Guided Practice

Determine whether each table represents a *linear* or *nonlinear* function. Explain. (Examples 1 and 2)

1.

x	0	1	2	3
y	1	3	6	10

Show your work.

Nonlinear; as x increases by 1, y increases by a greater amount of time.

2.

x	0	3	6	9
y	−3	9	21	33

Linear; the rate of change is constant; as x increases by 3, y increases by 12.

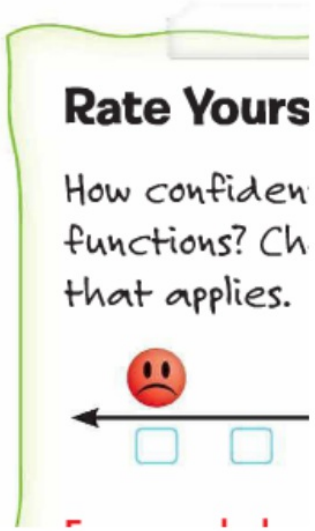
3. The table shows the measures of the sides of several rectangles. Are the widths of the rectangles a linear function of the lengths? Explain. (Example 3) **No; the rate of change is not constant.**

Length (in.)	1	4	8	10
Width (in.)	64	16	8	6.4

4. A cube has a side length of s meters. The volume of the cube is represented by the expression s^3. The volume of the cube is a function of the side length. Does this situation represent a linear or nonlinear function? Explain. (Example 4) **Nonlinear; sample answer: If you graph the function, the ordered pairs (side length, volume) do not lie on a straight line.**

5. **Building on the Essential Question** How can you use a table or a graph to determine if a function is linear or nonlinear?

Sample answer: The table values indicates a constant rate of change between the x- and y-values in a linear function; the graph of a linear function is a straight line that is not vertical.



1

x	−2	0	2	4
y	−1	0	1	2

Show your work.

Linear; rate of change is constant; as x increases by 2, y increases by 1.

2.

x	1	2	3	4
y	1	4	9	16

Nonlinear; rate of change is not constant.

3.

x	5	10	15	20
y	13	28	43	58

Linear; rate of change is constant; as x increases by 5, y increases by 15.

4.

x	1	3	5	7
y	−2	−18	−50	−98

Nonlinear; rate of change is not constant.

5 The Guzman family drove from Anderson to Myrtle Beach. Use the table to determine whether the distance driven is a linear function of the hours traveled. Explain. (Example 3)

Time (h)	1	2	3	4
Distance (mi)	65	130	195	260

Yes; the rate of change is constant; as the time increases by 1 hour, the distance increases by 65 miles.

6. The table shows the height of several buildings in Chicago. Use the table to determine whether the height of the building is a linear function of the number of stories. Explain. (Example 3)

Building	Stories	Height (ft)
Harris Bank III	35	510
One Financial Place	40	515
Kluczynski Federal Building	45	545
Mid Continental Plaza	50	582
North Harbor Tower	55	552

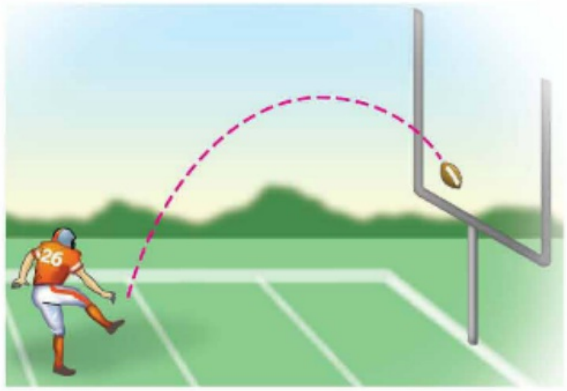
No; the rate of change is not constant.

7. There are 3,600 seconds in one hour. The total seconds is a function of the hours. Does this situation represent a linear or nonlinear function? Explain. (Example 4)

Linear; sample answer: If you graph the function, the ordered pairs (hours, seconds) lie on a straight line.

