

10.1 Start Thinking

Use a graphing calculator to graph $y = \sqrt{x}$. Describe the domain and range of the function. Explain why you cannot use negative numbers in the domain.

Graph $y = \sqrt{-x}$. Explain why the calculator is able to graph this function, and relate your explanation to the domain for the graph of $y = \sqrt{x}$. How does the domain of $y = \sqrt{-x}$ differ from the domain of $y = \sqrt{x}$?

10.1 Warm Up

Graph the function.

1. $y = 3x + 2$

2. $y = -2x$

3. $y = 1$

4. $y = -\frac{2}{3}x - 4$

5. $y = \frac{2}{5}x + 2$

6. $y = \frac{1}{2}x + 1$

10.1 Cumulative Review Warm Up

Graph the function. Describe the domain and range.

1. $y = \begin{cases} x, & \text{if } x < 0 \\ x + 7, & \text{if } x > 0 \end{cases}$

2. $y = \begin{cases} x, & \text{if } x \leq -2 \\ -3x, & \text{if } x > -2 \end{cases}$

3. $y = \begin{cases} -2x + 1, & \text{if } x \leq 0 \\ x - 1, & \text{if } x > 0 \end{cases}$

4. $y = \begin{cases} 2x - 7, & \text{if } x < 5 \\ 3x + 5, & \text{if } x \geq 5 \end{cases}$

10.1 Practice A

In Exercises 1–6, describe the domain of the function.

1. $y = 5\sqrt{x}$

2. $y = \sqrt{3x}$

3. $y = 6 + \sqrt{-x}$

4. $y = \sqrt{-4x} + 6$

5. $y = \sqrt{x - 8}$

6. $y = \sqrt{x + 6}$

In Exercises 7–12, graph the function. Describe the range.

7. $y = \sqrt{2x}$

8. $y = 3\sqrt{-x}$

9. $y = 4 + \sqrt{x}$

10. $y = \sqrt{x} - 1$

11. $y = \sqrt{x - 2}$

12. $y = -\sqrt{x + 5}$

In Exercises 13–18, graph the function. Compare the graph to the graph of $f(x) = \sqrt{x}$.

13. $g(x) = \frac{1}{3}\sqrt{x}$

14. $g(x) = \sqrt{\frac{1}{2}x}$

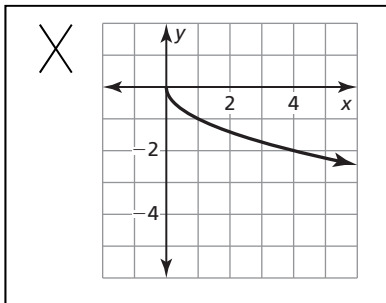
15. $g(x) = \sqrt{x - 1}$

16. $g(x) = \sqrt{x} + 6$

17. $g(x) = \sqrt{-2x}$

18. $g(x) = -3\sqrt{x}$

19. Describe and correct the error in graphing the function $y = \sqrt{-x}$.



20. Consider the graph of $y = \sqrt{x}$.

- Write a function that is a horizontal translation of the graph of $y = \sqrt{x}$.
- Write a function that is vertical shrink of the graph of $y = \sqrt{x}$.
- Write a function that is reflection in the x -axis followed by a vertical translation of the graph of $y = \sqrt{x}$.

10.1 Practice B

In Exercises 1–6, describe the domain of the function.

1. $y = \sqrt{7x}$

2. $y = 3 + \sqrt{-9x}$

3. $y = \sqrt{x - 8}$

4. $y = \sqrt{-x + 5}$

5. $y = 3\sqrt{x + 4}$

6. $y = \frac{1}{3}\sqrt{-x - 6}$

In Exercises 7–12, graph the function. Describe the range.

7. $y = 3\sqrt{-x}$

8. $y = -4 + \sqrt{x}$

9. $y = -\sqrt{x - 2}$

10. $y = \sqrt{x + 1}$

11. $y = \sqrt{x - 3} - 2$

12. $y = -\sqrt{x + 2} + 1$

In Exercises 13–18, graph the function. Compare the graph to the graph of $f(x) = \sqrt{x}$.

