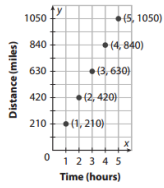


Algebra 1

5.1 Understanding Linear Functions

Explore 1 Recognizing Linear Functions

A race car can travel up to 210 mph. If the car could travel continuously at this speed, $y = 210x$ gives the number of miles y that the car would travel in x hours. Solutions are shown in the graph below.



x
3
3
3
3

The graph of the car's speed is a function because every x -value is paired with exactly one y -value. Because the graph is a non-vertical straight line, it is also a **linear function**.

- A Fill in the table using the data points from the graph above.
- B Using the table, check that x has a ~~constant~~ change between consecutive terms.

x	y
1	210
2	420
3	630
4	840
5	1050

1 < 1 210 > 210
1 < 2 420 > 210
1 < 3 630 > 210
1 < 4 840 > 210
1 < 5 1050 > 210

yes, 1

- C Now check that y has a ~~constant~~ change between consecutive terms.

yes, 210

- D Using the answers from before, what change in x corresponds to a change in y ?
for every 1 hr it increases 210 mi

- E All linear functions behave similarly to the one in this example. Based on this information a generalization can be made that a constant change in x will correspond to a constant change in y .

Discussion Consider the function $y = x^2$. Use two equal intervals to determine if the function is linear. The table for $y = x^2$ is shown.

x	$y = x^2$
1	1
2	8
3	27
4	64
5	125

1 < 1 1 > 7
1 < 2 8 > 19
1 < 3 27 > 37
1 < 4 64 > 61

nonlinear

a.

x	-2	-1	0	1	2
y	-6	-6	-4	0	6

$-1 -1 -1 -1$
 $-2 + 1 = -1$
 $-1 - 0 = -1$
 $0 - 1 = -1$
 $1 - 2 = -1$
 $0 + 4 = 4$
 $4 - 6 = -2$
4 6

Nonlinear

b.

x	2	-1	0	1	2
y	-2	1	4	7	10

Nonlinear
& not a function

c.

x	y
-3	5
-1	8
1	11
3	14

Linear

You Try:

d.

x	y
-20	9
-15	7
-10	4
-5	3

5's Nonlinear

Graphing Linear Functions Given in Standard Form

$y = mx + b$

Standard Form of a Linear Equation

$Ax + By = C$ where $A, B,$ and C are real numbers and A and B are not both 0.

Determine whether the equation is linear. If so, graph the function.

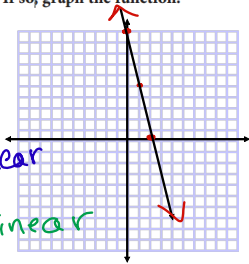
~~$5x + y = 10$~~ $5x + y = 10$ Linear

~~$y = -5x + 10$~~ $y = -5x + 10$ Linear

$3x^2 + y = 7$ Nonlinear

$4x^{\frac{1}{2}} + \frac{y}{5} = \frac{1}{5}$ Nonlinear

$x + 7y^2 = -3$ Nonlinear

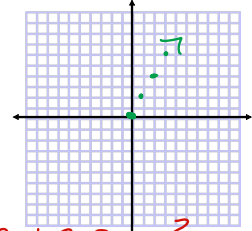


Example 2 Graph each function and give its domain and range.

(A) Sal opens a new video store and pays the film studios \$2.00 for each DVD he buys from them. The amount Sal pays is given by $f(x) = 2x$, where x is the number of DVDs purchased.

$f(x) = 2x$
 $y = 2x$

x	y
0	0
1	2
2	4
3	6



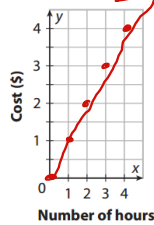
D: $\{0, 1, 2, 3, \dots\}$
R: $\{0, 2, 4, 6, \dots\}$

(B) Elsa rents a booth in her grandfather's mall to open an ice cream stand. She pays \$1 to her grandfather for each hour of operation. The amount Elsa pays each hour is given by $f(x) = x$, where x is the number of hours her booth is open.

$f(x) = x$
 $y = x$

x	y
0	0
1	1
2	2
3	3

Ice Cream Booth Rental



D: $x \geq 0$
all #'s greater than
or #s equal to 0
 $0 \leq x < \infty$
R: $y \geq 0$

Homework

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