

# Function Shape Check

*Spot rates and sketch graph shapes.*

**GRADE 8 • 8.FGR.5.2**

**8.FGR.5.2** "Within realistic situations, identify and describe examples of functions that are linear or nonlinear. Sketch a graph that exhibits the qualitative features of a function that has been described verbally."

NAME \_\_\_\_\_

DATE \_\_\_\_\_

## THE BIG IDEA

A linear function has a constant rate of change, so its graph is a straight line. If the rate changes, the function is nonlinear, and its graph does not stay one straight line.

## WORKED EXAMPLE

A tank has 20 liters of water and fills by 6 liters each minute. Is this linear? Sketch the graph.

1. The tank gains 6 liters each minute.
2. The rate is constant, so the function is linear.
3. Sketch a straight line that starts above zero and rises steadily.

**Answer: Linear. The graph is an increasing straight line.**

## PRACTICE 5 problems

- 1** For  $x = 1, 2, 3$ , the  $y$ -values are 5, 9, 13. Is the function linear or nonlinear?

**ANSWER** \_\_\_\_\_

- 2** For  $x = 1, 2, 3$ , the  $y$ -values are 2, 9, 22. Is the function linear or nonlinear?

**ANSWER** \_\_\_\_\_

- 3** A water tank drains at a constant rate. Sketch its graph over time.

**ANSWER** \_\_\_\_\_

- 4** A cyclist travels 14 miles, then 10 miles, then 5 miles in three equal time periods. Is total distance traveled versus time linear? Explain.

**ANSWER** \_\_\_\_\_

- 5** Which situation can be linear? A. A streaming video uses the same amount of data each minute. B. A snowball gains more snow each second as it rolls downhill.

**ANSWER** \_\_\_\_\_

## APPLY IT Show your work

- 1** A gaming laptop has 30 GB of free space. A game download uses 5 GB each hour. Is free space versus time linear or nonlinear? Sketch the graph.

WORK SPACE

ANSWER \_\_\_\_\_

- 2** A basketball is tossed upward. Its height rises, reaches a highest point, and then falls. Is height versus time linear or nonlinear? Sketch the graph.

WORK SPACE

ANSWER \_\_\_\_\_

## CHALLENGE One step up

### CHALLENGE

A phone battery is 90% at 8:00, 75% at 9:00, 65% at 10:00, and 60% at 11:00. Sketch a graph through these points. Is the model linear? Explain.

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## PART 1 • PRACTICE

| # | PROBLEM                                                                                                                                                       | ANSWER                                                                                             |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| 1 | For $x = 1, 2, 3$ , the $y$ -values are 5, 9, 13. Is the function linear or nonlinear?                                                                        | <b>Linear. The <math>y</math>-values increase by 4 each time, so the graph is a straight line.</b> |
| 2 | For $x = 1, 2, 3$ , the $y$ -values are 2, 9, 22. Is the function linear or nonlinear?                                                                        | <b>Nonlinear. The changes are 7 and 13, not constant.</b>                                          |
| 3 | A water tank drains at a constant rate. Sketch its graph over time.                                                                                           | <b>A decreasing straight line.</b>                                                                 |
| 4 | A cyclist travels 14 miles, then 10 miles, then 5 miles in three equal time periods. Is total distance traveled versus time linear? Explain.                  | <b>Nonlinear. The distance added each period changes.</b>                                          |
| 5 | Which situation can be linear? A. A streaming video uses the same amount of data each minute. B. A snowball gains more snow each second as it rolls downhill. | <b>A. Its graph can be an increasing straight line.</b>                                            |

## PART 2 • APPLY IT

- Linear. Sketch a decreasing straight line that starts at 30 GB and drops 5 GB each hour.** Free space changes by the same amount each hour. The relationship can be written as  $y = 30 - 5x$ .
- Nonlinear. Sketch a curved arch that rises to a peak and then falls.** The ball's height does not change at a constant rate. At each time, the ball has one height, so the graph represents a function.

## CHALLENGE

**Nonlinear. The battery drops 15%, then 10%, then 5%, so the rate changes. Sketch a decreasing graph that becomes less steep over time.**

Accept equivalent descriptions of straight, increasing, decreasing, curved, or changing steepness. For sketches, accept correctly labeled axes and the stated qualitative shape.