13. $g(x) = \sqrt{\frac{1}{3}x}$

14. $g(x) = \sqrt{x - 7}$

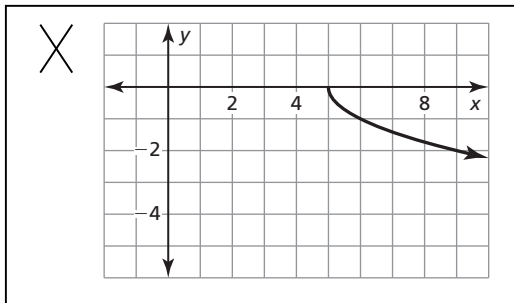
15. $g(x) = -1 + \sqrt{x}$

16. $g(x) = -\sqrt{x} + 2$

17. $g(x) = \sqrt{-4x}$

18. $g(x) = -\sqrt{x + 3}$

19. Describe and correct the error in graphing the function $y = -\sqrt{x + 5}$.



20. A right circular cylinder has a height of 2 centimeters. The radius r of the cylinder is given by $r = \sqrt{\frac{A}{2\pi}}$, where A is the cylinder's area.

- Describe the domain of the function. Use a graphing calculator to graph the function.
- Use the *trace* feature to approximate the area of the cylinder when the radius is 2.3 centimeters. Round your answer to the nearest tenth.

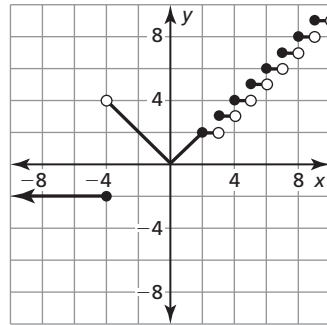
10.1 Enrichment and Extension

Graphing Functions Challenge

Use your knowledge of special functions, composition of functions, and linear, quadratic, and square root functions to complete the following challenge questions.

Example: Graph $y = \begin{cases} -2, & \text{if } x \leq -4 \\ |x|, & \text{if } -4 < x \leq 2. \\ [x], & \text{if } x > 2 \end{cases}$

Separate the graph into the three parts of the piecewise function. Using the bounds, graph each separate part in the appropriate place. From left to right, graph the constant function, the absolute value function, and then the step function.



Graph the function

1. $y = |2\sqrt{x+1} - 4|$

2. $y = -|(x-3)^2 - 4|$

3. $y = \begin{cases} -|x|, & \text{if } x \leq 2 \\ 3\sqrt{x-2} - 2, & \text{if } x > 2 \end{cases}$

4. $y = \begin{cases} \sqrt{-x-2} + 1, & \text{if } x \leq -2 \\ x^2 - 3, & \text{if } x > -2 \end{cases}$

10.1 Puzzle Time

What's A Sign Of Old Age In A Computer?

Write the letter of each answer in the box containing the exercise number.

Describe the domain of the function.

1. $y = 9\sqrt{x}$ 2. $g(x) = \sqrt{x + 6}$
 3. $r(x) = \sqrt{-x - 2}$ 4. $b(x) = \frac{1}{3}\sqrt{x + 8}$

Describe the range of the function.

5. $h(x) = 5\sqrt{-x}$ 6. $c(x) = \sqrt{x} - 9$
 7. $s(x) = -\sqrt{x + 5}$ 8. $m(x) = \sqrt{x + 4} - 3$

Describe the transformation(s) from the graph of $f(x) = \sqrt{x}$ to the graph of h .

9. $h(x) = 5\sqrt{x - 3} + 2$
 10. $h(x) = \frac{1}{6}\sqrt{-x} + 4$
 11. $h(x) = -8\sqrt{x + 2} - 7$
 12. $h(x) = \frac{1}{8}\sqrt{x - 1} + 11$

Answers

O. $y \geq 0$ **M.** $y \geq -9$
F. $y \leq 0$ **E.** $y \geq -3$
O. $x \geq -8$ **R.** $x \leq -2$
S. $x \geq -6$ **O.** $x \geq 0$

M. vertical shrink by a factor of $\frac{1}{6}$; reflection in the y -axis; translation 4 units up
L. vertical shrink by a factor of $\frac{1}{8}$; translation 1 unit right and 11 units up
S. vertical stretch by a factor of 5; translation 3 units right and 2 units up
Y. reflection in the x -axis; translation 2 units left and 7 units down; vertical stretch by a factor of 8

12	4	2	9		1	7		10	8	6	5	3	11
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