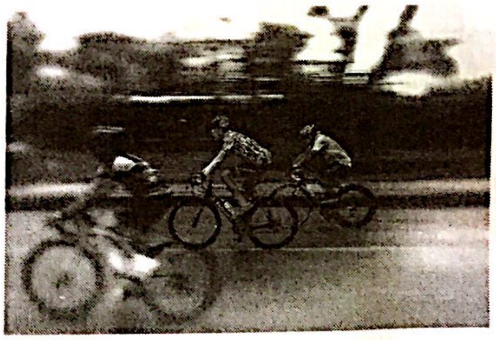
Lesson 2: Bike Lovers

A Solidify Understanding Task



Michelle and Rashid love going on long bike rides.

Every Saturday, they have a particular route they bike together that takes four hours. Below is a piecewise function that estimates the distance they travel for each hour of their bike ride.

$$f(x) = \begin{cases} 16x, & 0 \le x \le 1 \\ 10(x-1)+16, & 1 < x \le 2 \\ 14(x-2)+26, & 2 < x \le 3 \\ 12(x-3)+40, & 3 < x \le 4 \end{cases}$$

1st

1. What part of the bike ride are they going the fastest? Slowest?

   [0,1] (1,2]

2. What is the domain of this function?

   [0,4]

3. Find f(2). Explain what this means in terms of the context. = 26

   at 2 hrs he traveled 26 miles

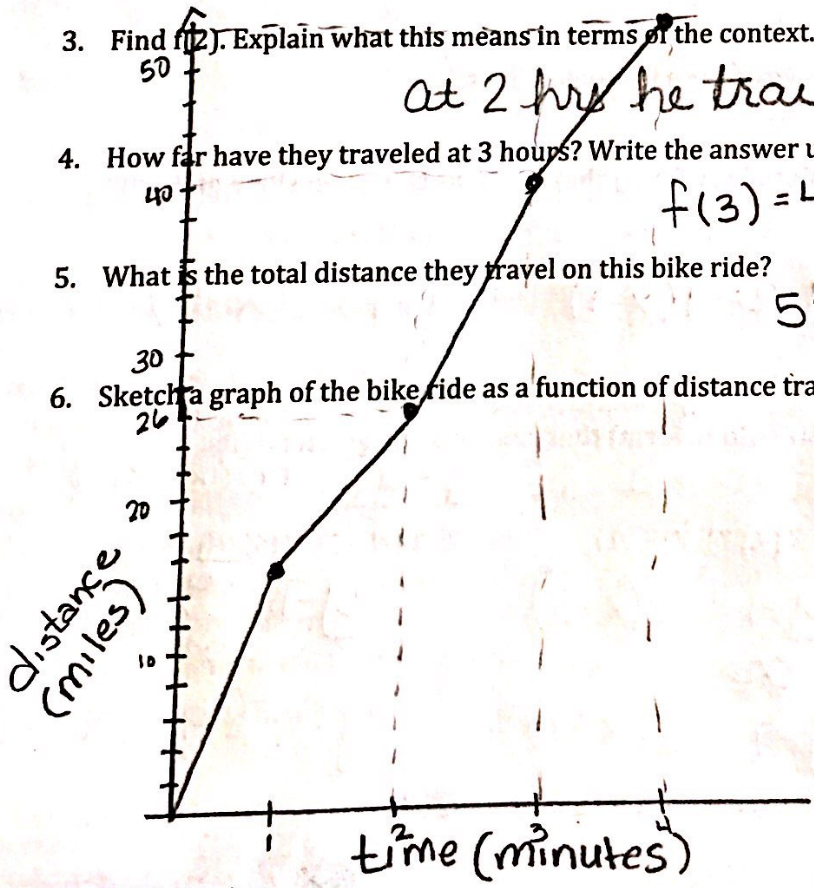
4. How far have they traveled at 3 hours? Write the answer using function notation.

   f(3) = 40

5. What is the total distance they travel on this bike ride?

   52 miles

6. Sketch a graph of the bike ride as a function of distance traveled over time.



Rashid also has a route he likes to do on his own and has the following continuous piecewise function to represent the average distance he travels in minutes:

$$g(x) = \begin{cases} \frac{1}{4}(x) & 0 \le x \le 20 \\ \frac{1}{5}(x - 20) + 5 & 20 < x \le 50 \\ \frac{2}{7}(x - 50) + 11 & 50 < x \le \boxed{92} \\ \frac{1}{8}(x - \boxed{a}) + b & 92 < x \le 100 \end{cases}$$

