Study Guide and Review - Chapter 6

Choose a word or term that best completes each statement.

1. If both compositions result in the _____, then the functions are inverse functions.

ANSWER:
identity function

2. In a(n)_____ , the results of one function are used to evaluate a second function.

ANSWER:
composition of functions

3. Radicals are_____ if *both* the index and the radicand are identical.

ANSWER:
like radical expressions

4. When there is more than one real root, the nonnegative root is called the_____.

ANSWER:
principal root

5. To eliminate radicals from a denominator or fractions from a radicand, you use a process called_____.

ANSWER:
rationalizing the denominator

6. Equations with radicals that have variables in the radicands are called_____.

ANSWER:
radical equations

7. Two relations are_____ if and only if one relation contains the element (b, a) when the other relation contains the element (a, b).

ANSWER:
inverse relations

8. When solving a radical equation, sometimes you will obtain a number that does not satisfy the original equation. Such a number is called a(n) _____.

ANSWER:
extraneous solution

9. The square root function is a type of _____.

ANSWER:
radical function

Find $[f \circ g](x)$ and $[g \circ f](x)$.

10. $f(x) = 2x + 1$
$g(x) = 4x - 5$

ANSWER:
$[f \circ g](x) = 8x - 9$
$[g \circ f](x) = 8x - 1$

11. $f(x) = x^2 + 1$
$g(x) = x - 7$

ANSWER:
$[f \circ g](x) = x^2 - 14x + 50$
$[g \circ f](x) = x^2 - 6$

12. $f(x) = x^2 + 4$
$g(x) = -2x + 1$

ANSWER:
$[f \circ g](x) = 4x^2 - 4x + 5$
$[g \circ f](x) = -2x^2 - 7$

13. $f(x) = 4x$
$g(x) = 5x - 1$

ANSWER:
$[f \circ g](x) = 20x - 4$
$[g \circ f](x) = 20x - 1$

14. $f(x) = x^3$
$g(x) = x - 1$

ANSWER:
$[fog](x) = x - 3x^2 + 3x - 1$
$[gof](x) = x^3 - 1$

15. $f(x) = x^2 + 2x - 3$
$g(x) = x + 1$

ANSWER:
$[f \circ g](x) = x^2 + 4x$
$[g \circ f](x) = x^2 + 2x - 2$

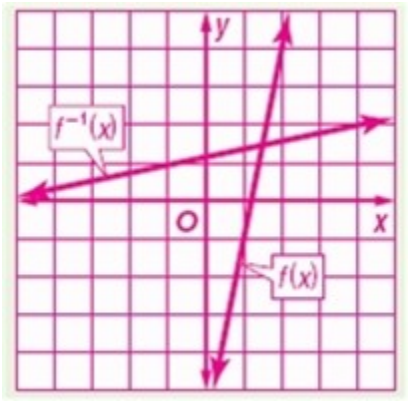
16. **MEASUREMENT** The formula $f = 3y$ converts yards y to feet f and $f = \frac{n}{12}$ converts inches n to feet f. Write a composition of functions that converts yards to inches.

ANSWER:
$n = 36y$

Find the inverse of each function. Then graph the function and its inverse.

17. $f(x) = 5x - 6$

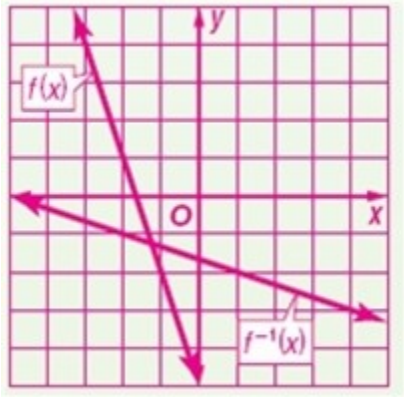
ANSWER:
$f^{-1}(x) = \frac{x + 6}{5}$



18. $f(x) = -3x - 5$

ANSWER:

