

# Graphing Functions and Transformations

## Algebra 1 • Section 4.4

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Score: \_\_\_\_\_ / 12

### Quick Review and Helpful Hints

A function pairs each input with exactly one output. Pay attention to what the input means, what rule is being applied, and whether the question asks for a value, a rule, a domain, or an interpretation.

▷ **Example:** For  $f(x) = 2x + 5$ , find  $f(4)$ .

**Work:** Replace  $x$  with 4:  $f(4) = 2(4) + 5 = 13$ .

★ **Answer:** 13

### ◆ Practice Problems

Solve each problem. Show enough work that another student could follow your thinking.

1. For  $g(x) = f(x) + 4$ , describe the transformation. \_\_\_\_\_

6. Evaluate  $g(x) = \sqrt[3]{x-1}$  at  $x = 28$ . \_\_\_\_\_

2. For  $g(x) = f(x - 3)$ , describe the transformation. \_\_\_\_\_

7. For  $h(x) = |x| + 2$ , find the vertex. \_\_\_\_\_

3. For  $g(x) = -f(x)$ , describe the transformation. \_\_\_\_\_

8. If  $p(x) = \begin{cases} x + 1, & x < 2 \\ 2x, & x \geq 2 \end{cases}$ , find  $p(3)$ . \_\_\_\_\_

4. Evaluate  $f(x) = \sqrt{x+5}$  at  $x = 4$ . \_\_\_\_\_

9. For the same  $p(x)$ , find  $p(0)$ . \_\_\_\_\_

5. Find the domain of  $y = \sqrt{x-2}$ . \_\_\_\_\_

10. Describe  $y = 2\sqrt{x}$  compared with  $y = \sqrt{x}$ . \_\_\_\_\_

### ◆ Word Problems

11. A fee is \$5 for the first hour and \$3 for each extra hour. Why is a piecewise model useful? \_\_\_\_\_

12. A square-root model starts only after  $x = 6$ . What domain restriction should you expect? \_\_\_\_\_



## Answer Keys

- Shift up 4
- Shift right 3
- Reflect over the  $x$ -axis
- 3
- $x \geq 2$
- 3
- $(0, 2)$
- 6
- 1
- Vertical stretch by 2
- Different rules apply to different time intervals
- $x \geq 6$

### Step-by-Step Explanations

- That  $+4$  sits outside, touching the output, so the whole graph rises 4 units.
- Changes inside with  $x$  feel backwards:  $x - 3$  slides the graph right, not left.
- Slapping a negative on the output flips every  $y$ -value, mirroring the graph over the  $x$ -axis.
- Inside first:  $4 + 5$  makes 9, and the square root of 9 is a clean 3.
- Whatever lives under a square root can't be negative, so  $x - 2$  must stay zero or higher.
- Subtract inside to get 27, then ask what cubed equals 27 — that's 3.
- The basic  $|x|$  has its corner at  $(0, 0)$ , and  $+2$  lifts that corner up to  $(0, 2)$ .
- Check which zone 3 falls in: since  $3 \geq 2$ , follow the  $2x$  rule to get 6.
- This time  $0 < 2$ , so the other branch takes over:  $x + 1$  gives 1.
- Multiplying the whole output by 2 pulls the graph taller — a vertical stretch.
- One price covers the first hour and a different one covers the rest — piecewise is built for exactly this split.
- If the model wakes up at  $x = 6$ , anything smaller simply isn't part of its domain.



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