Warm-up 10/18

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 10/18

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

1.) $y = 2x + 4$

$y = 2(3) + 4$

$y = 10$

$(3, 10) \ (0, 4)$

$(4, 12) \ (1, 6)$

2.) $y - 2x = 4$ $+2x \quad +2x$ $y = 2x + 4$

$y - 2(2) = 4$

$y - 4 = 4$

$+4 \quad +4$

$y = 8$

$(2, 8) \quad (4, 12)$

$(6, 16)$

3.) $2x + 2y = 6$ $-2x \quad -2x$ $\dfrac{2y}{2} = \dfrac{6}{2} - \dfrac{2x}{2}$

$2(9) + 2y = 6$ $y = 3 - x$

$-18 + 2y = 6$

$-18 \qquad -18$

$\dfrac{2x}{2} = \dfrac{-12}{2}$

$(4, -1)$

$y = -6$

$(9, -6) \ (2, 1)$

Warm-up 10/18

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

1.) $y = 2x + 4$

x	y
2	8
0	4
-2	0

2.) $y - 2x = 4$

$+2x \quad +2x$

$y = 4 + 2x$

x	y
3	10
0	4
-3	-2

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

$-2x \qquad -2x$

$\dfrac{2y}{2} = \dfrac{6 - 2x}{2}$

$y = \dfrac{6 - 2x}{2}$

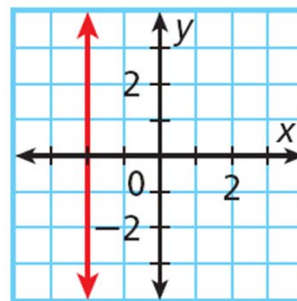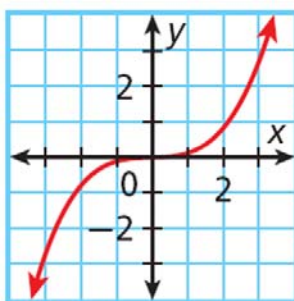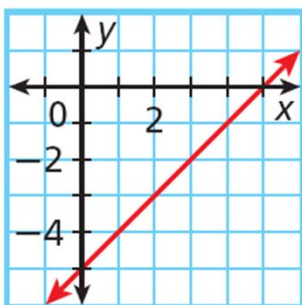| x	y
2	1
0	3
-2	5

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

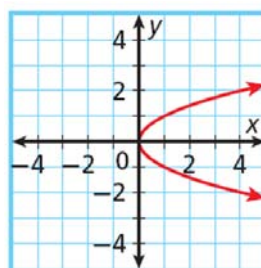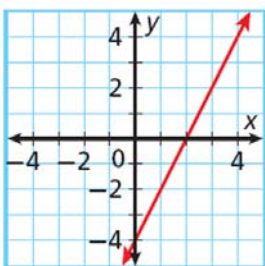Linear Function: **a function whose graph is a line**

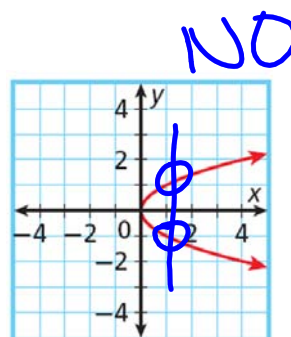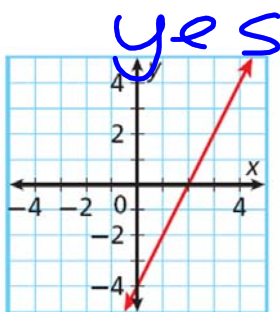Determining if a graph is a linear function.

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
-1	4
0	1
-1	-2
2	-5

-3
-3
-3
-3

NO

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

-3
-1

NO

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

(x, y)

{(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

> -3
> -3
> -3
> -3

NO

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

-3 -1

NO

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

-12 -4

yes

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

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

4 < : 3 > 3 > 3 > 3 >

10

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.

