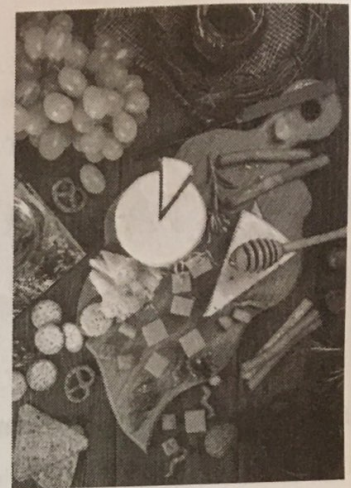


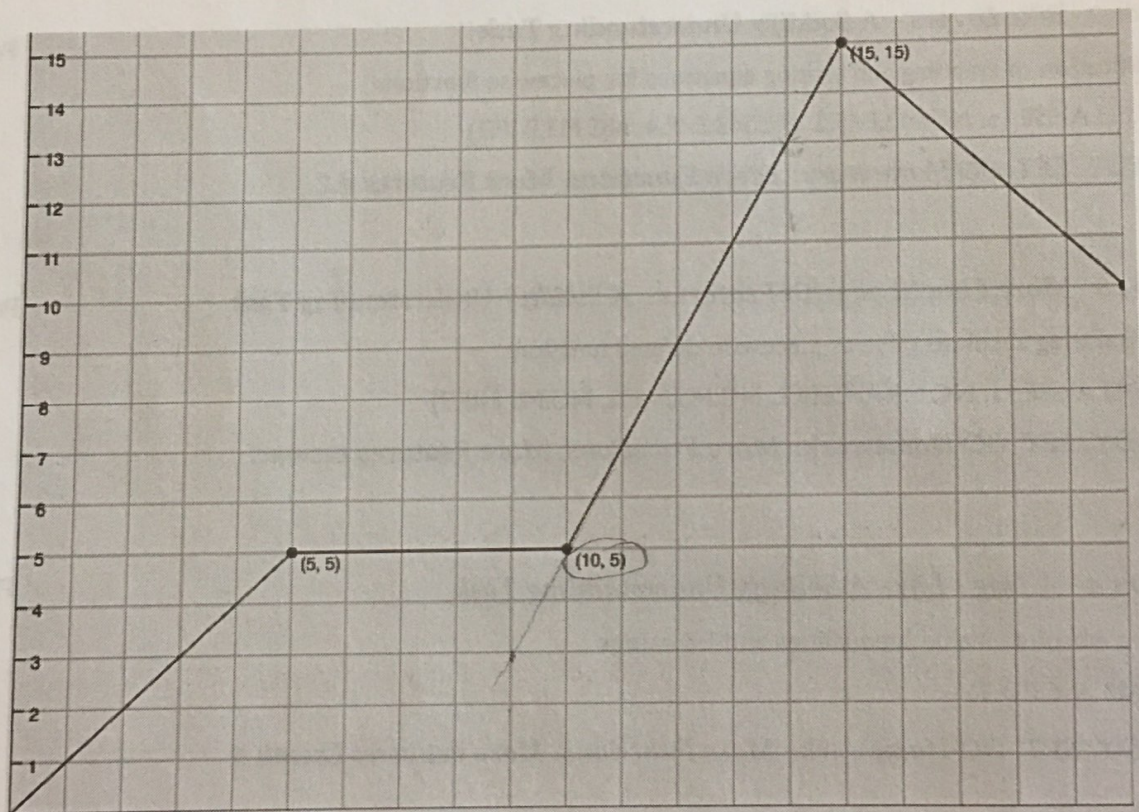
# Lesson 1: Some of This, Some of That

## A Develop Understanding Task



### Part I: Connect context and graphical representations

1. Create a story that matches the graph below. Label axes and be as specific as possible in describing what is happening to connect your story to the graph.



2. If you were to write a function to match each part of your story (or section of the graph), how many would you write? Explain.