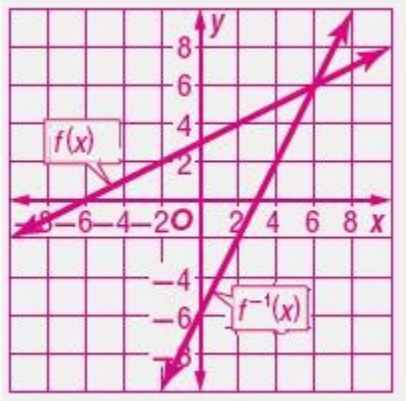
$f^{-1}(x) = \frac{x+5}{-3}$



19. $f(x) = \frac{1}{2}x + 3$

ANSWER:

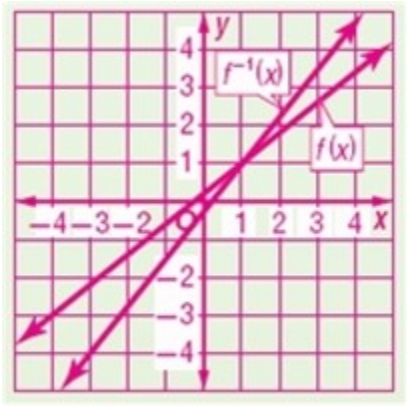
$f^{-1}(x) = 2x - 6$



20. $f(x) = \frac{4x+1}{5}$

ANSWER:

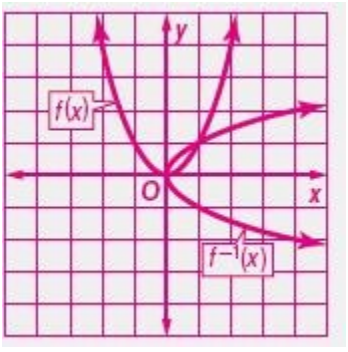
$f^{-1}(x) = \frac{5x-1}{4}$



21. $f(x) = x^2$

ANSWER:

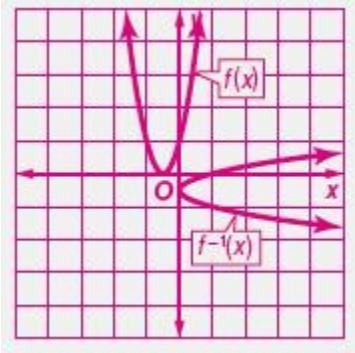
$f^{-1}(x) = \pm\sqrt{x}$



22. $f(x) = (2x+1)^2$

ANSWER:

$$f^{-1}(x) = \frac{-1 \pm \sqrt{x}}{2}$$



23. **SHOPPING** Samuel bought a computer. The sales tax rate was 6% of the sale price, and he paid $50 for shipping. Find the sale price if Samuel paid a total of $1322.

ANSWER:

$1200

Use the horizontal line test to determine whether the inverse of each function is also a function.

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

ANSWER:

No

25. $h(x) = x^3 - 3$

ANSWER:

Yes

26. $g(x) = -3x^4 + 2x - 1$

ANSWER:

No

27. $g(x) = 4x^3 - 5x$

ANSWER:

No

28. $f(x) = -3x^5 + x^2 - 3$

ANSWER:

No

29. $h(x) = 4x^4 - 5x$

ANSWER:

No

30. **FINANCIAL LITERACY** During the last month, Jonathan has made two deposits of $45, made a deposit of double his original balance, and has withdrawn $35 five times. His balance is now $189. Write an equation that models this problem. How much money did Jonathan have in his account at the beginning of the month?

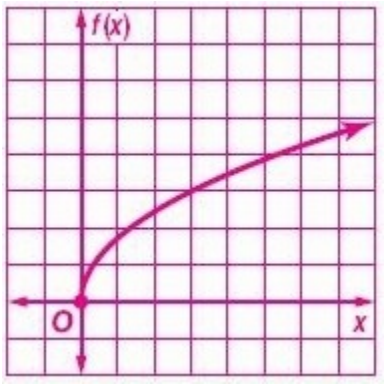
ANSWER:

$x + 2(45) + 2x - 5(35) = 189$; about $91.33

Graph each function. State the domain and range.

