Warm-up 9/17

Find 3 points for the following equations (x, y). You will choose your x's.

1.) $y = 2x + 4$

2.) $y - 2x = 4$

3.) $2x + 2y = 6$

Warm-up 9/17

Find 3 points for the following equations (x, y). You will choose your x's.

1.) $y = 2x + 4$

$y = 2(2) + 4$
$= 4 + 4$
$= 8$

$y = 2(3) + 4$
$= 6 + 4$
$= 10$

$y = 2(6) + 4$

(2, 8) (3, 10) (6, 16)

2.) $y - 2x = 4$

$+2x \quad +2x$

$y = 2x + 4$

$y - 2(5) = 4$

$y - 10 = 4$
$+10 \quad +10$
$y = 14$

$y = 2(3) + 4$
$= 6 + 4$
$= 10$

(5, 14) (3, 10) (6, 16)

3.) $2x + 2y = 6$

$-2x \quad -2x$

$\frac{2y}{2} = \frac{-2x}{2} + \frac{6}{2}$

$y = -x + 3$

$y = -(1.5) + 3$
$= 1.5$

$y = -(7) + 3$
$= -4$

$y = -(4) + 3$
$= -1$

(1.5, 1.5) (7, -4) (4, -1)

Today's Goals

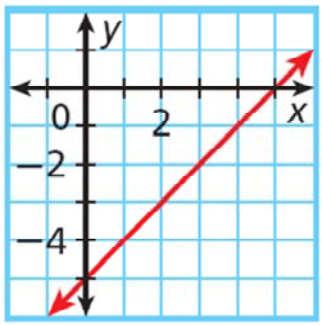
I can...

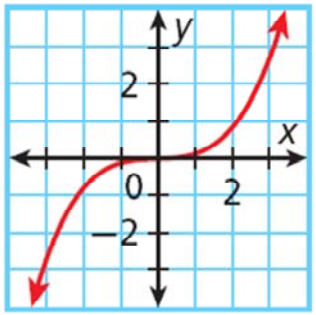
- identify linear functions and linear equations.
- give the domain and range of a linear function.
- graph linear functions that represent real-world situations.

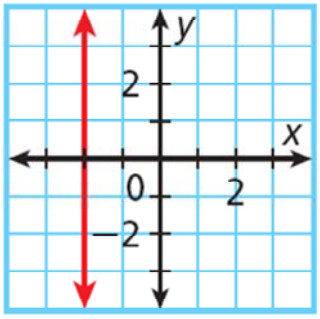
Section 4.1: Identify Linear Functions

Linear Function: **a function whose graph is a line; a function that has a constant rate of change**

Determining if a graph is a linear function.

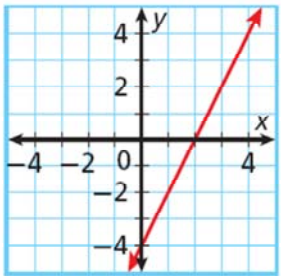


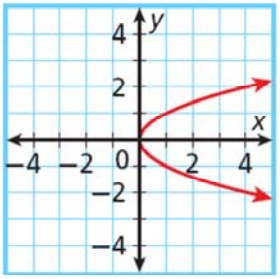




You Try These!

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

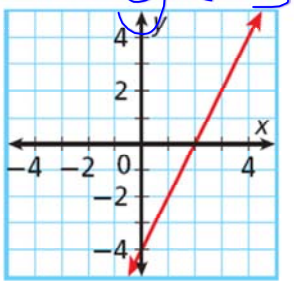




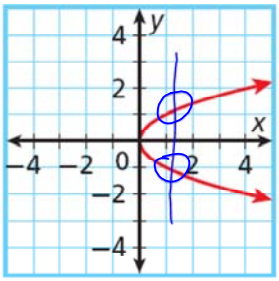
You Try These!

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

yes



NO



Determining if a table or ordered pairs are representing a linear function

yes

x	y	
-2	7	-3
-1	4	-3
0	1	-3
1	-2	-3
2	-5	

NO

x	y	
		-3
		-1
		1
		3

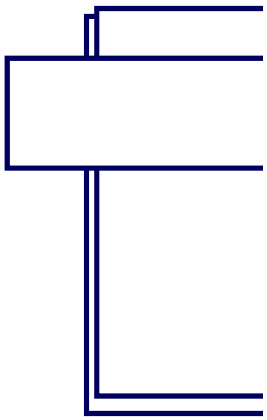
NO

x	y	
-4	13	-12
-1	1	-4
0	-3	4
1	1	12
7	13	

yes

{(0, -3), (4, 0), (8, 3), (12, 6), (16, 9)}

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



Determining if a table or ordered pairs are representing a linear function

If a table represents a linear function, then the x-values MUST change by a constant amount AND the y-values MUST change by a constant amount.

yes

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

NO

x	y
-2	6
-1	3
0	2
1	3
2	6

NO

x	y
-4	13
-1	1
0	-3
1	1
7	13

yes

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

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

You Try This!