3. Identify and write the function and corresponding domain for each section of the graph.

$$f(x) = \left. \begin{array}{l} \text{function here} \\ x \\ 5 \\ 2x - 15 \text{ or } 2(x - 10) + 5 \\ -x + 30 \text{ or } -1(x - 15) + 15 \end{array} \right\} \begin{array}{l} \text{domain here} \\ [0, 5] \\ (5, 10] \\ (10, 15] \\ (15, 20] \end{array}$$

3<sup>rd</sup>:  $m = \frac{15-5}{15-10} = \frac{10}{5} = 2$

$5 = 2(10) + b$   
 $5 = 20 + b$   
 $-15 = b$

$4 + n = m = -1$   
 $15 = -1(15) + b$   
 $30 = b$

4. Make connections between the graph, functions, and context (story you created).

- domain connects to story
- rate of change clear for each section

The function you created above is called a **piecewise function**. In mathematics, a piecewise-defined function is a function defined by more than one sub-function (or *piece* of a function), with each section only existing in a certain interval of the functions domain.

**Part II: Connecting function notation to a piecewise defined function**

- Find  $f(12)$ . Use the story you created to explain this meaning. = 9
- Which sub-function would you use to algebraically find the value of  $f(12)$ ?  
3<sup>rd</sup>
- Find the following:
  - $f(7) = 5$
  - $f(x) = 3$  3
  - $f(x) = 13$  14, 17
  - $f(15) = 15$

**READY**

Topic: Reading function values in a piece-wise defined graph.

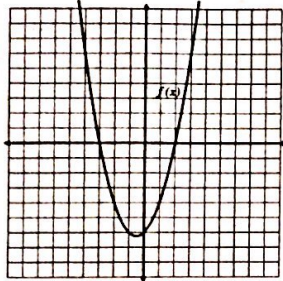
Use the graph to find the indicated function value.