X	Y
3	5
5	4
7	3
9	2
11	1

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 *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

$$2x + 3y = 8$$

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

$y = 4x - 7$

$-4x \quad -4x$

$-4x + y = -7$

$y - 4x = -7$

$-4x + y = -7$

$7x = -3y + 1$

$+3y \quad +3y$

$7x + 3y = 1$

$2x - 3y = 4$

$2x + (-3y) = 4$

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**

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

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

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

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

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

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

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

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

$$2^{\textcircled{x}} + y = 8 \qquad\qquad y = 8 - 2^{\textcircled{x}}$$

6. Must have a y in the equation.

$$y = 8 \qquad\qquad \text{Linear Function}$$

14

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

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

$\frac{2}{5}x + y = -1$ ✓

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

18. $y = 8$

$0x + y = 8$

19. $x = -4$

$x + 0y = -4$

20. $y = -0.25x + 2$

$+0.25x \quad +0.25x$

$0.25x + y = 2$ ✓

21. $y = 0.125x - 2$

22. $y = -4x^3$

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

$\frac{x}{3} \quad -\frac{x}{3}$

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

$-\frac{x}{3} + y = 1$ ✓

16. $y = -\frac{2}{5}x - 1$ **17.** $y = -\frac{1}{6}x + 1$ **18.** $y = 8$ **19.** $x = -4$

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

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

$\frac{2}{5}x + y = -1$ $\frac{1}{6}x + y = 1$

(NO)

must have
y

<u>yes</u>   <u>yes</u>   <u>yes</u>   _____

20. $y = -0.25x + 2$ **21.** $y = 0.125x - 2$ **22.** $y = -4x^3$ **23.** $y = \frac{x}{3} + 1$

$0.25x + y = 2$ $-0.125 + y = -2$ NO $-\frac{x}{3} + y = 1$

yes   yes   yes

Application of Linear Functions

Sue rents a manicure station in a salon and pays the salon owner $5.50 for each manicure she gives. The amount Sue pays each day is given by f(x) = 5.50x, where x is the number of manicures. Graph this function and give its domain and range.
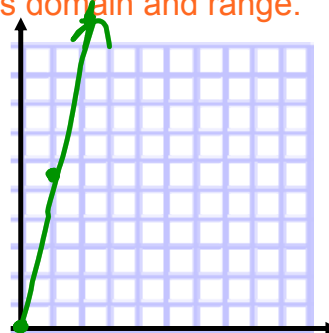
$$f(x) = 5.50x$$

$$y = 5.50x$$

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. 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.

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.
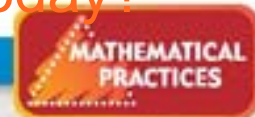
$f(x) = 3x + 10$

$y = 3x + 10$

Whole #'s

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

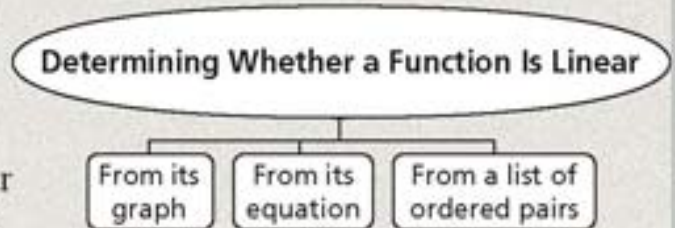R: $\{10, 13, 16, 19, \ldots\}$
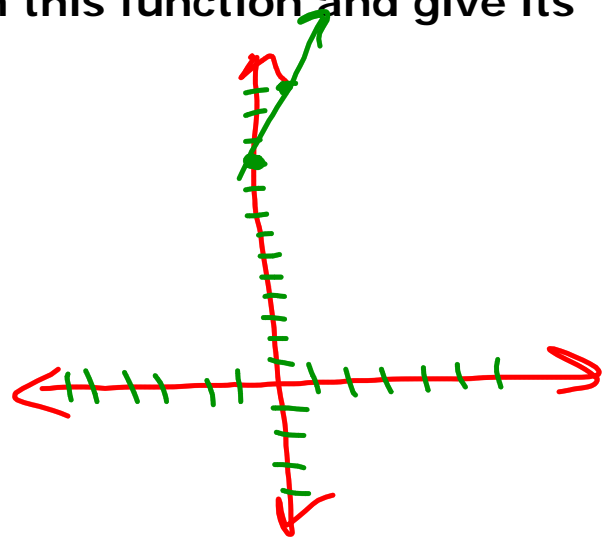
Did we accomplish our goals for today?

THINK AND DISCUSS

MATHEMATICAL PRACTICES

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.~~ ~~Explain why every point on the line is 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.

Determining Whether a Function Is Linear

| From its graph | From its equation | From a list of ordered pairs |

Homework

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