AGS 2
Module 4.2 Notes

Name Key
Period

Emma and Anna 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.

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

|slope| = speed

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

during the first hour, they travel fastest. (biggest slope)

smallest slope during the second hour, they travel slowest.

2. What is the domain of this function?

$[0,4]$ $0 \le x \le 4$

3. Find f(2). Explain what this means in context.

$f(2) = 10(2-1)+16 = 10(1)+16 = 10+16 = 26$ (2 = time, 26 = distance)

They traveled 26 miles after 2 hours.

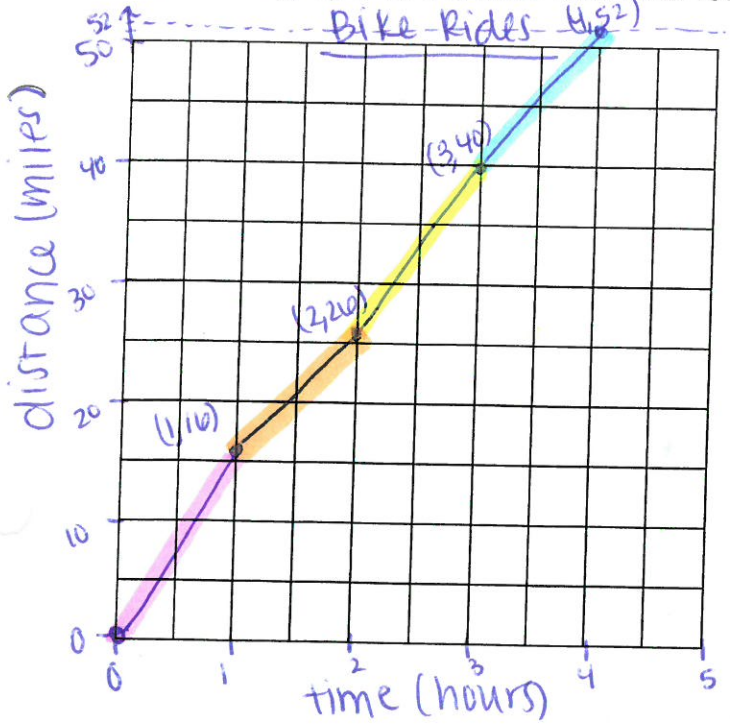
4. How far have they traveled at 3 hours? Write the answer using function notation.

$f(3) = 14(3-2)+26 = 14(1)+26 = 14+26 = 40$ miles

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

$f(4) = 12(4-3)+40 = 12(1)+40 = 12+40 = 52$ miles

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




$f(1) = 16(1) = 16$
$f(2) = 26$
$f(3) = 40$
$f(4) = 52$

Emma also has a route that she likes to do on her own and has the following continuous piecewise function to represent the average distance she travels in minutes.

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

$\frac{1}{8}x - \frac{1}{8}a + b$

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

[0,100] $0 \le x \le 100$ time in minutes

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

$\frac{1}{5}$ 1 mile per 5 minutes

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

$\frac{2}{7}$ = slope (50,92] $50 < x \le 92$

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

$\frac{1}{5}(30-20)+5$
$\frac{1}{5}(10)+5$
$2+5$

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

b. g(64) = 15. This means... Emma traveled 15 miles in 64 minutes

$\frac{2}{7}(64-50)+11$

c. g(10) = 2.5. When finding output values for given input values in a piecewise function, you must... plug them into the equation with the correct corresponding domain.

$\frac{2}{7}(14)+11$
$4+11=15$

$\frac{1}{4}(10) = 2.5$

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

$g(92) = \frac{2}{7}(92-50)+11 = 12+11 = 23$

$g(92) = \frac{1}{8}(92-a)+b = 23$

$= \frac{1}{8}(92-100) + 24 = 23$ (x, y)

or $= \frac{1}{8}(92-92) + 23 = 23$ (x, y)

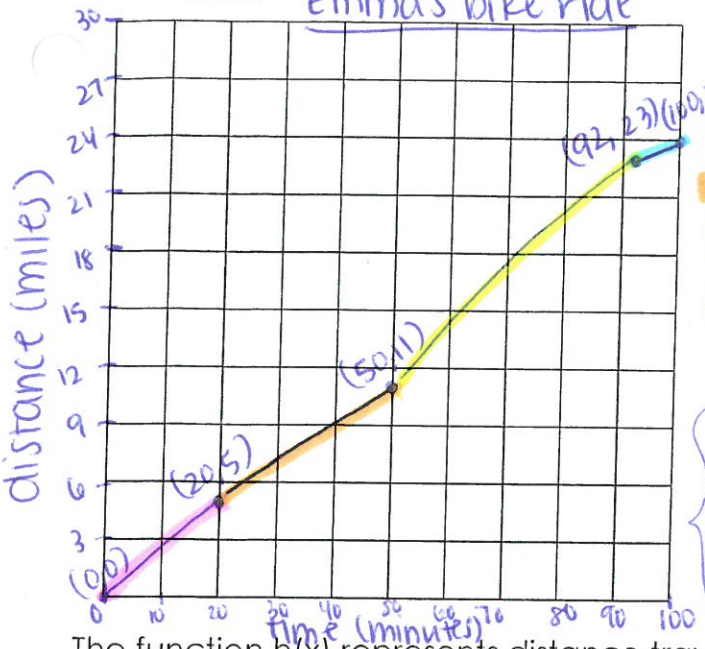
possibilities:

$a = 92$ $b = 23$

or

$a = 100$ $b = 24$

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




$f(0) = 0$

$f(20) = 5$

$f(50) = 11$

$f(92) = 23$

$f(100) = ?\ 24$

the slope of the last function is $\frac{1}{8}$ which means 1 mile per 8 minutes. If Emma bikes for eight minutes, she travels one mile.