$\frac{1}{5}(50-20)+5=11$

$\frac{2}{7}(92-50)+11=23$

$\frac{1}{8}(x-92)+23$

$a=92$

7. What is the domain for this function? What does the domain tell us?

rides his bike for 100 minutes [0,100]   0-100 minutes

8. What is the average rate of change during the interval [20, 50]?

$\frac{1}{5}$ miles in one minute

9. Over which time interval is the greatest average rate of change?

(50,92] rate of change $\frac{2}{7}$ which is greatest

10. Find the value of each, then complete each sentence frame:

a. g(30) = 7. This means... 30 minutes traveled 7 miles

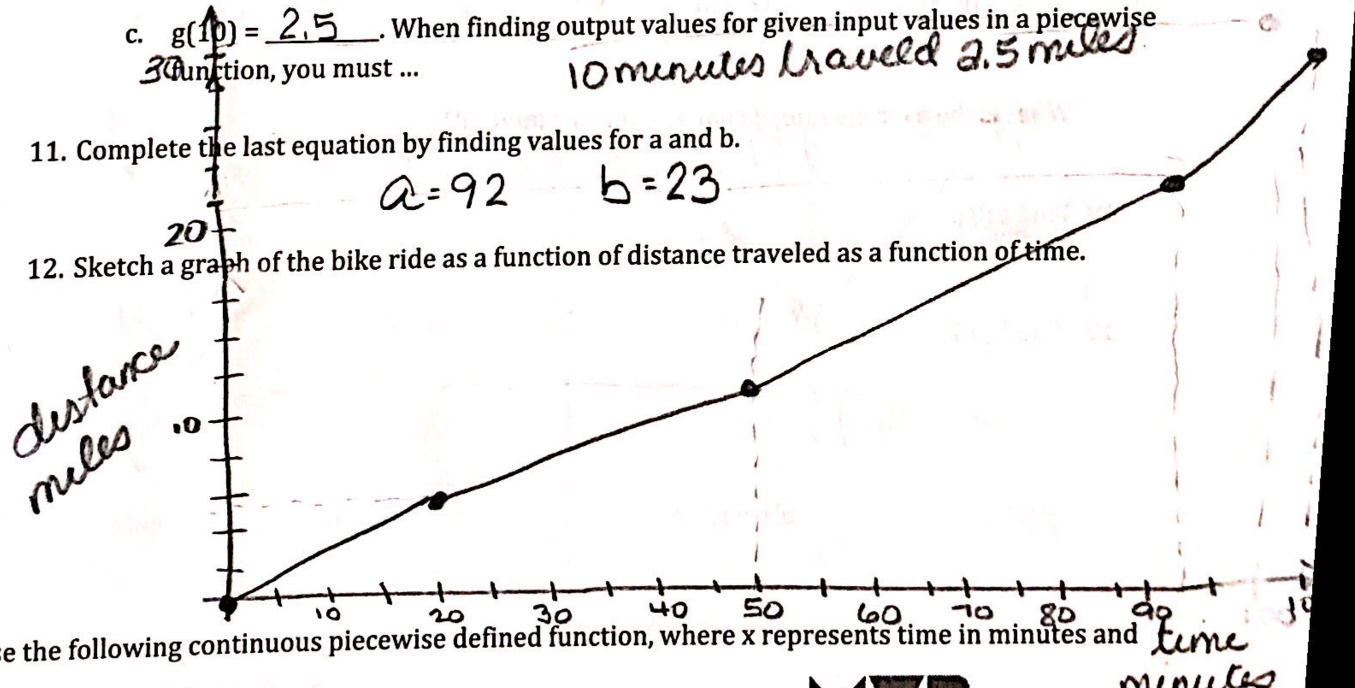
b. g(64)= 15. This means... 64 min. traveled 15 miles

c. g(10) = 2.5. When finding output values for given input values in a piecewise function, you must ... 10 minutes traveled 2.5 miles

11. Complete the last equation by finding values for a and b.

$a=92$ $b=23$

12. Sketch a graph of the bike ride as a function of distance traveled as a function of time.



Use the following continuous piecewise defined function, where x represents time in minutes and h(x) represents distance traveled in km, to answer the following questions.

