Algebra 3.2 Linear Functions

Learning Outcomes:
> I can identify linear and non-linear functions.
> I can graph linear functions using discrete and continuous data.
> I can write real-life problems to fit data.
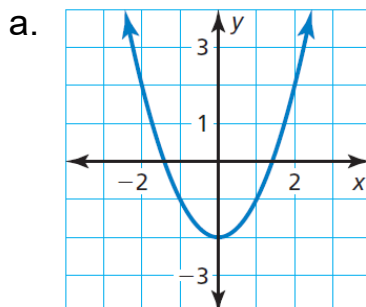
Essential Question

How can you determine whether a function is linear or nonlinear?

Warm Up

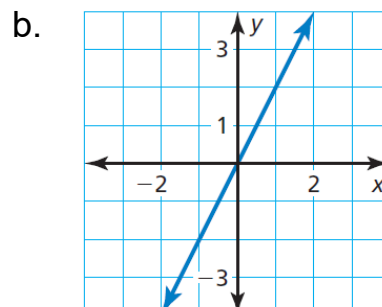A **linear function** forms a graph that is a non-vertical line.

Does the graph represent a linear or *nonlinear* function? Explain.

nonlinear

a.

curves

linear

b.

straight and not vertical

Example 1

A **linear function** has a ~~constant rate of change~~ *slope* and can be represented by a linear equation in two variables.

Does the table represent a *linear* (slope) or *nonlinear* (no slope) function? Explain.

a.

x	3	6	9	12
y	36	30	24	18

6   6   6

linear

b.

x	1	3	5	7
y	2	9	20	35

−7   −11   −15

nonlinear

Example 2

You try:

Does the graph or table represent a *linear* or *nonlinear* function? Explain.

1. linear

2. nonlinear

3.
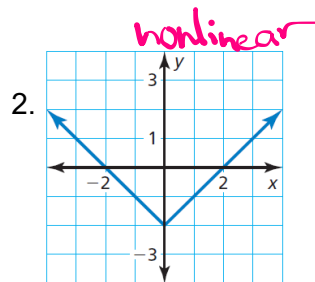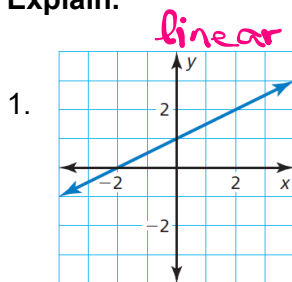
linear

x	0	1	2	3
y	3	5	7	9

−2   −2   −2

linear

4.

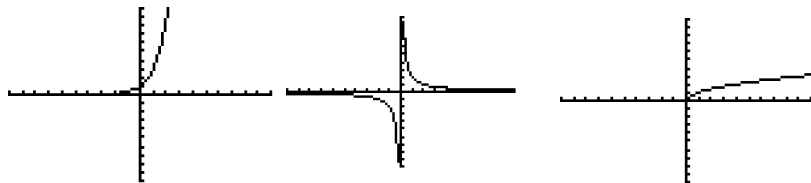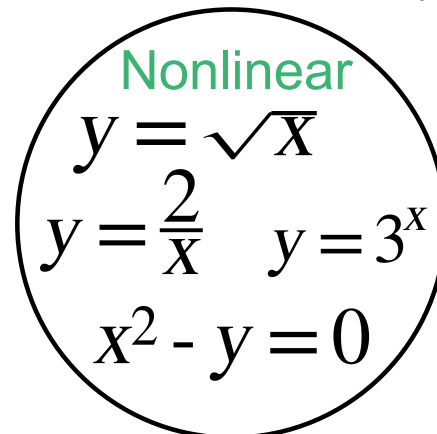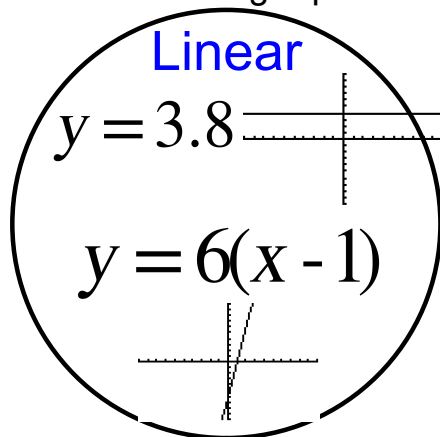| x	1	2	3	4
y	16	8	4	2

8   4   2

nonlinear

Linear equations: Can be written in the form $y = mx + b$, where m and b are constants.

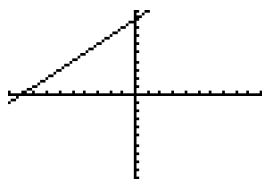Which of the following equations represent linear functions? Explain.

Linear

$y = 3.8$

$y = 6(x - 1)$

Nonlinear

$y = \sqrt{x}$

$y = \frac{2}{x}$ $y = 3^x$

$x^2 - y = 0$

Example 3

Try these:

