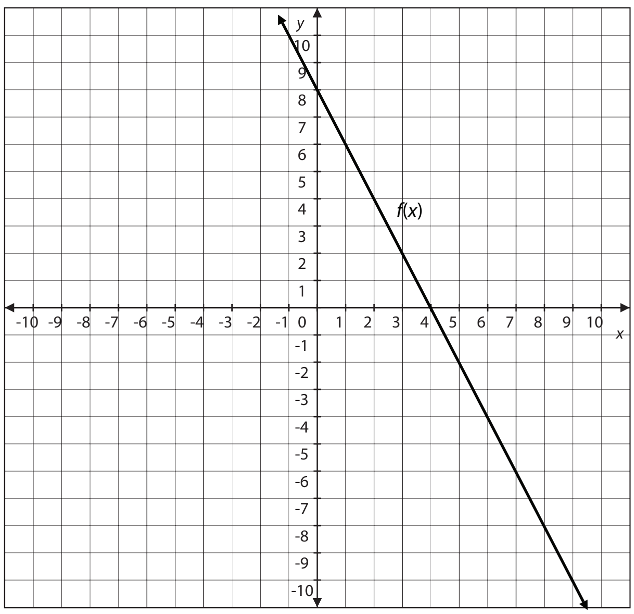
Guided Practice 2.8

Example 1

The functions $f(x)$ and $g(x)$ are shown. Compare the properties of each.



x	$g(x)$
–2	–10
–1	–8
0	–6
1	–4

1. Identify the rate of change for the first function, $f(x)$.

   Let (0, 8) be (x_1, y_1) and (4, 0) be (x_2, y_2).

   Substitute the coordinates into the slope formula.

   $m=\dfrac{y_2-y_1}{x_2-x_1}$ Slope formula

   $=\dfrac{(0)-(8)}{(4)-(0)}$ Substitute (0, 8) for (x_1, y_1) and (4, 0) for (x_2, y_2).

   $=\dfrac{-8}{4}$ Simplify.

   $=-2$

   The rate of change for this function is –2.

2. Identify the rate of change for the second function, $g(x)$.

   Choose two ordered pairs from the table. Let (–2, –10) be (x_1, y_1) and let (–1, –8) be (x_2, y_2).

   Substitute the coordinates into the slope formula.

   $m = \dfrac{y_2 - y_1}{x_2 - x_1}$ Slope formula

   $= \dfrac{(-8)-(-10)}{(-1)-(-2)}$ Substitute (–2, –10) for (x_1, y_1) and (–1, –8) for (x_2, y_2).

   $= \dfrac{2}{1}$ Simplify.

   $= 2$

   The rate of change for this function is 2.

3. Identify the y-intercept of the first function, $f(x)$.

   The graph intersects the y-axis at (0, 8), so the y-intercept is 8.

4. Identify the y-intercept of the second function, $g(x)$.

   From the table, we can determine that the function would intersect the y-axis where the x-value is 0. This happens at the point (0, –6). The y-intercept is –6.

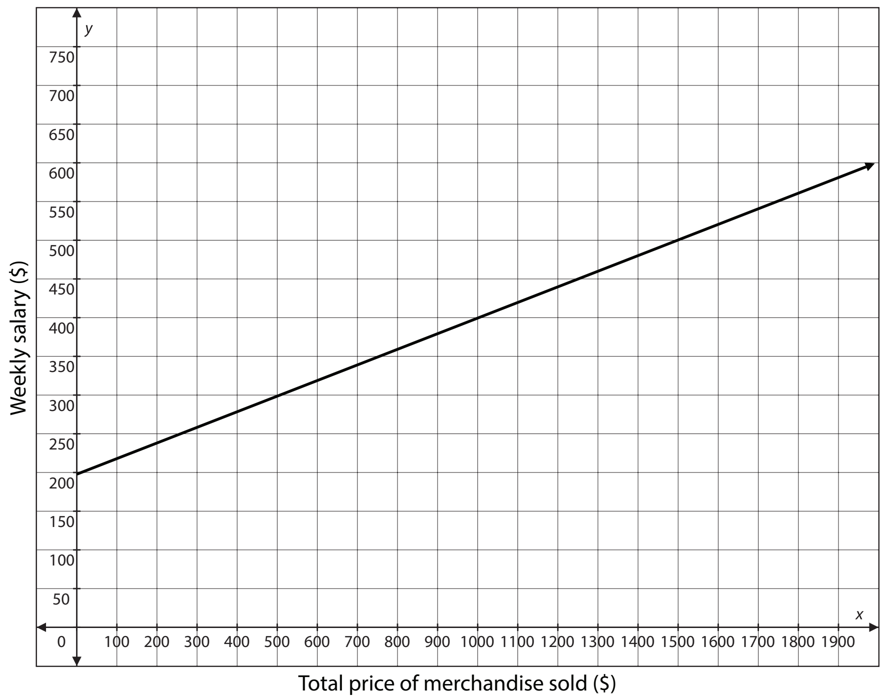
5. Compare the properties of each function.

