UNDERSTAND

9. Reason Explain how to find the range of the inverse of $f(x) = \sqrt{2x - 3}$ without finding $f^{-1}(x)$.

10. Error Analysis Describe and correct the error a student made in finding the inverse of the function $f(x) = x^2 - 4$.

$$f(x) = x^2 - 4$$
$$x = y^2 - 4$$
$$\sqrt{x} = \sqrt{y^2 - 4}$$
$$\sqrt{x} = y - 2$$
$$\sqrt{x} + 2 = y$$
$$f^{-1}(x) = \sqrt{x} + 2 \quad ✗$$

11. Higher Order Thinking What is the inverse operation of raising a number to the 4th power? How can you use the inverse operation of a number raised to the 4th power to find the inverse of the function $f(x) = x^4 - 1$? Is the inverse of f a function? Explain.

12. Communicate Precisely A function has the ordered pairs (1, 3), (7, 4), (8, 6), and (9, y). What restrictions are there on the value of y so that the inverse of the function is also a function? Explain.

13. Construct Arguments What is the inverse of the function $a(b) = \frac{1}{4}b^2$? Show how to use composition of functions to prove you found the correct inverse.

14. Construct Arguments A relation has one element in its domain and two elements in its range. Is the relation a function? Is the inverse of the relation a function? Explain.

15. Mathematical Connections Find the x- and y-intercepts of the function $y = 2x + 1$. What are the intercepts of the inverse function? How are the intercepts related?

PRACTICE

Identify the inverse relation. Is it a function?
SEE EXAMPLE 1

16.

x	−2	−1	0	1	2	3
y	9	3	−4	8	−6	3

17.

x	−2	1	0	1	2	3
y	−7	6	8	−1	3	7

Write an equation to represent the inverse of f. Sketch the graphs of f, $y = x$, and the inverse of f on the same coordinate axes. Is the inverse of f a function? SEE EXAMPLE 2

18. Let $f(x) = x + 3$.

19. Let $f(x) = 4x - 1$.

20. Let $f(x) = x^2 + 1$.

21. Let $f(x) = \sqrt{x + 5}$.

Find the inverse of the function by identifying an appropriate restriction of its domain. SEE EXAMPLE 3

22. $f(x) = x^2 + 4x + 4$

23. $f(x) = x^2 - 6x + 9$

24. $f(x) = x^2 - 2$

25. $f(x) = x^2 + 5$

Find an equation of the inverse function, and state the domain of the inverse. SEE EXAMPLE 4

26. $f(x) = 2x^2 - 5$

27. $f(x) = \sqrt{x + 6}$

28. $f(x) = 3x + 10$

29. $f(x) = \sqrt{x - 9}$

Use composition to determine whether f and g are inverse functions. SEE EXAMPLE 5

30. $f(x) = 2x - 9$, $g(x) = \frac{1}{2}x + 9$

31. $f(x) = \sqrt{\frac{x + 4}{3}}$, $g(x) = 3x^2 - 4$

32. A manager purchased cones for ice cream. Find a formula for the length of the radius, r, of a cone in terms of its volume, V. Then find the length of the radius of a cone if the volume is 290π cm^3 and the height is 15 cm. SEE EXAMPLE 6

ICECREAM

V of cone $= 290\pi$ cm^3

PRACTICE & PROBLEM SOLVING

## APPLY

33. Model With Mathematics The formula for converting Celsius to Fahrenheit is $F = \frac{5}{9}(C - 32)$. Find the inverse formula, and use it to find the Celsius temperature when the Fahrenheit temperature is 56° F.

34. Reason A DJ charges an hourly fee and an equipment setup fee.

DJ FOR HiRE

RATES

$75 an hour

$100 set up

CONTACT US

a. Write a function for the cost, C, of hiring a DJ for n hours.

b. Find the inverse of the cost function. What does the function represent?

c. If the DJ charged $550, for how many hours was she hired? Use the inverse function.

35. Reason A coffee can is in the shape of a cylinder.

Coffee
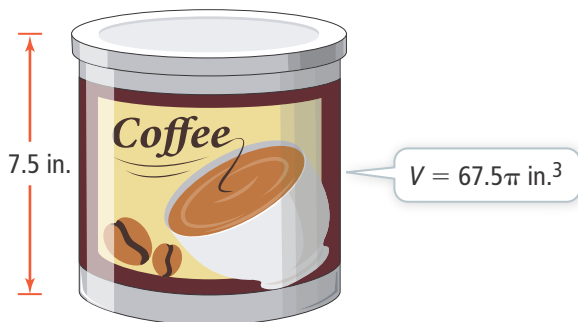
7.5 in.

$V = 67.5\pi \text{ in.}^3$

a. Find the formula that gives the radius of the coffee can r in terms of the volume V and height h.

b. Describe any restrictions on the formula.

c. What is the radius of a coffee can given the volume is 67.5π in.^{3} and the height is 7.5 in.?

ASSESSMENT PRACTICE

36. Choose Yes or No to tell whether each function has an inverse that is a function.

	Yes	No
a. $f(x) = 2x - 9$	☐	☐
b. $f(x) = x^2 + 4$	☐	☐
c. $f(x) = x^3 - 6$	☐	☐
d. $f(x) = \sqrt{2x + 7}$	☐	☐
e. $f(x) = x^2 - 10x + 25$	☐	☐

37. SAT/ACT What is the range of the inverse of $f(x) = \sqrt{-ax + b} - c$, where a, b, and c are real numbers?

Ⓐ $y \geq \frac{a}{b}$

Ⓑ $y \leq \frac{b}{a}$

Ⓒ $y \geq -\frac{a}{b}$

Ⓓ $y \geq -\frac{b}{a}$

Ⓔ $y \geq c$

38. Performance Task The table shows several functions and some of the inverses of those functions. The table also shows whether some of the inverses are functions.

Function	Inverse	Is the inverse a function?
$f(x) = x$	$f^{-1}(x) = x$	yes
$g(x) = x^2$	$g^{-1}(x) = \pm\sqrt{x}$	no
$h(x) = x^3$	$h^{-1}(x) = \sqrt[3]{x}$	yes
$k(x) = x^4$		
$m(x) = x^5$		
$n(x) = x^6$		

Part A Determine the inverses of the remaining functions in the table.

Part B Determine if the inverses of the remaining functions in the table are functions.

Part C Make a conjecture about the power of a function if the inverse of that function is a function.