Does the equation represent a *linear* or *nonlinear* function? Explain.
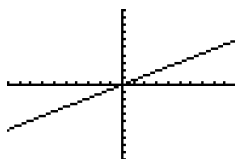
3. $y = x + 9$

   linear
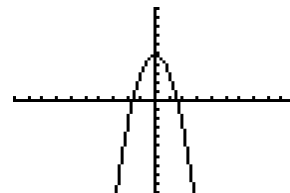
4. $y = \dfrac{3x}{5} = \dfrac{3}{5}x + 0$

   linear

5. $y = 5 - 2x^2$

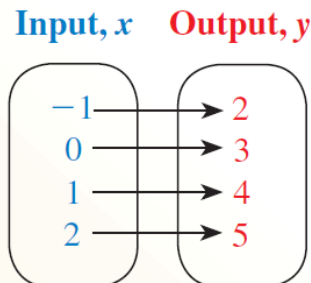   *nonlinear*

Concept Summary

Representations of Functions

1 Words   An output is 3 more than the input.
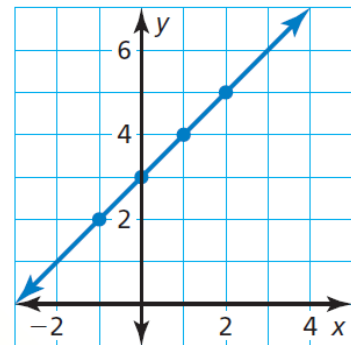
2 Equation $y = x + 3$

3 Input-Output Table

Input, x	Output, y
-1	2
0	3
1	4
2	5

4 Mapping Diagram

Input, x	Output, y
-1	2
0	3
1	4
2	5

5 Graph

Concept Summary

Core Concept

Discrete and Continuous Domains

A **discrete domain** is a set of input values that consists of only certain numbers in an interval. *pick up your pencil*

Example: Integers from 1 to 5

A **continuous domain** is a set of input values that consists of all numbers in an interval. *connect the dots*

Example: All numbers from 1 to 5

Core Concept

The linear function $y = 15.95x$ represents the cost y (in dollars) of x tickets for a museum. Each customer can buy a maximum of four tickets.
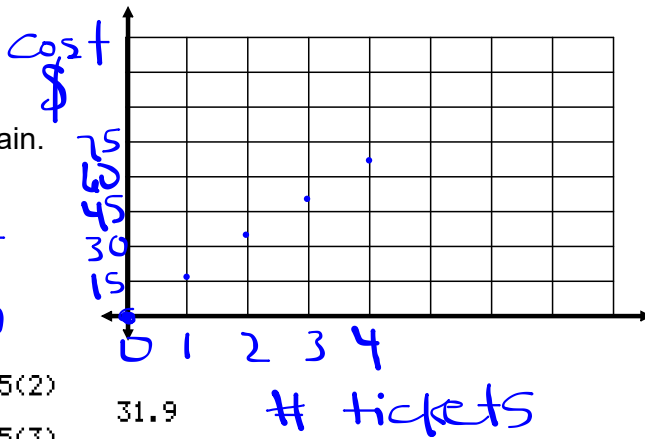
a. Find the domain of the function. Is the domain discrete or continuous? Explain.

$$D: \{0,1,2,3,4\}$$

b. Graph the function using its domain.

x	y=15.95x	y
0	15.95(0)	0
1	15.95(1)	15.95
2	15.95(2)	31.90
3	15.95(3)	
4	15.95(4)	

15.95(2)   31.9

15.95(3)   47.85

15.95(4)   63.8

Cost $

tickets

Example 4

A cereal bar contains 130 calories. The number c of calories consumed is a function of the number b of bars eaten.

a. Does this situation represent a linear function? Explain.

Yes $C(b) = 130b$

b. Find the domain of the function. Is the domain discrete or continuous? Explain.
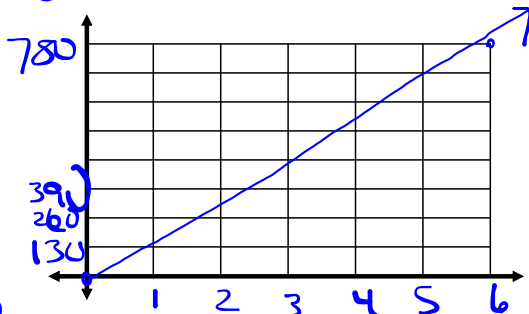
bars eaten $D: 0 \le x \le 6$

c. Graph the function using its domain.

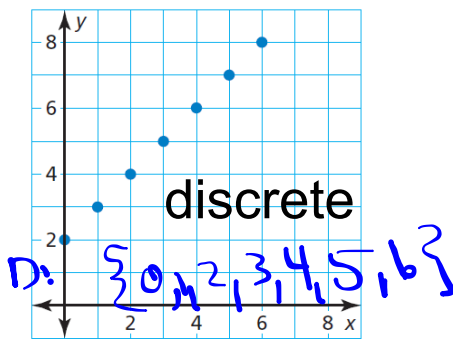| X	130X	y
0	130(0)	0
1		
2		
3		
4		
6	130(6)	780

X	Y1
0	0
1	130
2	260
3	390
4	520
5	650
6	780

Press + for ΔTbl

780

390
260
130

Example 5

Write a real-life problem to fit the data shown in the graph. Is the domain of the function *discrete* or *continuous*? Explain.

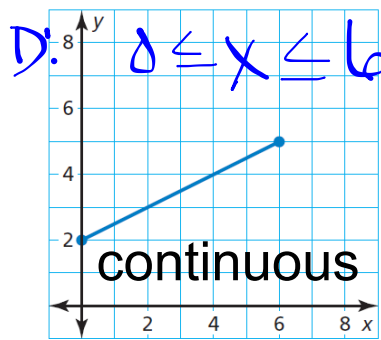discrete

D: $\{0, 2, 3, 4, 5, 6\}$

On a 6-point quiz, every student gets 2 free bonus points.

0 correct = 2 points

1 correct = 3 points

6 correct = 8 points

D: $0 \le x \le 6$

continuous

A marble is 2 cm from the wall when it starts rolling. It rolls 1 cm every 2 seconds for 6 seconds.

Monitoring Progress 11-12

HW: 3.2 DAY ONE

Pg. 117

A: 17 - 25 (o), 32 - 44(e), 50 - 53

B: 17 - 26, 32 - 44 (e), 50, 52

C: 17, 21, 23, 26, 32, 34, 36, 40, 42, 52

Oct 4-12:18 PM