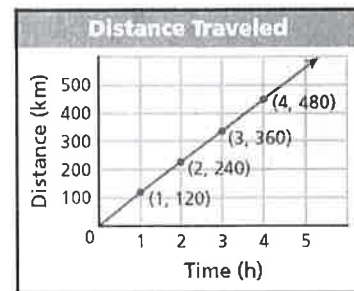


**Algebra 1**  
**Section 4.1 – Identifying Linear Functions**

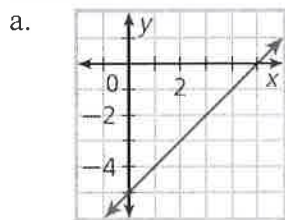
The graph represents a function because each input (x-value) is paired with exactly one output (y-value).

Notice that the graph is a straight line. A function whose graph forms a straight line is called a linear function.

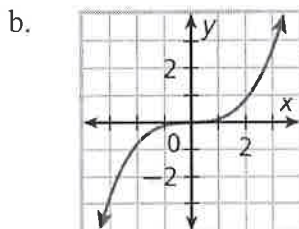


**Examples**

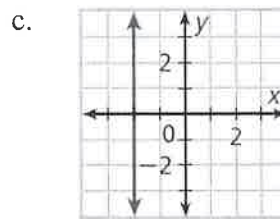
1. Identify whether the graph represents a function. Explain. If the graph does represent a function, is the function linear?



Function - Passes vertical line test.  
Linear Function



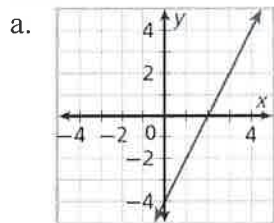
Function - Passes the vertical line test.  
Not linear function



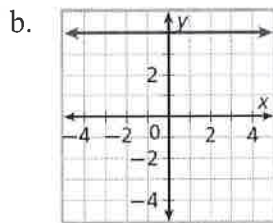
Not a function - fails vertical line test

**You Try!**

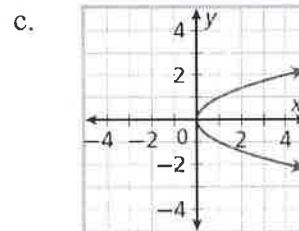
Identify whether the graph represents a function. Explain. If the graph does represent a function, is the function linear?



Function - passes vertical line test.  
Linear Function



Function - Passes the vertical line test  
Linear Function



Not a function - fails the vertical line test

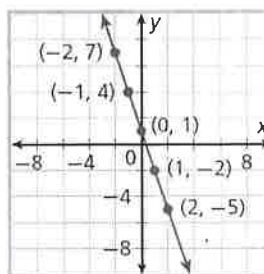
You can sometimes identify a linear function by looking at a table or a set of ordered pairs.

*\* A constant change in x to a constant change in y \**

x	y
-2	7
-1	4
0	1
1	-2
2	-5

+1 (change in x) and -3 (change in y) are indicated between rows.

Linear b/c a constant (+1) change in x corresponds with a constant (-3) change in y.



x	y
-2	7
-1	4
0	1
1	-2
2	-5

+1 (change in x) and -3 (change in y) are indicated between rows.

Linear b/c a constant (+1) change in x corresponds with a constant (-3) change in y.

### Examples

3. Tell whether the set of ordered pairs satisfies a linear function. Explain.

a.  $\{(0, -3), (4, 0), (8, 3), (12, 6), (16, 9)\}$

x	0	4	8	12	16
y	-3	0	3	6	9

Handwritten annotations:  $+4$  between x values,  $+3$  between y values.

Linear b/c a constant  $(+4)$  change in  $x$  corresponds to a constant  $(+3)$  change in  $y$ .

b.  $\{(-4, 13), (-2, 1), (0, -3), (2, 1), (4, 13)\}$

x	-4	-2	0	2	4
y	13	1	-3	1	13

Handwritten annotations:  $+2$  between x values,  $-12$ ,  $-4$ ,  $+4$ ,  $+12$  between y values.

Not linear b/c there is no constant change in  $y$ .

### Your Turn!

4. Tell whether the set of ordered pairs  $\{(3, 5), (5, 4), (7, 3), (9, 2), (11, 1)\}$  satisfies a linear function. Explain.

x	3	5	7	9	11
y	5	4	3	2	1

Handwritten annotations:  $+2$  between x values,  $-1$  between y values.

Linear b/c a constant  $(+2)$  change in  $x$  corresponds to a constant  $(-1)$  change in  $y$ .

Another way to determine whether a function is linear is to look at its equation.

A function is linear if it can be written in standard form or slope-intercept form

A linear equation is any equation that can be written in the two forms shown below.

STANDARD FORM

$$Ax + By = C$$

- A is positive
- No fractions or decimals
- A & B cannot both be zero

SLOPE-INTERCEPT FORM

$$y = mx + b$$

### Key Facts of Linear Equations in Standard Form

- \* x and y cannot be multiplied together
- \* x and y have exponents of 1
- \* x and y cannot appear in radicals or denominators

LINEAR		NOT LINEAR		
$y = 2x - 1$	$2x - 3y = 7$	$xy = 6$	$y = \sqrt{x}$	$y =  x $
$y = \frac{1}{2}x + 6$	$2x = 6 + y$	$y = x^2$	$y = \frac{1}{x}$	

### Examples

5. Determine whether the function is linear. Explain your answer.

a.  $x = 2y + 4$

$$\begin{aligned} & -2y - 2y \\ & x - 2y = 4 \end{aligned}$$

Linear Function

b.  $xy = 4$

Not linear

\* x and y are multiplied together

c.  $y = 5x - 9$

Linear Function

\* slope intercept form

d.  $y = 12$

Linear Function