31. $f(x) = \sqrt{3x}$

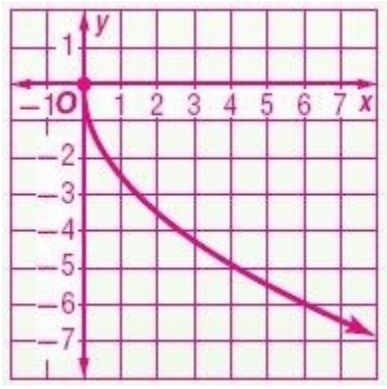
ANSWER:



$D=\{x \mid x \geq 0\}; R=\{f(x) \mid f(x) \geq 0\}$

32. $f(x) = -\sqrt{6x}$

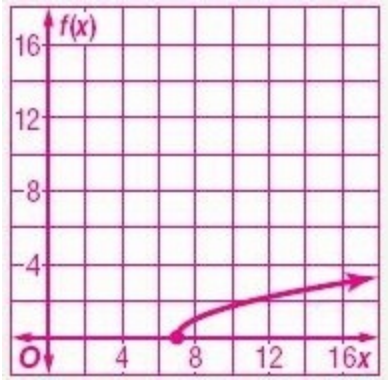
ANSWER:



$D=\{x \mid x \geq 0\}; R=\{f(x) \mid f(x) \leq 0\}$

33. $f(x) = \sqrt{x-7}$

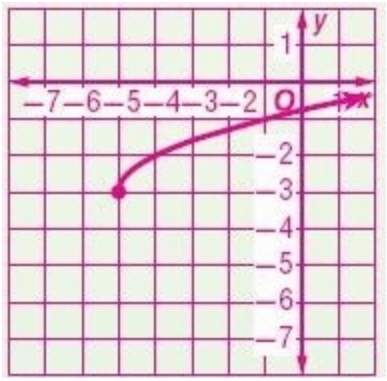
ANSWER:



$D=\{x \mid x \geq 7\}; R=\{f(x) \mid f(x) \geq 0\}$

34. $f(x) = \sqrt{x+5} - 3$

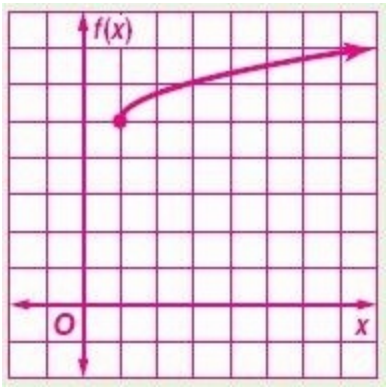
ANSWER:



$D=\{x \mid x^3 - 5\}; R=\{f(x) \mid f(x)^3 - 3\}$

35. $f(x)=\frac{3}{4}\sqrt{x-1}+5$

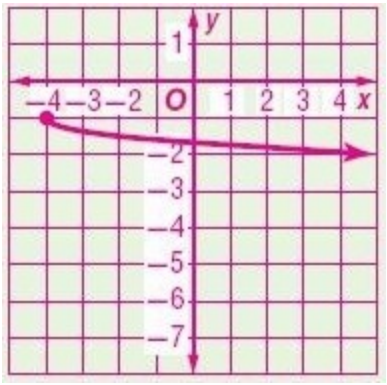
ANSWER:



$D=\{x \mid x \geq 1\}; R=\{f(x) \mid f(x) \geq 5\}$

36. $f(x)=-\frac{1}{3}\sqrt{x+4}-1$

ANSWER:



$D=\{x \mid x \geq -4\}; R=\{f(x) \mid f(x) \leq -1\}$

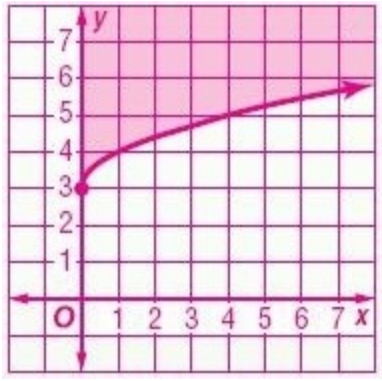
37. **GEOMETRY** The area of a circle is given by the formula $A=\pi r^2$. What is the radius of a circle with an area of 300 square inches?

