

3.2 SECTION EXERCISES

VERBAL

1. Why does the domain differ for different functions?
2. How do we determine the domain of a function defined by an equation?
3. Explain why the domain of $f(x) = \sqrt[3]{x}$ is different from the domain of $f(x) = \sqrt{x}$.
4. When describing sets of numbers using interval notation, when do you use a parenthesis and when do you use a bracket?
5. How do you graph a piecewise function?

ALGEBRAIC

For the following exercises, find the domain of each function using interval notation.

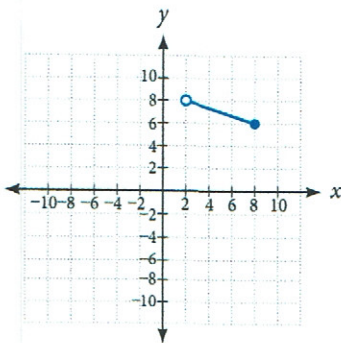
6. $f(x) = -2x(x-1)(x-2)$
7. $f(x) = 5 - 2x^2$
8. $f(x) = 3\sqrt{x-2}$
9. $f(x) = 3 - \sqrt{6-2x}$
10. $f(x) = \sqrt{4-3x}$
11. $f(x) = \sqrt{x^2+4}$
12. $f(x) = \sqrt[3]{1-2x}$
13. $f(x) = \sqrt[3]{x-1}$
14. $f(x) = \frac{9}{x-6}$
15. $f(x) = \frac{3x+1}{4x+2}$
16. $f(x) = \frac{\sqrt{x+4}}{x-4}$
17. $f(x) = \frac{x-3}{x^2+9x-22}$
18. $f(x) = \frac{1}{x^2-x-6}$
19. $f(x) = \frac{2x^3-250}{x^2-2x-15}$
20. $f(x) = \frac{5}{\sqrt{x-3}}$
21. $f(x) = \frac{2x+1}{\sqrt{5-x}}$
22. $f(x) = \frac{\sqrt{x-4}}{\sqrt{x-6}}$
23. $f(x) = \frac{\sqrt{x-6}}{\sqrt{x-4}}$
24. $f(x) = \frac{x}{x}$
25. $f(x) = \frac{x^2-9x}{x^2-81}$

26. Find the domain of the function $f(x) = \sqrt{2x^3-50x}$ by:
 - a. using algebra.
 - b. graphing the function in the radicand and determining intervals on the x -axis for which the radicand is nonnegative.

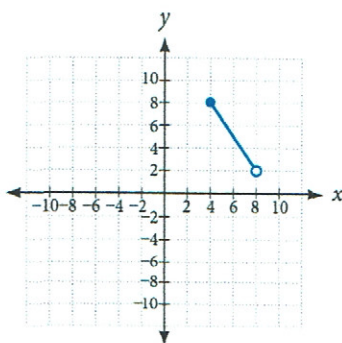
GRAPHICAL

For the following exercises, write the domain and range of each function using interval notation.

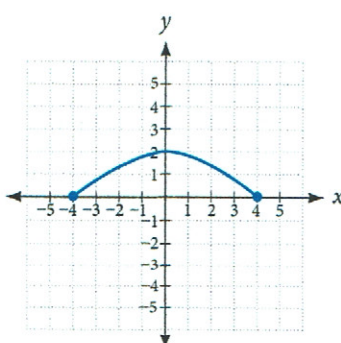
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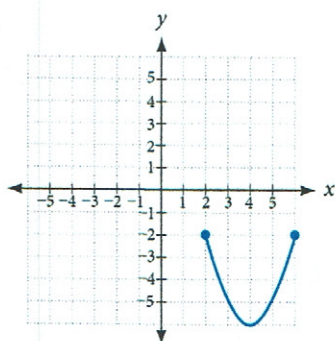
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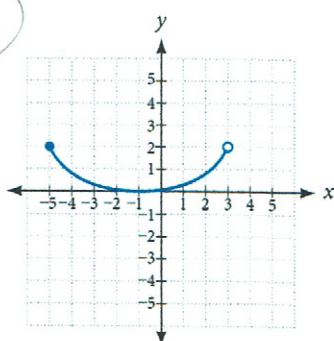
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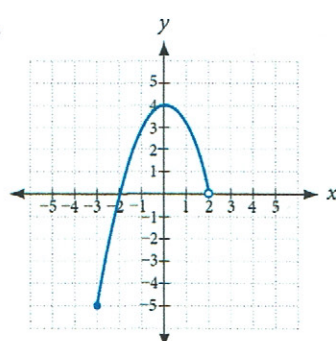
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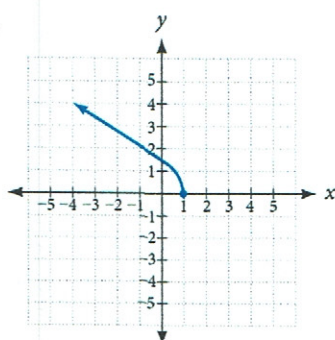
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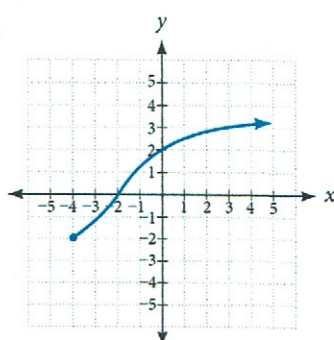
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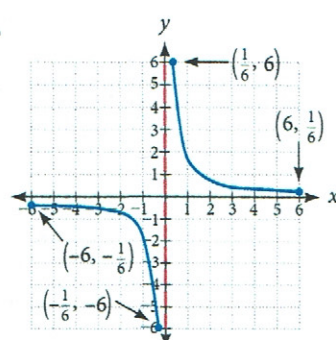
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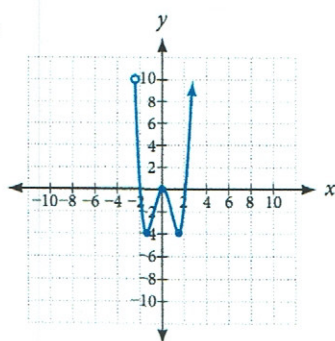
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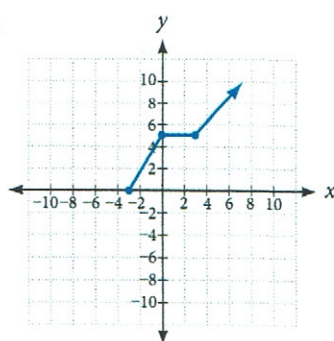
35.



