

3.1 Notes: Intro to Functions

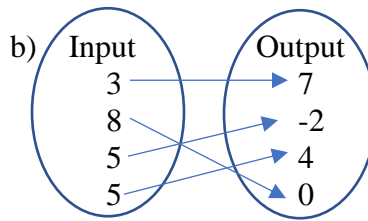
Key Vocabulary

|               |              |
|---------------|--------------|
| <b>Domain</b> | <b>Range</b> |
|---------------|--------------|

**Example 1:** Find the domain and range for each set of ordered pairs below.

a)

|          |    |    |    |    |    |
|----------|----|----|----|----|----|
| <b>x</b> | 1  | 2  | 3  | 4  | 5  |
| <b>y</b> | 11 | 12 | 13 | 13 | 13 |

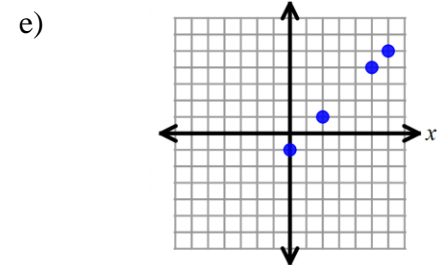


**You try!**

c)  $\{(7, -1), (6, 5), (-3, 2), (0, 5)\}$

d)

| input | output |
|-------|--------|
| 3     | Red    |
| 7     | Blue   |
| -2    | Green  |
| 5     | Green  |
| -4    | Green  |



Key Vocabulary

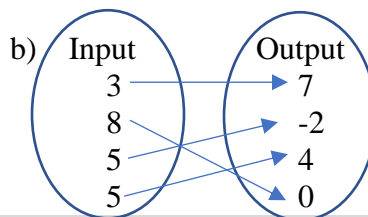
|                 |                 |
|-----------------|-----------------|
| <b>Relation</b> | <b>Function</b> |
|-----------------|-----------------|

|                           |
|---------------------------|
| <b>Vertical Line Test</b> |
|---------------------------|

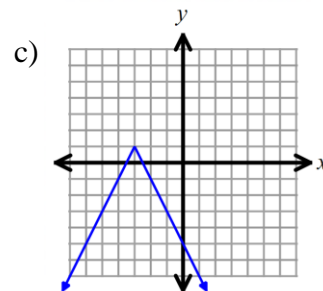
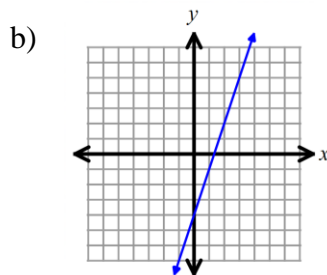
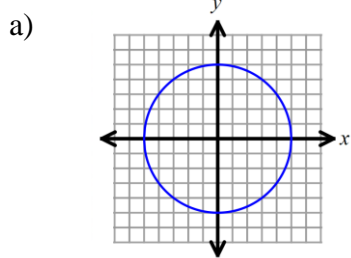
**Example 2:** For each relation, is it a function?

a)

|          |    |    |    |    |    |
|----------|----|----|----|----|----|
| <b>x</b> | 1  | 2  | 3  | 4  | 5  |
| <b>y</b> | 11 | 12 | 13 | 13 | 13 |



**Example 3:** For each relation, is it a function?

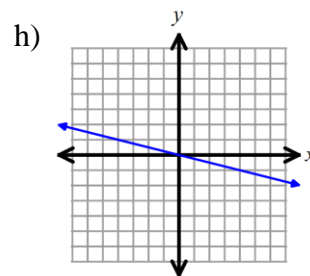
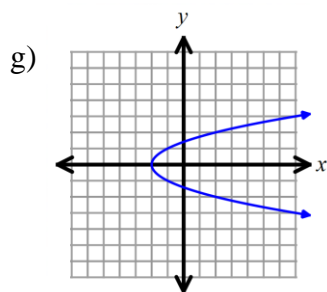
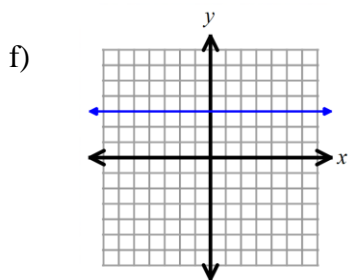


