GUIDED NOTES – 4.1 LINEAR FUNCTIONS

LEARNING OBJECTIVES

In this section, you will:

- Represent a linear function.
- Determine whether a linear function is increasing, decreasing, or constant.
- Interpret slope as a rate of change.
- Write and interpret an equation for a linear function.
- Graph linear functions.
- Determine whether lines are parallel or perpendicular.
- Write the equation of a line parallel or perpendicular to a given line.

REPRESENTING LINEAR FUNCTIONS

Study the box in your textbook section titled "linear function."
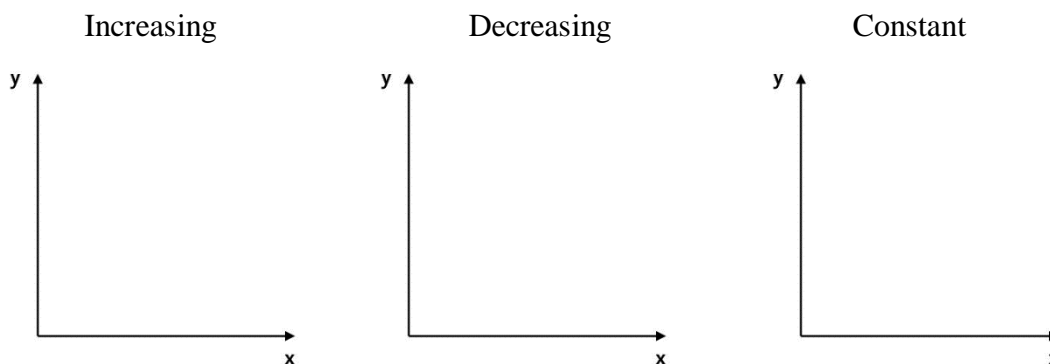
- Write the slope-intercept form of a line below.

- b represents the _____ and m represents the

  _____ .

- The y-intercept is at _____ .

DETERMINING WHETHER A LINEAR FUNCTION IS INCREASING, DECREASING, OR CONSTANT

*Study **Figure 5** in your textbook section.*

- Draw an example of an increasing, decreasing and constant linear function below.

| Increasing | Decreasing | Constant |

Study the box in your textbook section titled "increasing and decreasing functions."

- When is $y = mx + b$ a(n):

    - Increasing function: _____

    - Decreasing function: _____

    - Constant function: _____

INTERPRETING SLOPE AS A RATE OF CHANGE

Study the box in your textbook section titled "calculate slope."

- Give the formula used for calculating the slope, or rate of change, of a function.

- Write out the 3 step process for calculating and interpreting the slope, given two points from a linear function.

    1.

    2.

    3.

Try It: Read Example 3 in the text, then answer the following.

If $f(x)$ is a linear function, and (2,3) and (0,4) are points on the line, find the slope. Is this function increasing or decreasing?

Try It: Read Example 4 in the text, then answer the following.

The population of a small town increased from 1,442 to 1,868 between 2009 and 2012. Find the change of population per year if we assume the change was constant from 2009 to 2012.

WRITING AND INTERPRETING AN EQUATION FOR A LINEAR FUNCTION

- Write out the 4 step process for writing an equation to represent the function, given the graph of a linear function.

    1.

    2.

    3.

    4.

Try It: Read Examples 5, 6, and 7 in the text, then answer the following.

If $f(x)$ is a linear function, with $f(2) = -11$, and $f(4) = -25$, find an equation for the function in slope-intercept form.

MODELING REAL-WORLD PROBLEMS WITH LINEAR FUNCTIONS

- Write out the 3 step process for evaluating $f(c)$, given a linear function f and the initial value and rate of change.

    1.

    2.

    3.

Try It: Read Examples 8, 9, and 10 in the text, then answer the following.

A new plant food was introduced to a young tree to test its effect on the height of the tree. **Table 2** shows the height of the tree in feet, x months since the measurements began. Write a linear function, $H(x)$, where x is the number of months since the start of the experiment.

x	0	2	4	8	12
$H(x)$	12.5	13.5	14.5	16.5	18.5

Table 2

GRAPHING LINEAR FUNCTIONS

- Write out the 5 step process for graphing by plotting points, given a linear function.
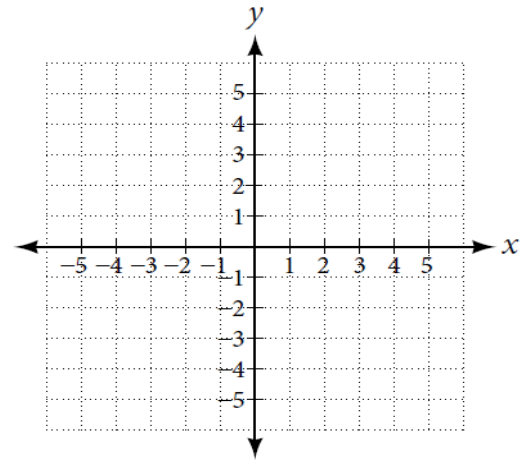
    1.

