

Your Name

Mrs. Theo

/ /

Notes

## Lesson 1.2

# LINEAR FUNCTIONS

# AND TRANSFORMATIONS

Math Skill Objective: To be able to identify the parent function given a function. To be able to describe transformations of functions. To be able to graph linear and view them as transformations

[HSF.BF.B.3](#)

Life Lessons: It is great when friends are in sync and together like two close points. Sometimes when friends move on their path, you could move together in the same direction, like a translation, but some times you move apart and the rate of change you see in the differences between you can be great and make you sad.

Linear Functions

$y = mx + b$

m is slope  
# multiplied in front of x  
b is y-intercept  
on y-axis (0, b)  
# ± after x

$y = ax + k$

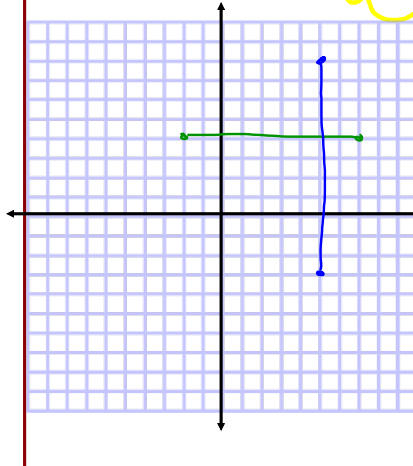
a = m  
vertical stretch  
pulls points up/down  
k = b  
vertical shift  
takes whole function up or down

Calculate Slope

Slope is:

- The stretch of a linear function
- The rate of change between two points

slope =  $m = a = \frac{\text{rise}}{\text{run}} = \frac{y_1 - y_2}{x_1 - x_2}$  Vertical  
horizontal



ex. (3, 2) and (-4, 5)  
 $x_1, y_1$        $x_2, y_2$

$m = \frac{2 - 5}{3 - (-4)} = \frac{-3}{7}$

$m = \frac{3}{-7} = -\frac{3}{7}$

ex. (-2, 4) and (7, 4)

$m = \frac{4 - 4}{-2 - 7} = \frac{0}{-9} = 0$

ex. (5, -3) and (5, 8)

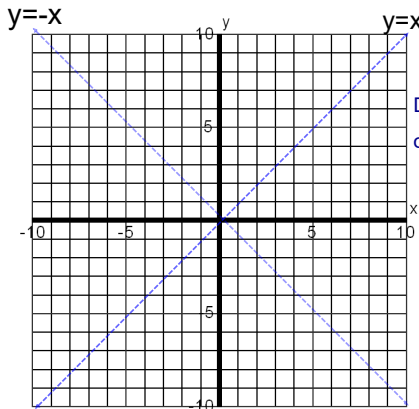
$m = \frac{-3 - 8}{5 - 5} = \frac{-11}{0} = \text{error}$

Undefined

Make a Table of Values and then Graph

1.  $f(x) = -3x - 1$

x	$f(x) = -3(\ ) - 1 = y$	(x, f(x)) (x, y)
-2		
-1		
0		
1		
2		



Describe the Transformations of  $y = -3x - 1$  compared to  $y = x$

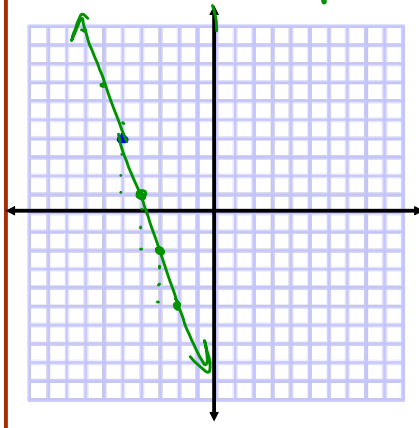
Graphing a Line

1. Make a point at the given coordinate
2. From the point move up and over the slope and make a point where you finish
3. Connect the points with a straight line

$(-5, 4) m = -3$  Transformation

$k=b=$  yint: \_\_\_\_\_

$a = m = -3 = \frac{-3}{-1} = \frac{3}{-1}$

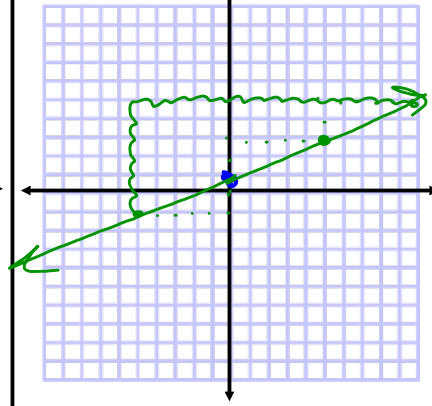


1. Make a point at the y-intercept (0,b)
2. From the point move up and over the slope and make a point where you finish
3. Connect the points with a straight line