**You try!**

d)  $\{(7, -1), (6, 5), (-3, 2), (0, 5)\}$

e) 

|    |       |
|----|-------|
| 3  | Red   |
| 7  | Blue  |
| -2 | Green |
| 5  | Green |
| -4 | Green |



**Function Notation:**

**For Examples 4 – 9, given that  $f(x) = 3x - 9$  and  $g(x) = -4x + 5$ .**

4) Find  $f(-2)$ .

5) Find  $g(7)$ .

6) **You try!** Find  $f(8)$ .

7) Find  $x$  if  $f(x) = 10$ .

8) Find  $x$  if  $g(x) = -5$ .

9) **You try!** Find  $x$  if  $g(x) = 0$ .

## 3.2 Notes: Linear Functions

Key Vocabulary

|                        |                  |
|------------------------|------------------|
| <b>Linear Function</b> |                  |
| <b>Rate of Change</b>  | <b>Zero Term</b> |

**Examples 1 – 2:** Write a linear function for the data shown in each table.

1)

|        |    |    |    |    |
|--------|----|----|----|----|
| $x$    | -1 | 0  | 1  | 2  |
| $f(x)$ | 17 | 32 | 47 | 62 |

2)

|     |        |
|-----|--------|
| $x$ | $g(x)$ |
| 1   | 5      |
| 2   | 2      |
| 3   | -1     |
| 4   | -4     |

**You try! Examples 3 – 6:** Write a linear function for the data shown in each table.

3)

|        |   |    |     |     |
|--------|---|----|-----|-----|
| $x$    | 0 | 1  | 2   | 3   |
| $h(x)$ | 1 | -5 | -11 | -17 |

4)

|     |        |
|-----|--------|
| $x$ | $d(x)$ |
| 1   | 6      |
| 2   | 8.5    |
| 3   | 11     |
| 4   | 13.5   |

5)

|     |     |
|-----|-----|
| $x$ | $y$ |
| -2  | 9   |
| -1  | 13  |
| 0   | 17  |
| 1   | 21  |

6)

|        |   |   |    |    |
|--------|---|---|----|----|
| $x$    | 1 | 2 | 3  | 4  |
| $h(x)$ | 5 | 2 | -1 | -4 |

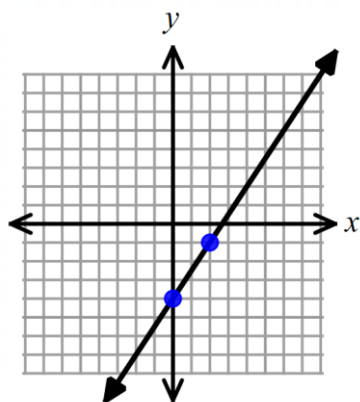
**Slope-intercept form of a line:**

For Examples 7 – 12, write the equation of the described line in slope-intercept form.

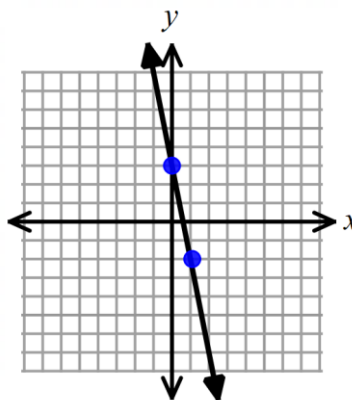
7) A line with a slope of  $\frac{1}{3}$  and a y-intercept of 10.

8) A line with a y-intercept of -7 and a slope of 5.

9) The line graphed below.



10) **You try!** The line graphed below.

**You try #11 – 12:**

11) A line with a slope of 1 and a y-intercept of 0.

12) A line with a y-intercept of  $-\frac{3}{4}$  and a slope of 8.