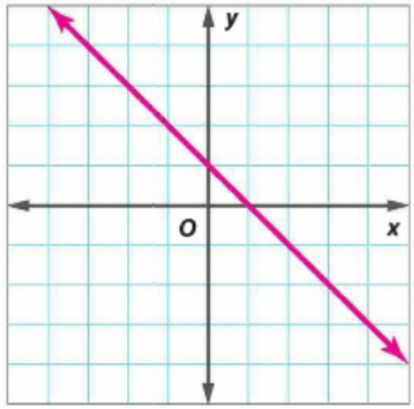
8. A football is placed on the ground to kick a field goal. The height of the ball is a function of the time in seconds. Does the path the football follows after being kicked represent a linear or nonlinear function? Explain. (Example 4)

Nonlinear; sample answer: After being kicked, the ball will reach a maximum height and come back to the ground.



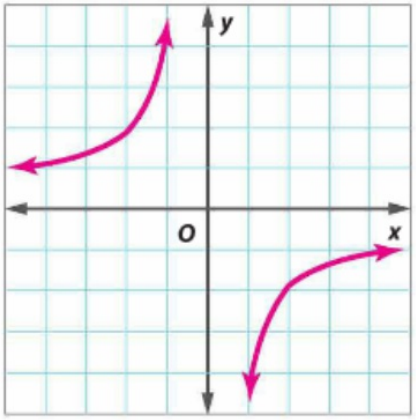
Graph each function by making a table of ordered pairs. Determine whether each function is *linear* or *nonlinear*. Explain.

9. $y = -x + 1$



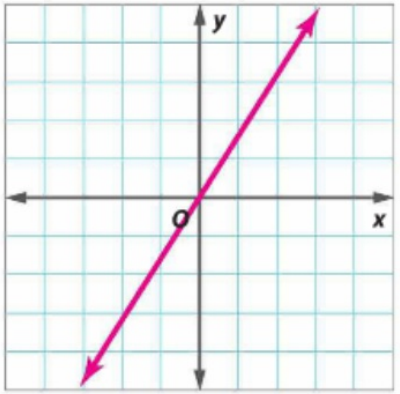
Linear; sample answer: The points lie on a straight line.

10. $y = \frac{-4}{x}$

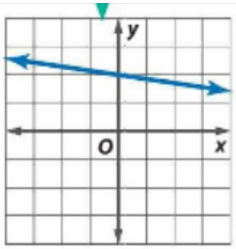


Nonlinear; sample answer: The graph is a curve.

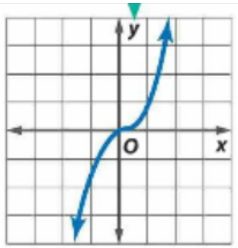
11. $y = \frac{3x}{2}$



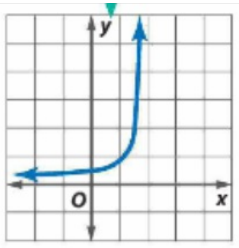
Linear; sample answer: The points lie on a straight line.



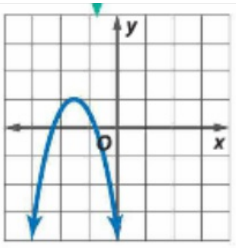
Linear



Nonlinear



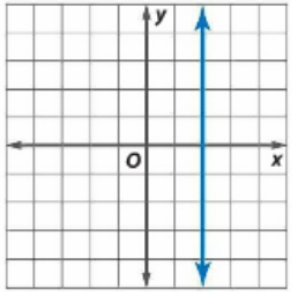
Nonlinear



Nonlinear

H.O.T. Problems Higher Order Thinking

13. CCSS **Persevere with Problems** Does the graph at the right represent a linear function? Explain. **No; sample answer: the graphs of vertical lines are not functions because there is more than one value of y that corresponds to $x = 2$.**



14. CCSS **Model with Mathematics** Give an example of a situation that can be represented by a nonlinear function. **Sample answer: Every hour the number of bacteria in a petri dish doubles.**

15. CCSS **Reason Inductively** Explain how you can use different representations to determine whether a function is linear. **Sample answer: A non-vertical graph that is a straight line is linear. An equation that can be written in the form $y = mx + b$ is linear. If a table of values shows a constant rate of change, it is linear.**