ANSWER:
about 9.8 in.

Graph each inequality.

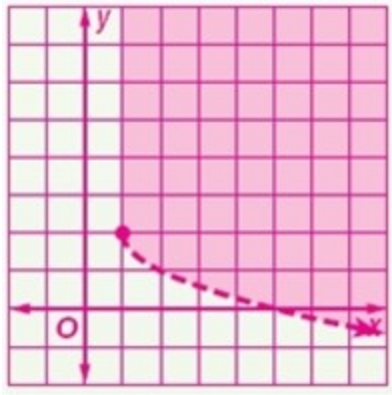
38. $y \geq \sqrt{x}+3$

ANSWER:



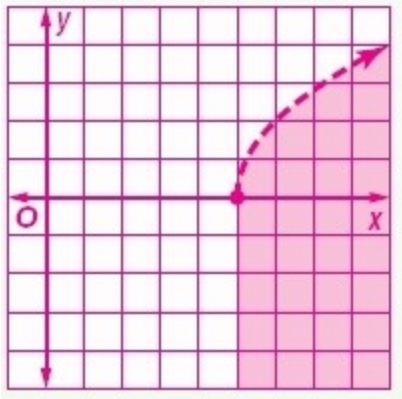
39. $y>-\sqrt{x-1}+2$

ANSWER:



40. $y < 2\sqrt{x-5}$

ANSWER:



Simplify.

41. $\pm\sqrt{121}$

ANSWER:
± 11

42. $\sqrt[3]{-125}$

ANSWER:
–5

43. $\sqrt{(-6)^2}$

ANSWER:
6

44. $\sqrt{-(x+3)^4}$

ANSWER:
$i(x+3)^2$

45. $\sqrt[6]{(x^2+2)^{18}}$

ANSWER:
$(x^2+2)^3$

46. $\sqrt[3]{27(x+3)^3}$

ANSWER:
$3(x + 3)$

47. $\sqrt[4]{a^8b^{12}}$

ANSWER:
$a^2|b^3|$

48. $\sqrt[5]{243x^{10}y^{25}}$

ANSWER:
$3x^2y^5$

49. **PHYSICS** The velocity v of an object can be defined as $v = \sqrt{\frac{2K}{m}}$, where m is the mass of an object and K is the kinetic energy in joules. Find the velocity in meters per second of an object with a mass of 17 grams and a kinetic energy of 850 joules.

ANSWER:
10 m/s

Simplify.

50. $\sqrt[3]{54}$

ANSWER:
$3\sqrt[3]{2}$

51. $\sqrt{144a^3b^5}$

ANSWER:
$12ab^2\sqrt{ab}$

52. $4\sqrt{6y}\cdot 3\sqrt{7x^2y}$

ANSWER:
$12|x|y\sqrt{42}$

53. $6\sqrt{72}+7\sqrt{98}-\sqrt{50}$

ANSWER:
$80\sqrt{2}$

54. $\left(6\sqrt{5}-2\sqrt{2}\right)\left(3\sqrt{5}+4\sqrt{2}\right)$

ANSWER:
$74+18\sqrt{10}$

55. $\dfrac{\sqrt{6m^5}}{\sqrt{p^{11}}}$

ANSWER:
$\dfrac{m^2\sqrt{6mp}}{p^6}$

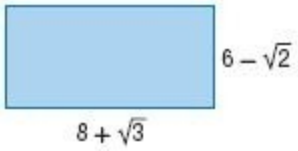
56. $\dfrac{3}{5+\sqrt{2}}$

ANSWER:
$\dfrac{15-3\sqrt{2}}{23}$

57. $\dfrac{\sqrt{3}}{\sqrt{5}-\sqrt{6}}$

ANSWER:
$-\sqrt{15}-3\sqrt{2}$

58. **GEOMETRY** What are the perimeter and the area of the rectangle?