    2.

    3.

    4.

    5.

Try It: Read Example 11 in the text, then answer the following.

Graph $f(x) = -\frac{3}{4}x + 6$ by plotting points.

Study the box in your textbook section titled "graphical representation of a linear function."

- Explain below what b and m represent in the equation $f(x) = mx + b$.

- Write out the 5 step process for graphing the function using the y-intercept and slope, given an equation for a linear function.

  1.

  2.

  3.

  4.

  5.

Try It: Read Example 12 in the text, then answer the following.

Find a point on the graph in **Figure 13** that has a negative x-value.
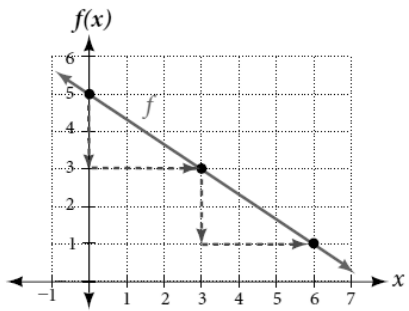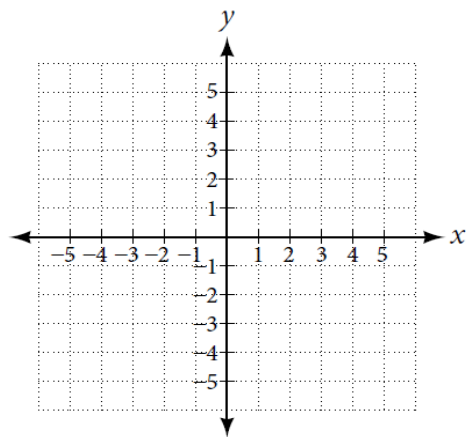
$f(x)$

Figure 13 Graph of $f(x) = -\frac{2}{3}x + 5$ and shows how to calculate the rise over run for the slope.

- Write out the 3 step process for using transformations to graph the linear function in the form $f(x) = mx + b$, given an equation of a linear function.

   1.

   2.

   3.

Try It: Read Example 13 in the text, then answer the following.

   Graph $f(x) = 4 + 2x$, using transformations.

WRITING THE EQUATION FOR A FUNCTION FROM THE GRAPH OF A LINE

- Write out the 3 step process for finding the equation to describe the function, given a graph of a linear function.

    1.

    2.

    3.

Study the box in your textbook section titled "x-intercept."

- The x-intercept of the function is the value of x when $f(x) = $ _____. It can be solved by the equation

    _____ .

    Try It: Read Example 15 in the text, then answer the following.

    Find the x-intercept of $f(x) = \frac{1}{4}x - 4$.

Study the box in your textbook section titled "horizontal and vertical lines."

- Give the equations for the following types of lines:
    1. Horizontal Line

    2. Vertical Line

DETERMINING WHETHER LINES ARE PARALLEL OR PERPENDICULAR

- Two lines that are parallel will never intercept. They have exactly the same steepness, which means they

  have the same _____. If the slopes are the _____ and the y-intercepts

  are _____, then the lines are parallel.

- Perpendicular lines do not have the same slope. The slope of one line is the _____ of

  the slope of the other line. If m_1 and m_2 are negative reciprocals of each other, they can be multiplied

  together to get _____.

WRITING THE EQUATION OF A LINE PARALLEL OR PERPENDICULAR TO A GIVEN LINE

- Write out the 3 step process for writing the equation of a line parallel to the given line that passes through the given point, given the equation of a function and a point through which its graph passes.

    1.

    2.

    3.

- Write out the 5 step process for writing the equation of a line perpendicular to the given line, given the equation of a function and a point though which its graph passes.
    1.

    2.

    3.

    4.

5.

Try It: Read Example 20 in the text, then answer the following.

Given the function $h(x) = 2x - 4$, write an equation for the line passing through (0,0) that is

a. Parallel to $h(x)$ **b.** Perpendicular to $h(x)$

- Write out the 4 step process for writing the equation of the perpendicular line that passes through the point, given two points on a line and a third point.

  1.

  2.

  3.

  4.

Try It: Read Example 21 in the text, then answer the following.

A line passes through the points $(-2, -15)$ and $(2, -3)$. Find the equation of a perpendicular line that passes through the point $(6, 4)$.