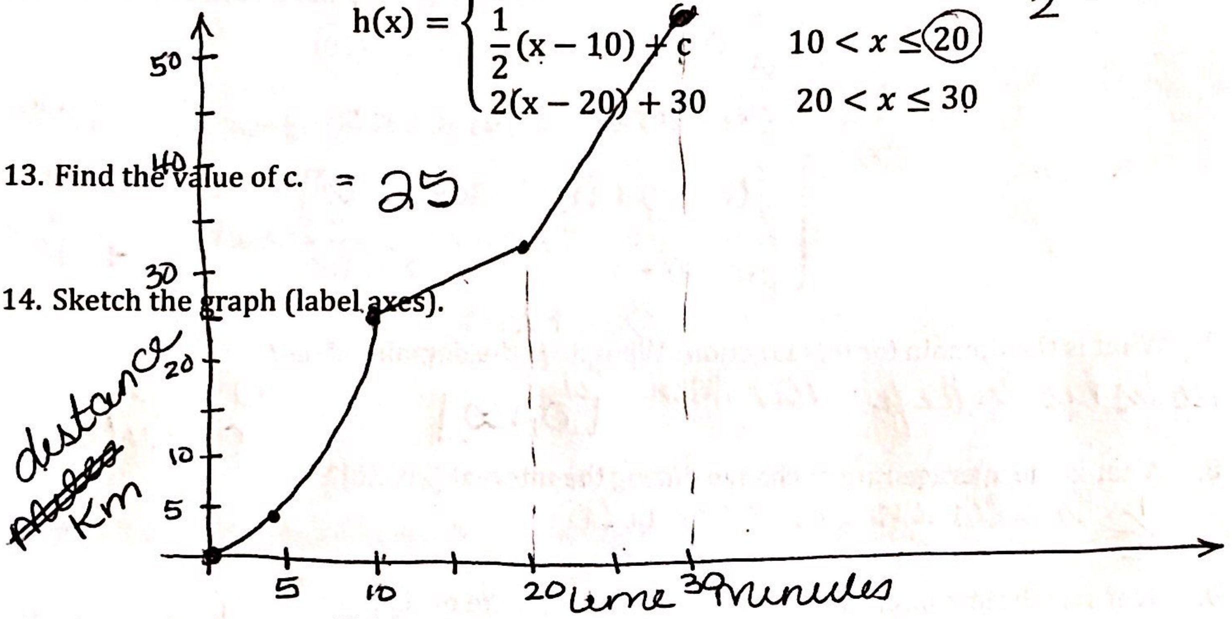
$\frac{1}{4}(10)^2 = 25$

$\frac{1}{2}(20-10) + 25 = 30$

$$h(x) = \begin{cases} \frac{1}{4}x^2 & 0 \le x \le 10 \\ \frac{1}{2}(x-10) + c & 10 < x \le 20 \\ 2(x-20) + 30 & 20 < x \le 30 \end{cases}$$

13. Find the value of c. $= 25$

14. Sketch the graph (label axes).



15. What is the domain of h(x)?

[0,30]

16. What is the range of h(x)?

[0, 50]

17. Which five minute interval of time has the greatest average rate of change?

a. [0, 5] b. [5, 10] c. [10, 15] d. [25, 30]

$\frac{25}{4}$ 25

25/5 $\frac{25 - 25/4}{5}$ = 3.75 km/min

What is the average rate of change over this interval?

18. Find h(8). $= 16$

19. Find h(15). $= 27.5$

UNIT 1 - Lesson 2

READY, SET, GO! Name Period Date

READY

Topic: Evaluating absolute value expressions.

Evaluate each expression.

1. $|4|$ = 4
2. $|-6|$ = 6
3. $|0|$ 0
4. $|11^2 - 16|$ = 105
5. $f(-2)$ *if* $f(x) = |7x + 23|$

   9

6. $g(3)$ *if* $g(x) = 2|x - 7| + 1$

   9

7. What does it mean to say the absolute value of a number is less than 5? between 0 - 5

   $-2.5 = |-2.5| = 2.5$

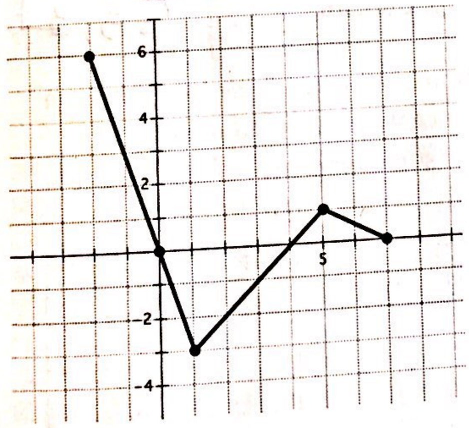
   $-7.9 = |-7.9| = \cancel{7.9}$

SET

Topic: Reading the domain and range from a graph

State the domain and range of the piece-wise functions in the graph. Use interval notation.

