## UNDERSTAND ▶

9. **Make Sense and Persevere** An exponential function of form $f(x) = b^x$ includes the points (2, 16), (3, 64), and (4, 256). What is the value of b?

10. **Reason** Is $y = 0$ the asymptote of all functions of the form $f(x) = ab^x$? Explain your reasoning.

11. **Error Analysis** Describe and correct the error a student made in writing an exponential function.

Starting value = 6
Constant ratio = $\frac{1}{3}$
$f(x) = 6(\frac{1}{3})^x$
$f(x) = 2^x$ ✗

12. **Use Structure** The function $f(x) = 4\left(\frac{1}{2}\right)^x$ is graphed below. Describe how the graph would change for $a > 4$ and $1 < a < 4$.
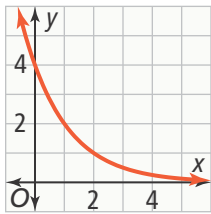
13. **Higher Order Thinking** The exponential function $f(x) = 2^x$ increases as x increases. Do all exponential functions behave this way? Use algebraic reasoning to support your answer.

14. **Use Structure** What happens to the graph of an exponential function when the initial value, a, is less than 0? Explain.

PRACTICE ▶

Identify the key features of each exponential function. SEE EXAMPLE 1

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

16. $f(x) = \left(\frac{1}{3}\right)^x$

Graph each exponential function. SEE EXAMPLE 2

17. $f(x) = 0.5^x$

18. $f(x) = 6^x$

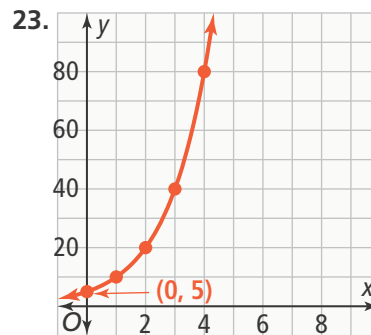19. $f(x) = 2(3)^x$

20. $f(x) = 4\left(\frac{1}{2}\right)^x$

Write each exponential function. SEE EXAMPLE 3

21.
x	f(x)
0	2
1	8
2	32
3	128
4	512

22.
x	f(x)
0	4
1	$\frac{4}{3}$
2	$\frac{4}{9}$
3	$\frac{4}{27}$
4	$\frac{4}{81}$

23.

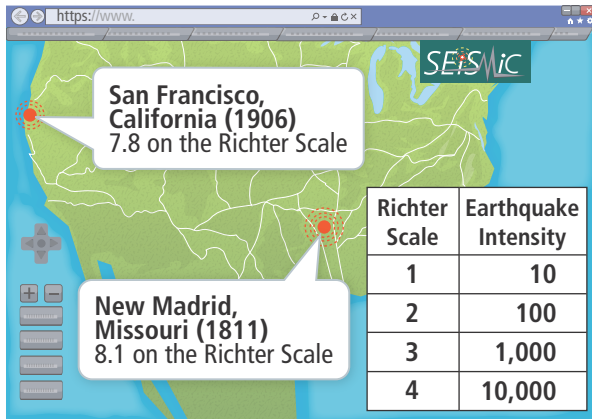**Tell whether each function is linear or exponential. Explain your reasoning.** SEE EXAMPLE 4

24.
x	f(x)
0	5
1	9
2	13
3	17
4	21

25.
x	f(x)
0	216
1	36
2	6
3	1
4	$\frac{1}{6}$

PRACTICE & PROBLEM SOLVING

APPLY

26. Make Sense and Persevere Write an exponential function to model earthquake intensity as a function of a Richter Scale number. How can you use your function to compare the intensity of the 1811 New Madrid and 1906 San Francisco earthquakes?

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San Francisco, California (1906) 7.8 on the Richter Scale

New Madrid, Missouri (1811) 8.1 on the Richter Scale

Richter Scale	Earthquake Intensity
1	10
2	100
3	1,000
4	10,000

27. Model With Mathematics A television show will be canceled if the estimated number of viewers falls below 2.5 million by Week 10. Use the graph to write an exponential function to model the situation. If this pattern continues, will the show be canceled?
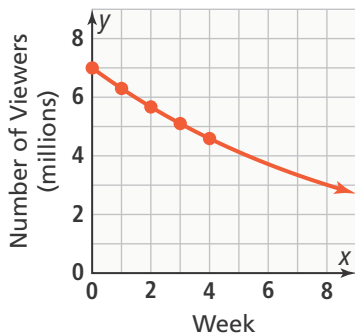
28. Make Sense and Persevere The table shows the number of algae cells in pool water samples. A pool will turn green when there are 24 million algae cells or more. Write and graph an exponential function to model the expected number of algae cells as a function of the number of days. If the pattern continues, in how many days will the water turn green?

Day	Number of Algae Cells
0	2000
1	10,000
2	50,000
3	250,000
4	1,250,000

ASSESSMENT PRACTICE

29. Consider the function $f(x) = 3(5)^x$.

The *y*-intercept is _____.

The asymptote is _____.

The domain is _____.

The range is _____.

30. SAT/ACT What is the *y*-intercept of $f(x) = 8\left(\frac{1}{2}\right)^x$?

Ⓐ 0

Ⓑ $\frac{1}{2}$

Ⓒ 1

Ⓓ 2

Ⓔ 8

31. Performance Task A gardener can increase the number of dahlia plants in an annual garden by either buying new bulbs each year or dividing the existing bulbs to create new plants. The table shows the expected number of bulbs for each method.

Year	Buy New Bulbs	Divide Existing Bulbs
0	6	6
1	56	12
2	106	24
3	156	48
4	206	96
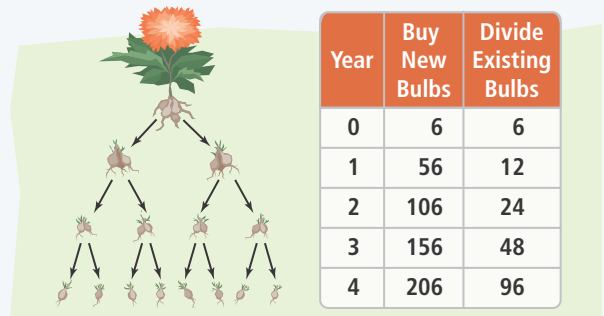
Part A For each method, write a function to model the expected number of plants for each year.

Part B Use your functions to find the expected number of plants in 10 years for each method.

Part C How does the expected number of plants in five years compare to the expected number of plants in 15 years? Explain how these patterns could affect the method the gardener decides to use.

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