36.



37.



For the following exercises, sketch a graph of the piecewise function. Write the domain in interval notation.

$$38. f(x) = \begin{cases} x + 1 & \text{if } x < -2 \\ -2x - 3 & \text{if } x \geq -2 \end{cases}$$

$$39. f(x) = \begin{cases} 2x - 1 & \text{if } x < 1 \\ 1 + x & \text{if } x \geq 1 \end{cases}$$

$$40. f(x) = \begin{cases} x + 1 & \text{if } x < 0 \\ x - 1 & \text{if } x > 0 \end{cases}$$

$$41. f(x) = \begin{cases} 3 & \text{if } x < 0 \\ \sqrt{x} & \text{if } x \geq 0 \end{cases}$$

$$42. f(x) = \begin{cases} x^2 & \text{if } x < 0 \\ 1 - x & \text{if } x > 0 \end{cases}$$

$$43. f(x) = \begin{cases} x^2 & \text{if } x < 0 \\ x + 2 & \text{if } x \geq 0 \end{cases}$$

$$44. f(x) = \begin{cases} x + 1 & \text{if } x < 1 \\ x^3 & \text{if } x \geq 1 \end{cases}$$

$$45. f(x) = \begin{cases} |x| & \text{if } x < 2 \\ 1 & \text{if } x \geq 2 \end{cases}$$

NUMERIC

For the following exercises, given each function f , evaluate $f(-3)$, $f(-2)$, $f(-1)$, and $f(0)$.

$$46. f(x) = \begin{cases} x+1 & \text{if } x < -2 \\ -2x-3 & \text{if } x \geq -2 \end{cases} \quad 47. f(x) = \begin{cases} 1 & \text{if } x \leq -3 \\ 0 & \text{if } x > -3 \end{cases} \quad 48. f(x) = \begin{cases} -2x^2+3 & \text{if } x \leq -1 \\ 5x-7 & \text{if } x > -1 \end{cases}$$

For the following exercises, given each function f , evaluate $f(-1)$, $f(0)$, $f(2)$, and $f(4)$.

$$49. f(x) = \begin{cases} 7x+3 & \text{if } x < 0 \\ 7x+6 & \text{if } x \geq 0 \end{cases} \quad 50. f(x) = \begin{cases} x^2-2 & \text{if } x < 2 \\ 4+|x-5| & \text{if } x \geq 2 \end{cases} \quad 51. f(x) = \begin{cases} 5x & \text{if } x < 0 \\ 3 & \text{if } 0 \leq x \leq 3 \\ x^2 & \text{if } x > 3 \end{cases}$$

For the following exercises, write the domain for the piecewise function in interval notation.

$$52. f(x) = \begin{cases} x+1 & \text{if } x < -2 \\ -2x-3 & \text{if } x \geq -2 \end{cases} \quad 53. f(x) = \begin{cases} x^2-2 & \text{if } x < 1 \\ -x^2+2 & \text{if } x \geq 1 \end{cases} \quad 54. f(x) = \begin{cases} 2x-3 & \text{if } x < 0 \\ -3x^2 & \text{if } x \geq 0 \end{cases}$$

TECHNOLOGY

55. Graph $y = \frac{1}{x^2}$ on the viewing window $[-0.5, -0.1]$ and $[0.1, 0.5]$. Determine the corresponding range for the viewing window. Show the graphs.
56. Graph $y = \frac{1}{x}$ on the viewing window $[-0.5, -0.1]$ and $[0.1, 0.5]$. Determine the corresponding range for the viewing window. Show the graphs.

EXTENSION

57. Suppose the range of a function f is $[-5, 8]$. What is the range of $|f(x)|$?
58. Create a function in which the range is all nonnegative real numbers.
59. Create a function in which the domain is $x > 2$.

REAL-WORLD APPLICATIONS

60. The height h of a projectile is a function of the time t it is in the air. The height in feet for t seconds is given by the function $h(t) = -16t^2 + 96t$. What is the domain of the function? What does the domain mean in the context of the problem?
61. The cost in dollars of making x items is given by the function $C(x) = 10x + 500$.
- The fixed cost is determined when zero items are produced. Find the fixed cost for this item.
 - What is the cost of making 25 items?
 - Suppose the maximum cost allowed is \$1500. What are the domain and range of the cost function, $C(x)$?