Review: find the slope between the points below. Use the slope formula:  $m = \frac{y_2 - y_1}{x_2 - x_1}$

13)  $(-14, 30)$  and  $(12, 27)$

14)  $(-3, -5)$  and  $(9, -2)$

**3.3 Notes: Writing Linear Equations in  $(h, k)$  Form**

$(h, k)$  form of a line:

**Example 1:** Write the equation of the line, in  $(h, k)$  form, that passes through  $(5, -2)$  with a slope of  $-3$ .

**Example 2:** Write the equation of the line, in  $(h, k)$  form, that passes through  $(-7, 1)$  with a slope of  $5$ .

**You try! Example 3 – 4:** For each line described below, write the equation in  $(h, k)$  form.

3) through  $(-3, 1)$  with a slope of  $2$

4) through  $(4, 6)$  with a slope of  $\frac{3}{4}$ .

| $(h, k)$<br>form |  |  |
|------------------|--|--|
|                  |  |  |

**Converting to Slope-intercept form:**

**Example 5:** Write the equation of the line from Example 1 in **slope-intercept form** of a line.

**You Try! Example 6:** Write the equation of the line from Example 2 in **slope-intercept form** of a line.

**Example 7:** Write the equation of the line from Example 4 in **slope-intercept form** of a line.

**Function Notation for an ordered pair:**

**Example 8:** Write the equation of the line, in  $(h, k)$  form, that contains  $f(-11) = -2$  and has a slope of 2.

**You try! Example 9:** Write the equation of the line, in  $(h, k)$  form, that contains  $f(14) = -5$  and has a slope of  $-\frac{1}{2}$ .

**Writing Equations of Lines from Word Problems in Slope-Intercept Form:**

“Starting value” or “one-time fee”:

Rate of change (look for “per” or “each”):

**Examples 10 – 13: write an equation in slope-intercept form to represent each situation.**

10) A plumber charges \$40 per hour, plus a one-time service fee of \$50. Use  $c$  for the total cost and  $h$  for the number of hours.

11) A t-shirt company charges a set-up fee of \$30, plus \$12 per t-shirt ordered. Use  $y$  for the total cost and  $x$  for the number of t-shirts ordered.

**You try!**

12) Andrea is keeping track of how many miles she runs. So far, she has run 34 miles, and she plans to run an additional 4 miles each day. Use  $T$  for the total number of miles run, and  $d$  for the number of days she is going to continue running.

**You try!**

13) You are visiting Baltimore, and a taxi company charges a flat fee of \$8.00 for using the taxi, as well as \$2.50 per mile. Use  $c$  for the total cost and  $m$  for miles.

14) For the situation in #11, if you use the taxi for 31 miles, how much would this trip cost?

**3.4 Notes: Writing Linear Equations from Two Points**

**$(h, k)$  form:**

- What do we need to write the equation of a line in  $(h, k)$  form?
- If we have two ordered pairs (two points), could we get this information?

**Using  $(h, k)$  form to write the equation of a line that passes through two points:**

**Example 1:** Write the equation of the line that passes through the points  $(7, 3)$  and  $(5, 9)$ . Write your answer in  $(h, k)$  form.

**Note:** Could you write a different answer that is equivalent? If so, how many?

**Example 2:** Write the equation of the line that passes through the points  $(6, -2)$  and  $(9, -8)$ . Write your answer in  $(h, k)$  form.

**Example 3:** convert your answer from #2 to slope-intercept form.

**Example 4:** Write the equation of the line that passes through the points  $(-8, 1)$  and  $(2, 3)$ . Write your answer in  $(h, k)$  form.

**Example 5:** Write the equation of the line that passes through the points  $(5, 4)$  and  $(10, 6)$ . Write your answer in  $(h, k)$  form.

**Example 6:** Consider the line that passes through the points  $(-2, -3)$  and  $(2, 3)$ . Write *as many* correct equations for this line as you can. 😊

Now graph the two points from Example 6. Verify that your lines are correct by graphing them, and making sure they go through both points above.