$y = mx + b$   
 $y = \frac{2}{5}x + 1$  Transformation

$k=b=$  yint:  $(0, 1)$

$a = m = \frac{2}{5} = \frac{-2}{-5} = 0.4 = \frac{6}{15}$



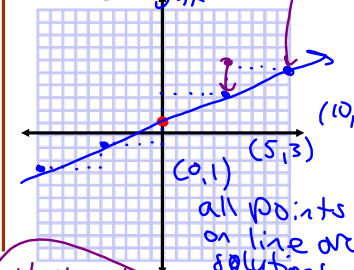
Graphing a Line

1. Make a point at the y-intercept (0,b)
2. From the point move up and over the slope and make a point where you finish
3. Connect the points with a straight line

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

$k=b=1$  yint:  $(0, 1)$  rise down

$a = m = \frac{2}{5}$  run right = 5, rise up = 2



all points on line are solutions to  $y = \frac{2}{5}x + 1$

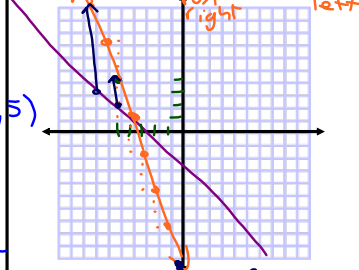
- Vertical shift up 1
- Vertical shrink by  $\frac{1}{2}$
- less steep

1. Make a point at the given coordinate
2. From the point move up and over the slope and make a point where you finish
3. Connect the points with a straight line

$(-5, 4) m = -3$  Transformation

$k=b=11$  yint: rise down

$a = m = -3 = \frac{-3}{1} = -3$  run right = 1, rise up = -3

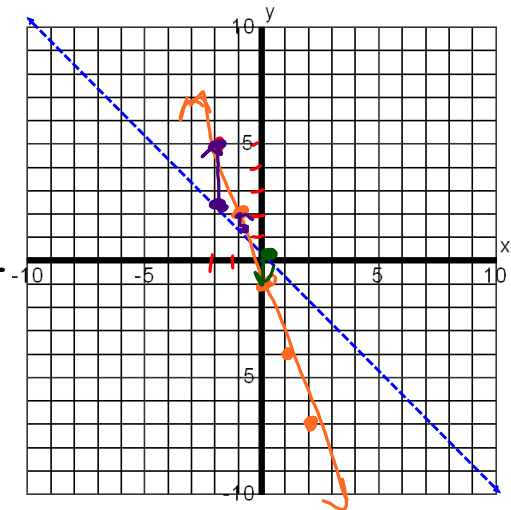


- Vertical shift down 11
- Reflection over X-axis (horizontal reflect)
- Vertical stretch by 3

Make a Table of Values and Graph

1.  $y = -3x - 1$

x	$y = -3(\ ) - 1$	(x,y)
-2	$y = -3(-2) - 1 = +6 - 1 = 5$	(-2, 5)
-1	$y = -3(-1) - 1 = 3 - 1 = 2$	(-1, 2)
0	$y = -3(0) - 1 = 0 - 1 = -1$	(0, -1)
1	$y = -3(1) - 1 = -3 - 1 = -4$	(1, -4)
2	$y = -3(2) - 1 = -6 - 1 = -7$	(2, -7)



Describe the Transformations

Vertical Shift down 1  
b/c  $k = -1$

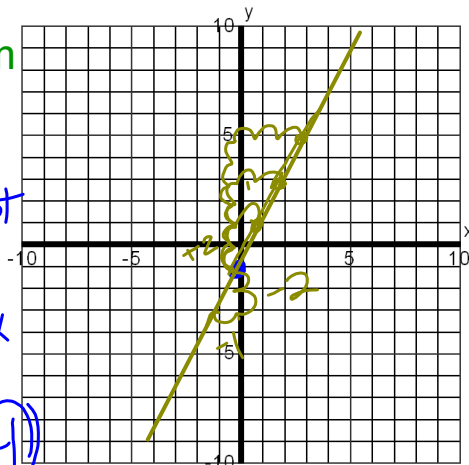
Vertical Reflection b/c  $a$  is negative  
over  $x$  axis  $a = -3$

Vertical Stretch by 3  
b/c  $a = -3$

Graph the line using b and m

$y = mx + b$

$m$  is slope  
# multiplied in front of  $x$   
 $\frac{\text{rise}}{\text{run}} = \frac{\text{vertical}}{\text{horizontal}}$   
y-intercept  $(0, b)$   
#  $\pm$  to  $x$



