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# Graphs of Functions

8.F.1, 8.F.2, 8.F.3, 8.F.5



Coordinate points are written in the form  $(x, y)$ , where  $x$  is the input and  $y$  is the output.

The graph of a linear function is a straight line. The graph of a nonlinear function is a curved line.

The equation of a linear function is in the form  $y = mx + b$ , where  $m$  represents the slope and  $b$  represents the  $y$ -intercept of the line.

A function is increasing if it moves upward from left to right. It is decreasing if it moves downward from left to right.

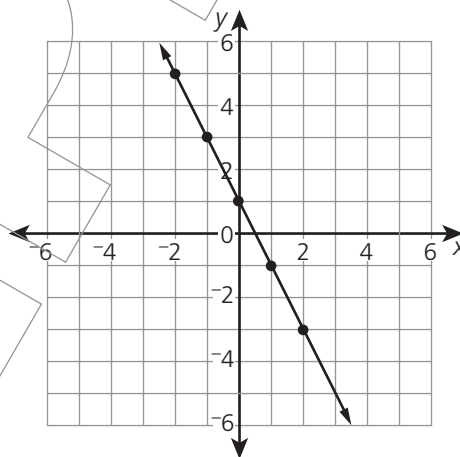
A linear function is either increasing everywhere or decreasing everywhere. A nonlinear function can increase and decrease over different intervals, or values, of  $x$ .

A function represented as an equation or in table form can also be represented as a graph. The  $x$ -coordinates represent the input. The  $y$ -coordinates represent the output.

Draw the graph of  $y = -2x + 1$ .

Make a table of values to find coordinate points for the graph. Choose any  $x$ -value for the input and find the corresponding  $y$ -value, or output. Then plot the points on a coordinate plane.

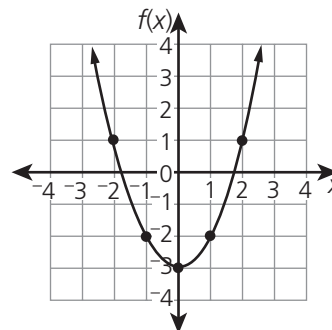
$x$	$y$
-2	5
-1	3
0	1
1	-1
2	-3



Functions can be linear or nonlinear. A **linear function** is one where it has the same change in  $y$ -values for each change in  $x$ -values. A **nonlinear function** has varying changes in  $x$ - and  $y$ -values.

Draw a graph of the function represented by this table of values. Explain whether the function is linear or nonlinear.

$x$	$f(x)$
-2	1
-1	-2
0	-3
1	-2
2	1

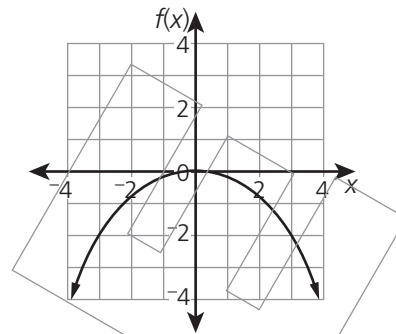


This function is nonlinear because it is not a straight line.

Read each problem. Circle the letter of the best answer.

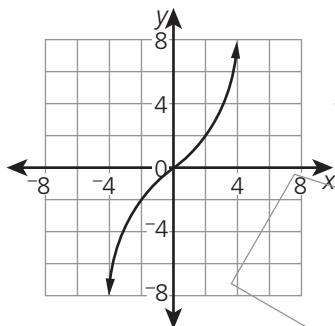
**SAMPLE** Which statement best describes the graph of this function?

- A** It increases everywhere.
- B** It decreases everywhere.
- C** It decreases for all values of  $x$ .
- D** It increases for negative values of  $x$ .



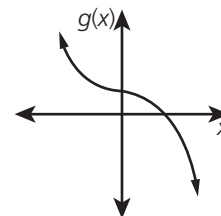
The correct answer is D. This graph shows a nonlinear function that both increases and decreases. The graph increases for all negative values of  $x$  since it moves upward from left to right for these values. It decreases for all positive values of  $x$  since it moves downward from left to right for these values.

