6 Chapter Review

Check It Out
Vocabulary Help
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Review Key Vocabulary

closed, *p. 266*
nth root, *p. 278*
exponential function, *p. 286*
exponential growth, *p. 296*
exponential growth function, *p. 296*
compound interest, *p. 297*
exponential decay, *p. 302*
exponential decay function, *p. 302*
geometric sequence, *p. 308*
common ratio, *p. 308*
recursive rule, *p. 312*

Review Examples and Exercises

6.1 Properties of Square Roots *(pp. 260–267)*

Evaluate $\sqrt{b^2 - 4ac}$ when $a = -2$, $b = 2$, and $c = 5$.

$$\begin{aligned} \sqrt{b^2-4ac} &= \sqrt{2^2 - 4(-2)(5)} && \text{Substitute.} \\ &= \sqrt{44} && \text{Simplify.} \\ &= \sqrt{4 \cdot 11} && \text{Factor.} \\ &= \sqrt{4} \cdot \sqrt{11} && \text{Product Property of Square Roots} \\ &= 2\sqrt{11} && \text{Simplify.} \end{aligned}$$

Exercises

Evaluate the expression when $x = 3$, $y = 4$, and $z = 2$.

1. $\sqrt{xy^2z}$

2. $\sqrt{2z + y}$

3. $\dfrac{8 + \sqrt{xy}}{z}$

6.2 Properties of Exponents *(pp. 268–275)*

Simplify $\left(\dfrac{3x}{4}\right)^{-4}$. Write your answer using only positive exponents.

$$\begin{aligned} \left(\frac{3x}{4}\right)^{-4} &= \frac{(3x)^{-4}}{4^{-4}} && \text{Power of a Quotient Property} \\ &= \frac{4^4}{(3x)^4} && \text{Definition of negative exponent} \\ &= \frac{4^4}{3^4x^4} && \text{Power of a Product Property} \\ &= \frac{256}{81x^4} && \text{Simplify.} \end{aligned}$$

Exercises

Simplify. Write your answer using only positive exponents.

4. $y^3 \cdot y^{-3}$ **5.** $\dfrac{x^4}{x^7}$ **6.** $(xy^2)^3$ **7.** $\left(\dfrac{2x}{5y}\right)^{-2}$

6.3 Radicals and Rational Exponents (pp. 276–281)

Simplify each expression.

a. $\sqrt[3]{512} = \sqrt[3]{8 \cdot 8 \cdot 8} = 8$ Rewrite and simplify.

b. $900^{1/2} = \sqrt{900}$ Write the expression in radical form.

$= \sqrt{30 \cdot 30}$ Rewrite.

$= 30$ Simplify.

Exercises

Simplify the expression.

8. $\sqrt[3]{8}$ **9.** $64^{1/2}$ **10.** $625^{3/4}$

6.4 Exponential Functions (pp. 284–293)

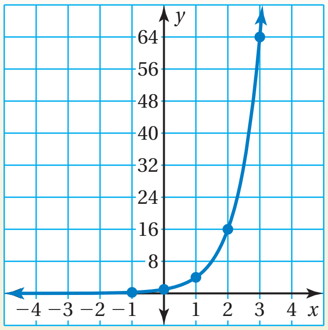
a. Graph $y = 4^x$.

Step 1: Make a table of values.

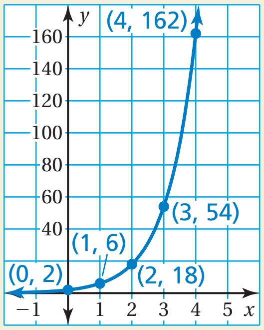
x	−1	0	1	2	3
y	0.25	1	4	16	64

Step 2: Plot the ordered pairs.

Step 3: Draw a smooth curve through the points.



b. Write an exponential function represented by the graph.



Use the graph to make a table of values.

x	0	1	2	3	4
y	2	6	18	54	162

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The *y*-intercept is 2 and the *y*-values increase by a factor of 3 as *x* increases by 1.

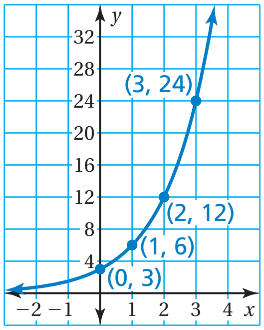
So, the exponential function is $y = 2(3)^x$.

Exercises

11. Graph $y = -2(4)^x + 3$. Describe the domain and range. Compare the graph to the graph of $y = -2(4)^x$.

Write an exponential function represented by the graph or table.

12.



13.

x	0	1	2	3
y	2	1	0.5	0.25

Solve the equation. Check your solution, if possible.