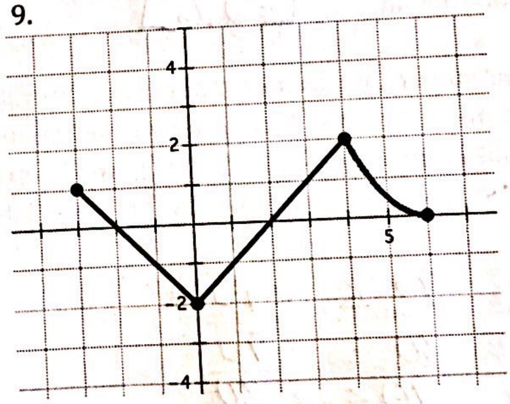
8.



a. Domain: [-2,7]

b. Range: [-3,6]

9.



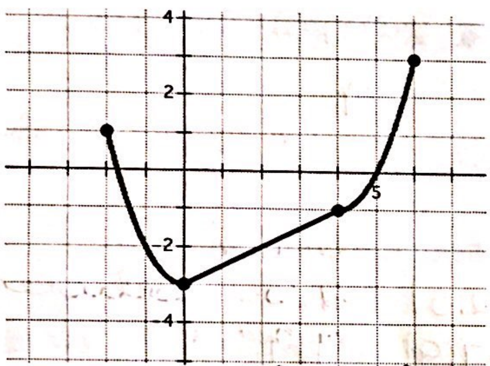
a. Domain: [-3,6]

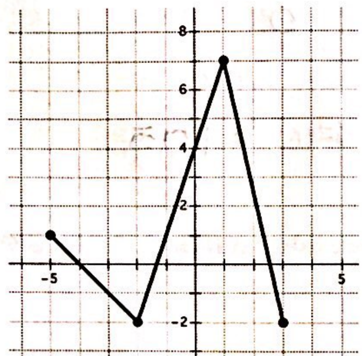
b. Range: [-2,2]

For each of the graphs below write the interval that defines each piece of the graph. Then write the domain of the entire piece-wise function.

Example: (Look at the graph in #14. Moving left to right. Piece-wise functions use set notation.)
Interval 1 $-3 \leq x < 0$
Interval 2 $0 \leq x < 4$
Interval 3 $4 \leq x \leq 6$
Domain: $[-3,6]$ (We can use interval notation on the domain, if it's continuous.)

Pay attention to your inequality symbols! You do not want the pieces of your graph to overlap. Do you know why?





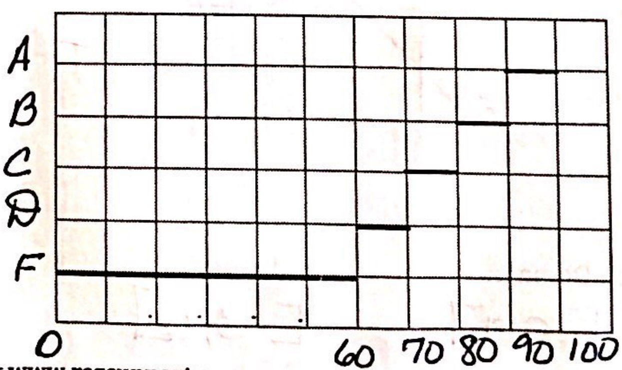
10. a. Interval 1 $[-2,0)$
b. Interval 2 $[0,4]$
c. Interval 3 $[4,6]$
d. Domain: $[-2,6]$

11. a. Interval 1 $[-5,-2)$
b. Interval 2 $[-2,1)$
c. Interval 3 $[1,3]$
d. Domain: $[-5,3]$

12. So far you've only seen continuous piece-wise defined functions, but piece-wise functions can also be non-continuous. In fact, you've had some real life experience with one kind of non-continuous piece-wise function. The graph below represents how some teachers calculate grades. Finish filling in the piece-wise equation. Then label the graph with the corresponding values.