$y = 2x - 1 \rightarrow y = 2x + (-1)$

$b = -1$  y-int:  $(0, -1)$

$m = 2 = \frac{2}{1} = \frac{-2}{-1}$

$y = 2 - 3x$   
 $\rightarrow y = -3x + 2$

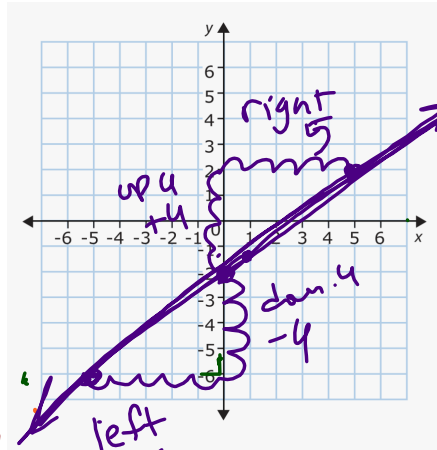
$\frac{2}{1} = \frac{4}{2} = \frac{6}{3}$

1.2 Day 1 Bell Ringer: Complete here or on paper, take a picture and attach it in the class notebook

Graph:  $y = \frac{4}{5}x - 2$

$a = m = \frac{4}{5} = \frac{\text{rise}}{\text{run}} = \frac{-4}{-5}$   $y\text{-int} = b$

$k = b = -2$   $(0, -2)$



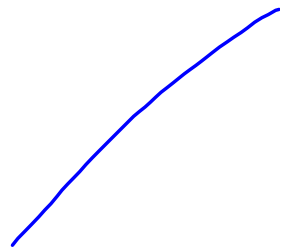
Describe Transformation

Vert. shrink  $\frac{4}{5}$

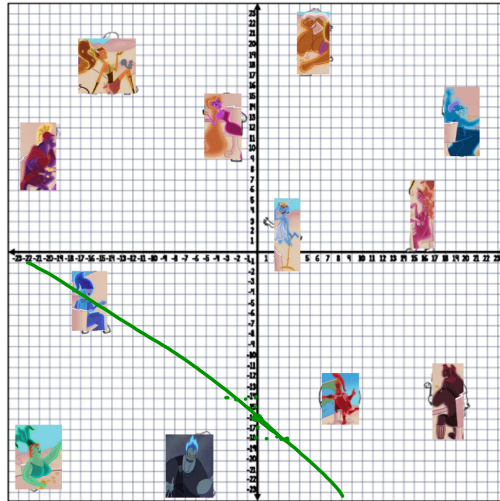
Vert. shift down 2

Domain

Range



Graphing Lines and Meeting Greek Gods and Goddesses Header:



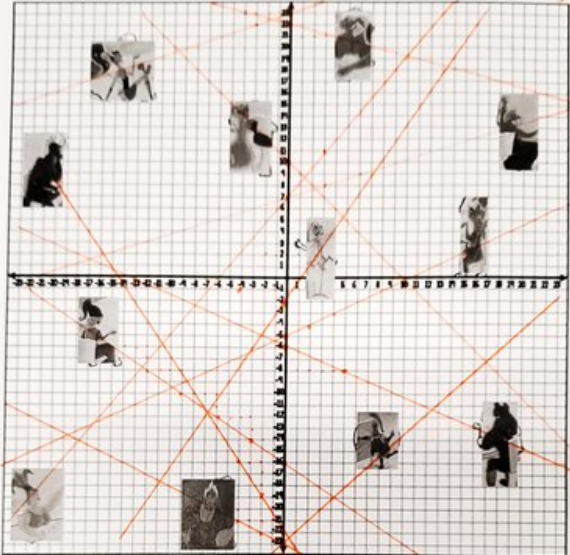
Graph each line and match it to the Greek god or goddess you "meet." To "meet" a deity you must run into any piece of its body. Each line should only meet one god or goddess. If you meet more than 1, you were not precise enough.















These are the equations you are to graph and use to meet the gods and goddesses. Write these equations next to the god or goddess it allows you to "meet."

$y = -2/3x - 16$	$y = -1/2x - 23$	$y = -3/2x - 22$	$y = -1/4x + 22$
$y = x - 23$	$y = 4/3x + 7$	$y = 1/3x + 7$	$y = 4/3x - 2$
$y = -x + 10$	$y = 1/3x + 23$	$y = -2/5x - 6$	$y = 1/2x - 5$

Graphing Lines and Meeting Greek Gods and Goddesses Header: *Key*



Graph each line and match it to the Greek god or goddess you "meet." To "meet" a deity you must run into any piece of its body. Each line should only meet one god or goddess. If you meet more than 1, you were not precise enough.

 $y = -\frac{2}{3}x - 22$	 $y = -x + 10$	 $y = -\frac{1}{4}x + 22$	 $y = -\frac{2}{5}x - 6$
 $y = -\frac{2}{3}x + 6$	 $y = -\frac{1}{2}x - 23$	 $y = \frac{4}{3}x - 2$	 $y = \frac{1}{2}x - 5$
 $y = \frac{4}{3}x + 7$	 $y = \frac{1}{3}x + 23$	 $y = \frac{1}{3}x + 23$	 $y = \frac{1}{3}x + 7$