**1** Which table of values matches this graph?



**2** Functions  $f(x)$  and  $g(x)$  are shown below.

$x$	$f(x)$
0	9
1	6
2	3
3	0



Which statement best describes these functions?

- A**

$x$	$y$
-2	2
-1	1
1	-1
2	-2
- B**

$x$	$y$
-2	-2
-1	-1
1	1
2	2
- C**

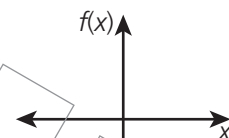
$x$	$y$
-2	-8
-1	-1
1	1
2	8
- D**

$x$	$y$
-8	-2
-1	-1
1	1
8	2

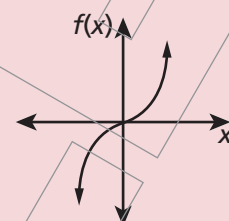
- A**  $f(x)$  and  $g(x)$  are nonlinear.
- B**  $f(x)$  is nonlinear and  $g(x)$  is linear.
- C**  $f(x)$  and  $g(x)$  increase everywhere.
- D**  $f(x)$  and  $g(x)$  decrease everywhere.

Read each problem. Write your answer.

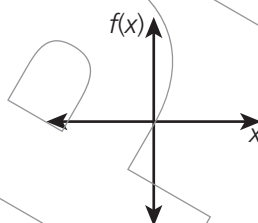
**SAMPLE** The function  $f(x)$  is nonlinear and it increases for all values of  $x$ . On the coordinate plane at the right, draw a graph that could represent  $f(x)$ .



A nonlinear graph is a curved line. A graph that increases for all values of  $x$  moves upward from left to right. The graph shown here satisfies both of these conditions.



**3** The function  $f(x)$  is linear and it decreases for all values of  $x$ . On the coordinate plane at the right, draw a graph that could represent  $f(x)$ .



**4** The surface area of a cube is represented by the function  $A(s) = 6s^2$ , where  $s$  is the side length of the cube. Explain whether this function is linear or nonlinear.

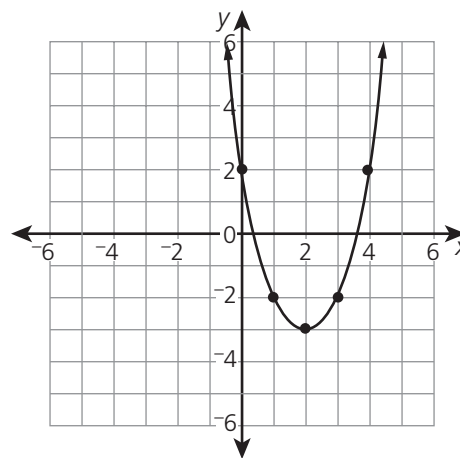
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**5** For which values of  $x$  is the function graphed here decreasing?

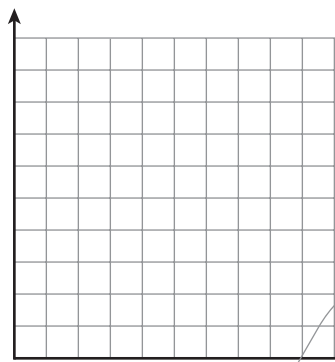
**Answer** \_\_\_\_\_



Read the problem. Write your answer to each part.

6 The function  $f(x) = 0.6x$  shows the relationship between the original price,  $x$ , in dollars, and the discounted price,  $f(x)$ , in dollars, of all clearance items at Max's Music Store.

**Part A** Graph this function on the coordinate plane below.



**Part B** The table of values below shows the relationship between the original price,  $x$ , and the discounted price,  $f(x)$ , of all clearance items at Timmy's Tunes.

$x$	20	25	30	35
$f(x)$	8	10	12	14



Find the discount factors for each store. Compare the change in  $f(x)$ -values to the change in  $x$ -values.

Which store has a better discount, Max's Music Store or Timmy's Tunes? Explain how you know.

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