ANSWER:
perimeter $= 28+2\sqrt{3}-2\sqrt{2}$ units;
area $= 48+6\sqrt{3}-8\sqrt{2}-\sqrt{6}$ units^2

Simplify each expression.

59. $x^{\frac{1}{2}}\cdot x^{\frac{2}{3}}$

ANSWER:
$x^{\frac{7}{6}}$

60. $m^{-\frac{3}{4}}$

ANSWER:

$\frac{m^{\frac{1}{4}}}{m}$

61. $\frac{d^{\frac{1}{6}}}{d^{\frac{3}{4}}}$

ANSWER:

$\frac{d^{\frac{5}{12}}}{d}$

Simplify each expression.

62. $\frac{1}{y^{\frac{1}{4}}}$

ANSWER:

$\frac{y^{\frac{3}{4}}}{y}$

63. $\sqrt[3]{\sqrt{729}}$

ANSWER:

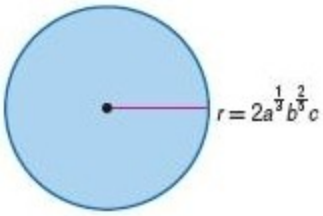
3

64. $\frac{x^{\frac{2}{3}} - x^{\frac{1}{3}}y^{\frac{2}{3}}}{x^{\frac{1}{3}}}$

ANSWER:

$x^{\frac{1}{3}} - y^{\frac{2}{3}}$

65. **GEOMETRY** What is the area of the circle?



ANSWER:

$4a^{\frac{2}{3}}b^{\frac{4}{5}}c^2\pi$ units^2

Solve each equation.

66. $\sqrt{x-3}+5=15$

ANSWER:

103

67. $-\sqrt{x-11}=3-\sqrt{x}$

ANSWER:

$\frac{100}{9}$

68. $4+\sqrt{3x-1}=8$

ANSWER:
$\frac{17}{3}$

69. $\sqrt{m+3}=\sqrt{2m+1}$

ANSWER:
2

70. $\sqrt{2x+3}=3$

ANSWER:
3

71. $(x+1)^{\frac{1}{4}}=-3$

ANSWER:
no solution

72. $a^{\frac{1}{3}}-4=0$

ANSWER:
64

73. $3(3x-1)^{\frac{1}{3}}-6=0$

ANSWER:
3

74. **PHYSICS** The formula $t=2\pi\sqrt{\frac{\ell}{32}}$ represents the swing of a pendulum, where t is the time in seconds for the pendulum to swing back and forth and ℓ is the length of the pendulum in feet. Find the length of a pendulum that makes one swing in 2.75 seconds.

ANSWER:
about 6.13 ft

Solve each inequality.

75. $2+\sqrt{3x-1}<5$

ANSWER:
$\frac{1}{3}\le x<\frac{10}{3}$

76. $\sqrt{3x+13}-5\ge 5$

ANSWER:
$x\ge 29$

77. $6-\sqrt{3x+5}\le 3$

ANSWER:
$x\ge\frac{4}{3}$

78. $\sqrt{-3x+4}-5\ge 3$

ANSWER:
$x\le -20$

79. $5+\sqrt{2y-7}<5$

ANSWER:
no solution

80. $3+\sqrt{2x-3} \geq 3$

ANSWER:

$x \geq \frac{3}{2}$

81. $\sqrt{3x+1}-\sqrt{6+x} > 0$

ANSWER:

$x > \frac{5}{2}$