Label

$$f(x)=\begin{cases} A, & 90 \leq x \leq 100 \\ B, & 80 \leq x < 90 \\ C, & 70 \leq x < 80 \\ D, & 60 \leq x < 70 \\ F, & 0 \leq x < 60 \end{cases}$$



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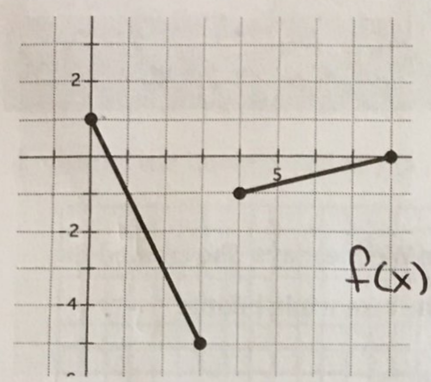
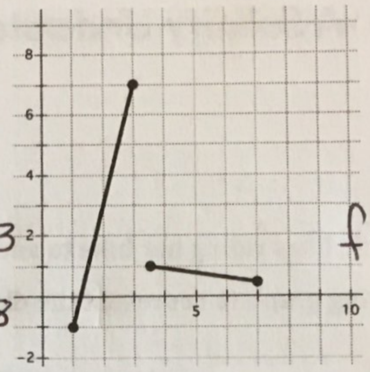
Write the piece-wise functions for the given graphs.

13H.



$$f(x)=\begin{cases}-2x+1 & 0\le x\le 3\\ \frac{1}{4}x-2 & 4\le x\le 8\end{cases}$$

14H.



$$f(x)=\begin{cases}4x-5 & 1\le x\le\\ -\frac{1}{7}x+\frac{3}{2} & 3.5\le\end{cases}$$

GO

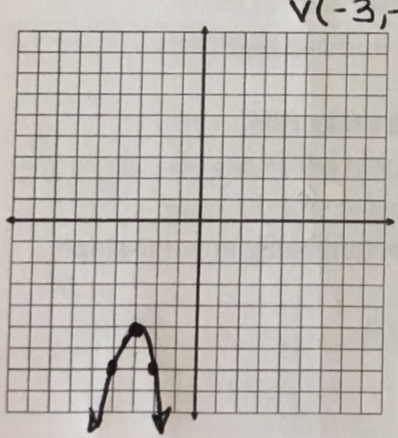
Topic: Transformations on quadratic equations

Beginning with the parent function $f(x) = x^2$, write the equation of the new function $g(x)$ that is a transformation of $f(x)$ as described. Then graph it.

15. Shift $f(x)$ left 3 units, stretch vertically by 2, reflect $f(x)$ vertically, and shift down 5 units.

$g(x) =$ $-2(x+3)^2-5$

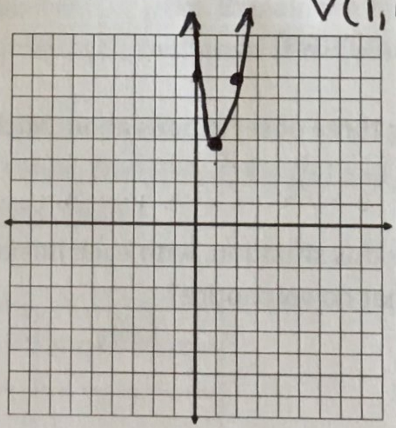
$V(-3,-5)$



16. Shift $f(x)$ right 1, stretch vertically by 3, and shift up 4 units.

$g(x) =$ $3(x-1)^2+4$

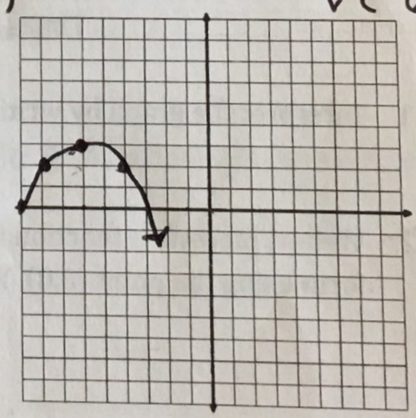
$V(1,4)$



17. Shift $f(x)$ up 3 units, left 6, reflect vertically, and stretch by ½

$g(x) =$ $-\frac{1}{2}(x+6)^2+3$

$V(-6,3)$



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