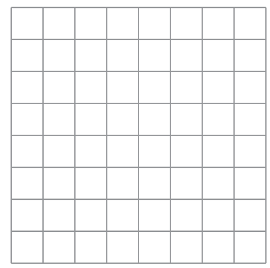
$$A = P\left(1 + \frac{r}{n}\right)^{nt}.$$

Notes:

Extra Practice

In Exercises 1–4, tell whether the function represents *exponential growth* or *exponential decay.* Then graph the function.

1. $y = \left(\frac{1}{12}\right)^x$ **2.** $y = (1.5)^x$ **3.** $y = \left(\frac{7}{2}\right)^x$ **4.** $y = (0.8)^x$

5. The number of bacteria y (in thousands) in a culture can be approximated by the model $y = 100(1.99)^t$, where t is the number of hours the culture is incubated.

a. Tell whether the model represents exponential growth or exponential decay.

b. Identify the hourly percent increase or decrease in the number of bacteria.

c. Estimate when the number of bacteria will be 1,000,000.

In Exercises 6 and 7, use the given information to find the amount *A* in the account earning compound interest after 5 years when the principal is $1250.

6. $r = 2.25\%$, compounded quarterly

7. $r = 1.25\%$, compounded daily