   The rate of change for the first function is –2 and the rate of change for the second function is 2. The first function is decreasing and the second is increasing, but the absolute values of the slopes are equal, so the lines are equally steep.

   The y-intercept of the first function is 8, but the y-intercept of the second function is –6. The graph of the second function intersects the y-axis at a lower point.

Example 2

Your employer has offered two pay scales for you to choose from. The first option is to receive a base salary of $250 a week plus 15% of the price of any merchandise you sell. The second option is represented in the graph, where *x* represents the price of the merchandise sold and *y* represents your weekly salary. Compare the properties of the functions.



1. Identify the rate of change for the first function.

   Determine which information tells you the rate of change, or the slope, *m*.

   You are told that your employer will pay you 15% of the price of the merchandise you sell.

   This information is the rate of change for this function and can be written as 0.15.

2. Identify the *y*-intercept for the first function.

   Your employer has offered a base salary of $250 per week.

   250 is the *y*-intercept of the function.

3. Identify the rate of change for the second function.

   Let (0, 200) be (x_1, y_1) and (500, 300) be (x_2, y_2).

   Substitute the values into the slope formula.

   $m=\dfrac{y_2-y_1}{x_2-x_1}$ Slope formula

   $=\dfrac{(300)-(200)}{(500)-(0)}$ Substitute (0, 200) for (x_1, y_1) and (500, 300) for (x_2, y_2).

   $=\dfrac{100}{500}$ Simplify.

   $=\dfrac{1}{5}=0.2$

   The rate of change for this function is 0.2.

4. Identify the *y*-intercept as the *y*-coordinate of the point where the line intersects the *y*-axis.

   The graph intersects the *y*-axis at (0, 200). The *y*-intercept is 200.

5. Compare the properties of each function.

   The rate of change for the second function is greater than the first function. You will get paid more for the amount of merchandise you sell.

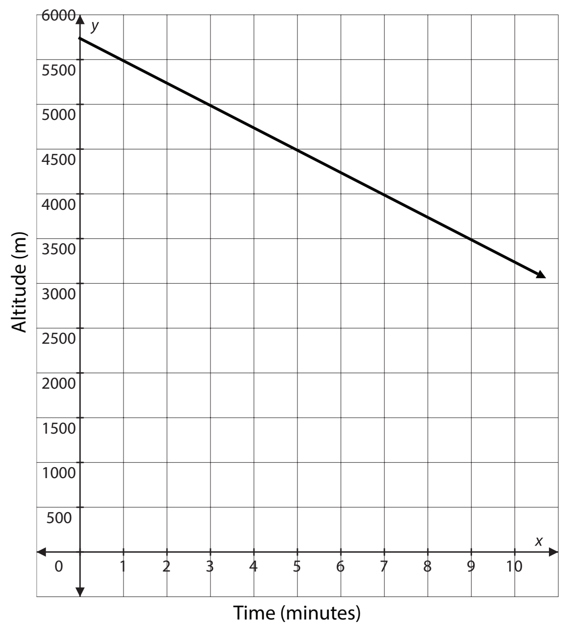
   The *y*-intercept of the first function is greater than the second. You will get a higher base pay with the first function.

   In the first function, you would receive a higher base salary, but get paid less for the amount of merchandise you sell.

   In the second function, you would receive a lower base salary, but get paid more for the merchandise you sell.

Example 3

Two airplanes are in flight. The function $f(x) = 400x + 1200$ represents the altitude in meters, $f(x)$, of one airplane after x minutes. The following graph represents the altitude of the second airplane after x minutes. Compare the properties of the functions.



1. Identify the rate of change for the first function.

   The function is written in $f(x) = mx + b$ form; therefore, the rate of change for the function is 400.

2. Identify the y-intercept for the first function.

   The y-intercept of the first function is 1,200, as stated in the equation.

3. Identify the rate of change for the second function.

   Choose two points from the graph.

   Let (0, 5750) be (x_1, y_1) and (5, 4500) be (x_2, y_2).

   Substitute the coordinates into the slope formula.

$m=\dfrac{y_2-y_1}{x_2-x_1}$	Slope formula
$=\dfrac{(4500)-(5750)}{(5)-(0)}$	Substitute (0, 5750) for (x_1, y_1) and (5, 4500) for (x_2, y_2).
$=\dfrac{-1250}{5}$	Simplify.
$=-250$	

   The rate of change for this function is –250.

4. Identify the *y*-intercept of the second function as the *y*-coordinate of the point where the line intersects the *y*-axis.

   The graph intersects the *y*-axis at (0, 5750), so the *y*-intercept is 5,750.

5. Compare the properties of each function.

   The absolute value of the slope for the first function is greater than the absolute value of the slope for the second function. The slope for the first function is also positive, whereas the slope for the second function is negative. The first airplane is ascending at a faster rate than the second airplane is descending.

   The *y*-intercept of the second function is greater than the first. The second airplane is higher in the air than the first airplane at that moment.