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

You Try This!

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

yes, both x and y increase/decrease by a constant number

Determining if an equation is a linear function

A **linear equation** is any equation that can be written in the slope intercept form shown below.

Slope Intercept Form:

y = mx + b where m and b are real numbers.

m - slope b - y-intercept

If an equation is not in Slope Intercept Form, you can change it into the form.

y = 4x - 7

7x = -3y + 1

-1 -1

7x - 1 = -3y

-3 -3

$y = \frac{7x-1}{-3}$

2x - 3y = 4

-2x -2x

-3y = 4 - 2x

-3 -3

$y = \frac{4-2x}{-3}$

Determining if an equation is a linear function

A **linear equation** is any equation that can be written in the ***standard form*** shown below.

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

* find both intercepts

If an equation is not in Standard Form, you can change it into the form.

$y = 4x - 7$

$7x = -3y + 1$

$+3y \quad +3y$

$7x + 3y = 1$

$2x - 3y = 4$

Determining if an equation is a linear function

A **linear equation** is any equation that can be written in the point-slope form shown below.

Point-Slope Form:

$(y - y_1) = m(x - x_1)$ where m, y_1, and x_1 are real numbers.

* good for creating equations (x_1, y_1)

$y - 2 = 4(x - 4)$

$m = 4$

$P: (4, 2)$

$y + 2 = 0.5(x - 4)$

$m = 0.5$

$P: (4, -2)$

$y - 2 = -4(x + 4)$

$m = -4$

$P: (-4, 2)$

16. $y = -\frac{2}{5}x - 1$

17. $y = -\frac{1}{6}x + 1$

18. $y = 8$

19. $x = -4$

_____ _____ _____ _____

20. $y = -0.25x + 2$

21. $y = 0.125x - 2$

22. $y = -4x^3$

23. $y = \frac{x}{3} + 1$

16. $y = -\frac{2}{5}x - 1$

$y = -\frac{2}{5}x - 1$

$+\frac{2}{5}x \quad +\frac{2}{5}x$

$\frac{2}{5}x + y = -1$

yes

17. $y = -\frac{1}{6}x + 1$

$\frac{1}{6}x + y = 1$

yes

18. ~~$y = 8$~~

yes

19. $x = -4$

NO

must have y

20. $y = -0.25x + 2$

$0.25x + y = 2$

yes

21. $y = 0.125x - 2$

$-0.125 + y = -2$

yes

22. $y = -4x^3$

NO

23. $y = \frac{x}{3} + 1$

$-\frac{x}{3} + y = 1$

yes

Rules for determining if an equation is linear (if not in standard for)

1. If the variable x has any exponent other than 1 then the equation is **NOT LINEAR**

$2x^2 + 3y = 8$ $y = \frac{8-2x^2}{3}$

2. If the variable x is in the denominator then the equation is **NOT LINEAR**

$\frac{8}{x} + y = 4$ $y = 4 - \frac{8}{x}$

3. If the variable x is inside the $\sqrt{\ }$ sign then the equation is **NOT LINEAR**

$\sqrt{x} + 2y = 8$ $y = 4 - \frac{\sqrt{x}}{2}$

4. If the variable x is multiplied by y then the equation is **NOT LINEAR**

$xy = 8$ $y = \frac{8}{x}$

5. **If the variable x is the exponent then the equations is NOT LINEAR**

$2^x + y = 8$ $y = 8 - 2^x$

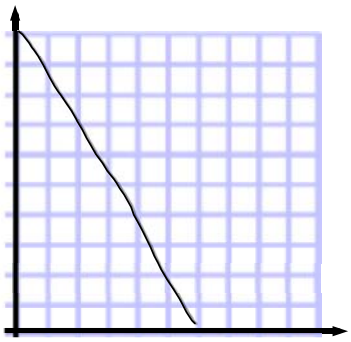
6. **Must have a y in the equation.**

$y = 8$ Linear Function

Application of Linear Functions

Tom has $20 that he can spend on roses and carnations. If roses cost $2 and carnations cost $1, write an equation to represent how many roses and carnations he can purchase, then graph the function.

