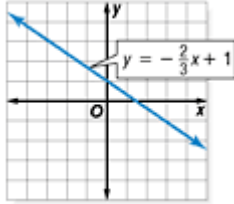


## Lesson 13-5

### Example 1 Identify Functions Using Graphs

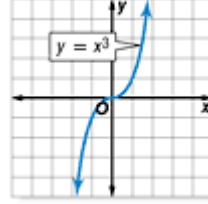
Determine whether each graph represents a *linear* or *nonlinear* function. Explain.

a.



The graph is a straight line, so it represents a linear function.

b.



The graph is a curve, not a straight line, so it represents a nonlinear function.

### Example 2 Identify Functions Using Equations

Determine whether each equation represents a *linear* or *nonlinear* function.

a.  $y = 3x^2 + 2$

This is nonlinear because  $x$  is raised to the second power and the function cannot be written in the form  $y = mx + b$ .

b.  $y = -4x$

This is linear because it can be written as  $y = -4x + 0$ .

### Example 3 Identify Functions Using Tables

Determine whether each table represents a *linear* or *nonlinear* function.

a.

$x$	$y$
3	6
7	5
11	3
15	0

Annotations: On the left, three curved arrows point downwards between rows, each labeled '+4'. On the right, three curved arrows point downwards between rows, labeled '-1', '-2', and '-3' respectively.

As  $x$  increases by 4,  $y$  decreases by a greater amount each time, so this is a nonlinear function.

b.

$x$	$y$
18	2
16	8
14	14
12	20

Annotations: On the left, three curved arrows point downwards between rows, each labeled '-2'. On the right, three curved arrows point upwards between rows, each labeled '+6'.

As  $x$  decreases by 2,  $y$  increases by 6, so this is a linear function.

**Example 4 Describe a Linear Function**  
**Multiple-Choice Test Item**

Which rule describes a linear function?

- A.  $y = 2x^3$       B.  $y = \frac{5}{x} + 7$       C.  $-3x + y = 6$       D.  $y = 4x(x + 3)$

**Read the Test Item**

A rule describes a relationship between variables. A rule that can be written in the form  $y = mx + b$  describes a relationship that is linear.

**Solve the Test Item**

- $y = 2x^3$       cubic equation      The variable has an exponent of 3.

$y = \frac{5}{x} + 7$       nonlinear      The variable is in the denominator.

You can eliminate choices A and B.

- $y = 4x(x + 3)$   
 $= 4x^2 + 12x$       The variable has an exponent of 2.

This is a quadratic equation. Eliminate choice D.

The answer is C.

**CHECK**  $-3x + y = 6 \rightarrow y = 3x + 6$

This equation is in the form  $y = mx + b$ . ✓