The function h(x) represents distance traveled in kilometers to answer the following questions.

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

$\frac{1}{4}(0)^2 = 0$

$2(30-20)+30$
$= 2(10)+30$
$= 20+30$
$= 50$

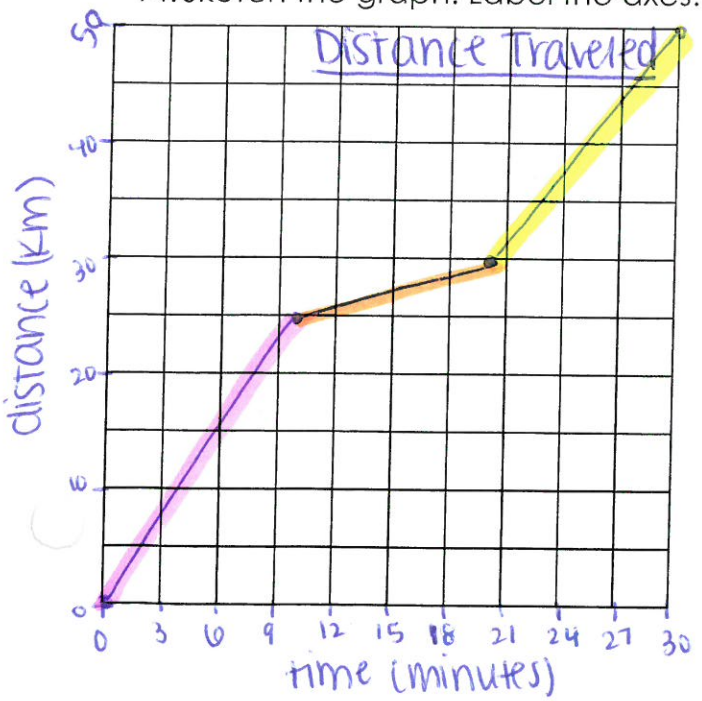
13. Find the value of c.

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

$0 + c = 25$

$\boxed{c = 25}$ because this is a continuous piecewise function.

14. Sketch the graph. Label the axes.




$f(0) = 0$

$f(10) = 25$

$f(20) = 30$

$f(30) = 50$

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

[0, 30] $0 \leq x \leq 30$

16. What is the range of h(x)? lowest y to highest y

[0, 50] $0 \leq y \leq 50$

plug in the domain boundaries and solve for y.

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

a. [0,5] $m = 1/4$ b. [5,10] $m = 1/4$ c. [10,15] $m = 1/2$ (d.) [25,30] $m = 2$ ← biggest slope

What is the average rate of change over this interval?

$m = 2$

18. Find h(8).

$h(8) = \frac{1}{4}(8)^2 = \frac{1}{4}(64) = (16)$

19. Find h(15).

$h(15) = \frac{1}{2}(15 - 10) + c$

$= \frac{1}{2}(5) + c$

$= 2.5 + c$

Solve. Get the absolute value by itself first.

20. $-2|x| = -12$

$\frac{-2}{-2} \quad \frac{-12}{-2}$

$|x| = 6$

$x = 6$ $\quad$ $x = -6$

21. $|4m| = 12$

$\frac{4m}{4} = \frac{12}{4} \quad \frac{4m}{4} = \frac{-12}{4}$

$m = 3$ $\quad$ $m = -3$

22. $-|x + 5| = -17$

$\frac{-1}{-1} \quad \frac{-17}{-1}$

$|x+5| = 17$

$x+5 = 17 \quad x+5 = -17$

$-5 \ -5 \quad -5 \ -5$

$x = 12$ $\quad$ $x = -22$

23. $|-3x| = 24$

$\frac{-3x}{-3} = \frac{24}{-3} \quad \frac{-3x}{-3} = \frac{-24}{-3}$

$x = -8$ $\quad$ $x = 8$

24. $2|x + 3| - 8 = -4$

$+8 \ +8$

$\frac{2|x+3|}{2} = \frac{4}{2}$

$|x+3| = 2$

$x+3 = 2 \quad x+3 = -2$

$-3 \ -3 \quad -3 \ -3$

$x = -1$ $\quad$ $x = -5$

25. $6|3x - 1| + 4 = 28$

$-4 \ -4$

$\frac{6|3x-1|}{6} = \frac{24}{6}$

$|3x-1| = 4$

$3x-1 = 4 \quad 3x-1 = -4$

$+1 \ +1 \quad +1 \ +1$

$\frac{3x}{3} = \frac{5}{3} \quad \frac{3x}{3} = \frac{-3}{3}$

$x = 5/3$ $\quad$ $x = -1$