1a.  $f(-3) = 0$

b.  $f(-2) = -4$

c.  $f(0) = -6$

d.  $f(2) = 0$

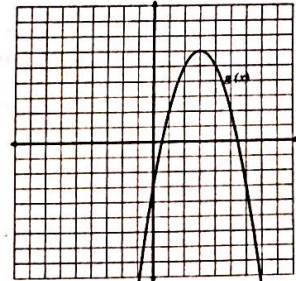


2a.  $g(0) = -3$

b.  $g(2) = 5$

c.  $g(3) = 6$

d.  $g(5) = 2$

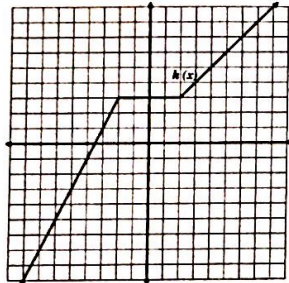


3a.  $h(-4) = -1$

b.  $h(0) = 3$

c.  $h(2) = 3$

d.  $h(4) = 5$

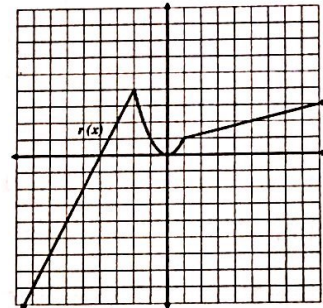


4a.  $r(-3) = 2$

b.  $r(-1) = 1$

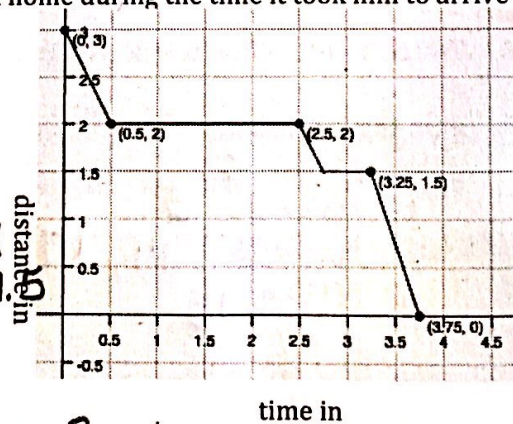
c.  $r(0) = 0$

d.  $r(5) = 2$



5. Isaac lives 3 miles away from his school. School ended at 3 pm and Isaac began his walk home with his friend Tate who lives 1 mile away from the school, in the direction of Isaac's house. Isaac stayed at Tate's house for a while and then started home. On the way he stopped at the library. Then he hurried home. The graph at the right is a **piece-wise defined function** that shows Isaac's distance from home during the time it took him to arrive home.

- How much time passed between school ending and Isaac's arrival home? *3.75 hrs*
- How long did Isaac stay at Tate's house? *2 hrs*
- How far is the library from Isaac's house? *1.5 miles*
- Where was Isaac, 3 hours after school ended? *library*
- Use function notation to write a mathematical expression that says the same thing as question d. *f(3) = 1.5*
- When was Isaac walking the fastest? How fast was he walking? *at the end of the walk : 3mph*

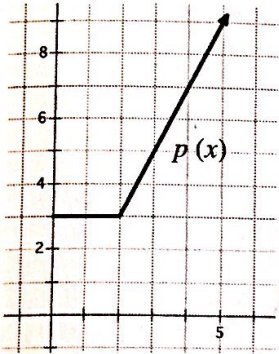


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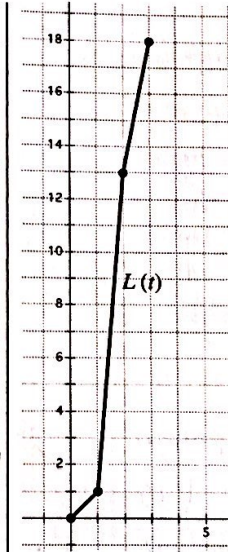
**SET**

**Topic:** Writing piece-wise defined functions

6. A parking garage charges \$3 for the first two hours that a car is parked in the garage. After that, the hourly fee is \$2 per hour. Write a piece-wise function  $p(x)$  for the cost of parking a car in the garage for  $x$  hours. (The graph of  $p(x)$  is shown.)



$$f(x) = \begin{cases} 3, & 0 \leq x \leq 2 \\ 2x-1, & x > 2 \end{cases} \quad (2, \infty)$$



7. Lexie completed an 18 mile triathlon. She swam 1 mile in 1 hour, bicycled 12 miles in 1 hour, and then ran 5 miles in 1 hour. The graph of Lexie's distance versus time is shown. Write a piecewise function  $L(t)$  for the graph.

$$L(t) = \begin{cases} t & 0 \leq t \leq 1 \quad [0,1] \\ 12t-11 & 1 < t \leq 2 \quad \text{or } (1,2] \\ 5t+3 & 2 < t \leq 3 \quad (2,3] \end{cases}$$

**GO**

**Topic:** Using the point-slope formula to write the equations of lines.

$$y - y_1 = m(x - x_1)$$

Write the equation of the line (in point-slope form) that contains the given slope and point.

8.  $p: (1, 2); m = 3$

$$y - 2 = 3(x - 1)$$

9.  $p: (1, -2); m = -1$

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

10.  $p: (5, -1); m = 2$

$$y + 1 = 2(x - 5)$$

Write the equation of the line (in point-slope form) that contains the given points.

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

11.  $K(0, 0); L(-4, 5)$

$$y - 5 = -\frac{5}{4}(x + 4)$$

or

$$y = -\frac{5}{4}x$$

12.  $X(-1, 7); Y(3, -1)$

$$y + 1 = -2(x - 3)$$

or

$$y - 7 = -2(x + 1)$$

13.  $T(-1, -9); V(5, 18)$

$$y - 18 = \frac{9}{2}(x - 5)$$

or

$$y + 9 = \frac{9}{2}(x + 1)$$

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