14. $3^x = 27$

15. $5^x = 5^{x-2}$

16. $2^{5x} = 8^{2x-4}$

6.5 Exponential Growth *(pp. 294–299)*

The enrollment at a high school increases by 4% each year. In 2010, there were 800 students enrolled at the school.

a. Write a function that represents the enrollment y of the high school after t years.

$y = a(1 + r)^t$ — Write exponential growth function.

$y = 800(1 + 0.04)^t$ — Substitute 800 for a and 0.04 for r.

$y = 800(1.04)^t$ — Simplify.

b. How many students will be enrolled at the high school in 2020?

The value $t = 10$ represents 2020.

$y = 800(1.04)^t$ — Write exponential growth function.

$y = 800(1.04)^{10}$ — Substitute 10 for t.

≈ 1184 — Use a calculator.

Exercises

17. PLUMBER A plumber charges \$22 per hour. The hourly rate increases by 3% each year.

a. Write a function that represents the plumber's hourly rate y (in dollars) after t years.

b. What is the plumber's hourly rate after 8 years?

6.6 Exponential Decay (pp. 300–305)

The table shows the value of a boat over time.

Year, t	0	1	2	3
Value, y	\$6000	\$4800	\$3840	\$3072

a. Determine whether the table represents an *exponential growth function*, an *exponential decay function*, or *neither*.

$+1$ $+1$ $+1$

Year, t	0	1	2	3
Value, y	\$6000	\$4800	\$3840	\$3072

$\times\ 0.8$ $\times\ 0.8$ $\times\ 0.8$

As x increases by 1, y is multiplied by 0.8. So, the table represents an exponential decay function.

b. The boat loses 20% of its value every year. Write a function that represents the value y (in dollars) of the boat after t years.

$y = a(1 - r)^t$ Write exponential decay function.

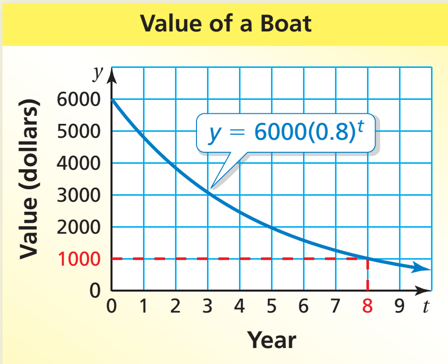
$y = 6000(1 - 0.2)^t$ Substitute 6000 for a and 0.2 for r.

$y = 6000(0.8)^t$ Simplify.

c. Graph the function from part (b). Use the graph to estimate the value of the boat after 8 years.

From the graph, you can see that the y-value is about 1000 when $t = 8$.

So, the value of the boat is about \$1000 after 8 years.



Exercises

Determine whether the table represents an *exponential growth function*, an *exponential decay function*, or *neither*.

18.

x	0	1	2	3
y	3	6	12	24

19.

x	1	2	3	4
y	162	108	72	48

20. **DISCOUNT** The price of a TV is \$1500. The price decreases by 6% each month. Write and graph a function that represents the price y (in dollars) of the TV after t months. Use the graph to estimate the price of the TV after 1 year.

6.7 Geometric Sequences (pp. 306–315)

a. Write the next three terms of the geometric sequence 2, 6, 18, 54, ...

Use a table to organize the terms and extend the pattern.

Position	1	2	3	4	5	6	7
Term	2	6	18	54	162	486	1458

$\times 3$ $\times 3$ $\times 3$ $\times 3$ $\times 3$ $\times 3$

Each term is 3 times the previous term. So, the common ratio is 3.

Multiply a term by 3 to find the next term.

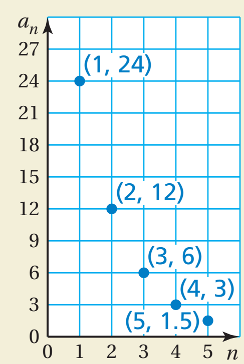
The next three terms are 162, 486, and 1458.

b. Graph the geometric sequence 24, 12, 6, 3, 1.5, ... What do you notice?

Make a table. Then plot the ordered pairs (n, a_n).

Position, n	1	2	3	4	5
Term, a_n	24	12	6	3	1.5

The points of the graph appear to lie on an exponential curve.



Exercises

Write the next three terms of the geometric sequence. Then graph the sequence.

21. $-3, 9, -27, 81, \ldots$

22. $48, 12, 3, \frac{3}{4}, \ldots$

Write an equation for the *n*th term of the geometric sequence.

23.

n	1	2	3	4
a_n	1	4	16	64

24.

n	1	2	3	4
a_n	5	-10	20	-40

Write a recursive rule for the sequence.

25. 3, 8, 13, 18, 23, . . .

26. 3, 6, 12, 24, 48, . . .