Be sure to identify x and y.



$2x + 1y = 20$

$-2x \quad -2x$

$y = -2x + 20$

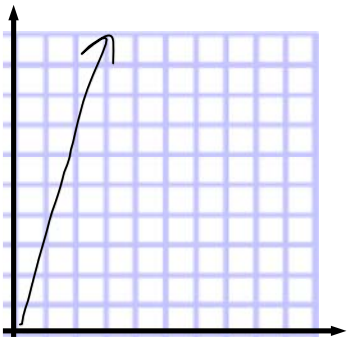
x - rose

y - carnation

Application of Linear Functions

Sue rents a manicure station in a salon and pays the salon owner $5.50 for each manicure she gives, where x is the number of manicures. Graph this function.

$y = 5.50x$



Application of Linear Functions

Sue rents a manicure station in a salon and pays the salon owner $5.50 for each manicure she gives, where x is the number of manicures. Graph this function.

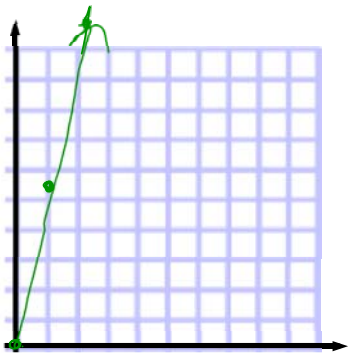
$f(x) = 5.50x$

$y = 5.50x$

x	y
0	0
1	5.50
2	11
3	16.50

D: {0, 1, 2, 3 . . . }

R: {0, 5.5, 11, 16.5 . . . }



You Try This!

At a salon, Sue can rent a station for $10.00 per day plus $3.00 per manicure, where *x* is the number of manicures. Graph this function and give its domain and range.

You Try This!

At a salon, Sue can rent a station for $10.00 per day plus $3.00 per manicure. The amount she would pay each day is given by $f(x) = 3x + 10$, where x is the number of manicures. Graph this function and give its domain and range.

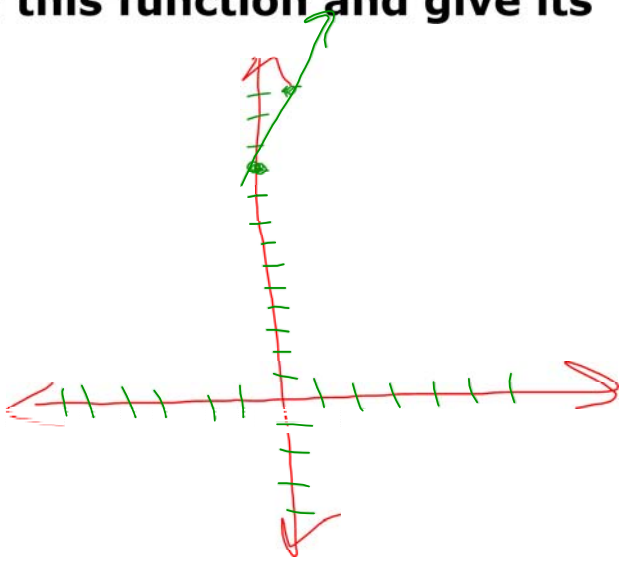
$f(x) = 3x + 10$

$y = 3x + 10$

whole #'s

D: {0, 1, 2, 3, ...}

R: {10, 13, 16, 19, ...}



Did we accomplish our goals for today?

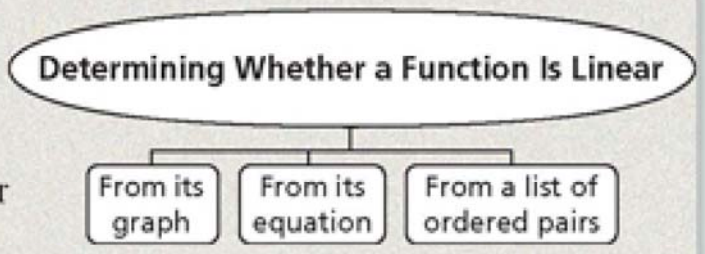
MATHEMATICAL PRACTICES

THINK AND DISCUSS

1. Suppose you are given five ordered pairs that satisfy a function. When you graph them, four lie on a straight line, but the fifth does not. Is the function linear? Why or why not?

2. ~~In Example 4, why is every point on the line not a solution?~~

3. **GET ORGANIZED** Copy and complete the graphic organizer. In each box, describe how to use the information to identify a linear function. Include an example.



Homework

Create 2 scenarios (word problems) that can be represented by a linear equation