Functions Study Guide
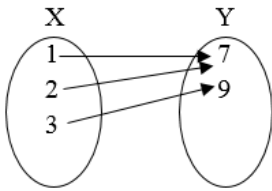
Name _____

Give the BEST classification for each function: <u>relation</u> or <u>function</u>. Explain why.

1.

X   Y

1   7
2   9
3

_____

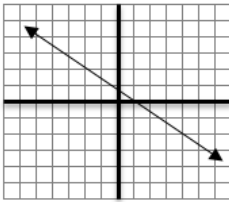2. {(4,-2), (5,-7), (-8,2), (1,-1)} _____

3. $f(x) = 7x + 8$ _____

4.

x	-3	1	3	8
$f(x)$	3	3	3	3

_____

5.

x	3	3	3	3
$f(x)$	-3	1	3	8

_____

6.

_____

7. What is the range of the function $y = -8x + 4$ for the domain $\{-4, 0, 9\}$?   7._____

8. Janie slides down a steep slide into a sandbox.

- Let t be the number of seconds Janie slides down the slide.
- Let $h(t)$ be the height of Janie off the ground in feet.
- The function that models this scenario is $h(t) = -t^2 + 10$.
- Janie slides down the slide for 3 seconds before falling into the sandbox.

Answer each question below using proper set notation.

a. What is the domain that models Janie's adventure?   D:_____

b. What is the range that models Janie's adventure?   R:_____

c. **BONUS: How high is the sandbox off the ground?**   c. _____

9.

x	-3	1	3	8
$f(x)$	23	3	-7	-32

a. BONUS: What is the function rule for the table? a._____

b. What is the domain for the table? Use proper notation. b._____

c. What is the range for the table? Use proper notation. c._____

d. List the ordered pairs for the function using function notation. d._____

e. Evaluate f(1). e._____

f. If f(x) = -32, what is the value of x? f._____

g. If f(x) = 23, what is the value of x? g._____

h. What is the average rate of change from $1 \le x \le 8$? h._____

10. Given the table below, write a recursive equation and evaluate for a_{15}. Make sure to use proper notation.

n	4	5	6	7
a_n	-10	-9.2	-8.4	-7.6

Recursive Equation: _____

a₁₅ = _____

11. BONUS: Given the table below, write a recursive equation and evaluate for a_{15}. Make sure to use proper notation.
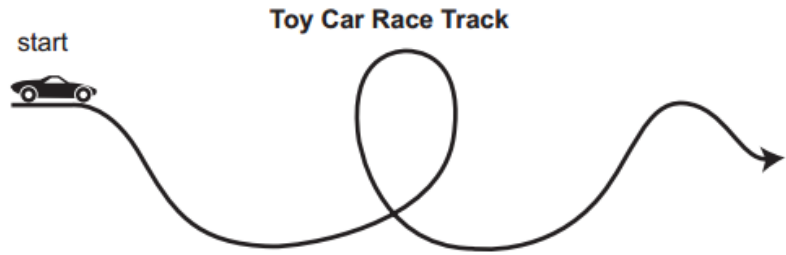
n	1	2	3	4 …	n
a_n	2	6	18	54 …	

Recursive Equation: _____
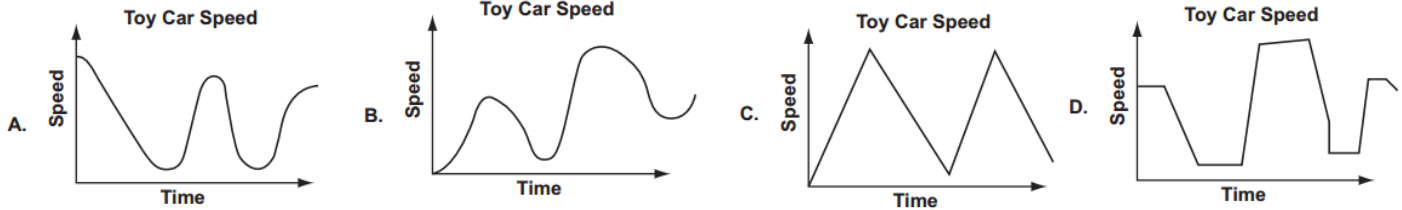
a₁₅ = _____

Evaluate each of the following if $f(x) = x^2 + 5x$ and $g(x) = -2x + 11$

12. $g(-5)$ 12. _____

13. $f(-2) + g(4)$ 13. _____

14. $f(-3) + 1$ 14. _____

15. $g(n + 1)$ 15. _____

16. $g(x) + f(x)$ 16. _____

17. $f(x) - g(x)$ 17. _____

18. BONUS $g(f(x))$ 18. _____

19. Find $f(-5)$ if $f(x) = -10x + 4$ 19. _____

20. If $f(x) = -14$, find the value for x in the function $f(x) = -3x + 1$ 20. _____

21. Use the picture to answer the question below. The picture shows the beginning of a racetrack for a toy car.

Toy Car Race Track

start

Which graph models the estimated speed of the toy car as it moves through the racetrack.

A. Toy Car Speed

Speed / Time

B. Toy Car Speed

Speed / Time

C. Toy Car Speed
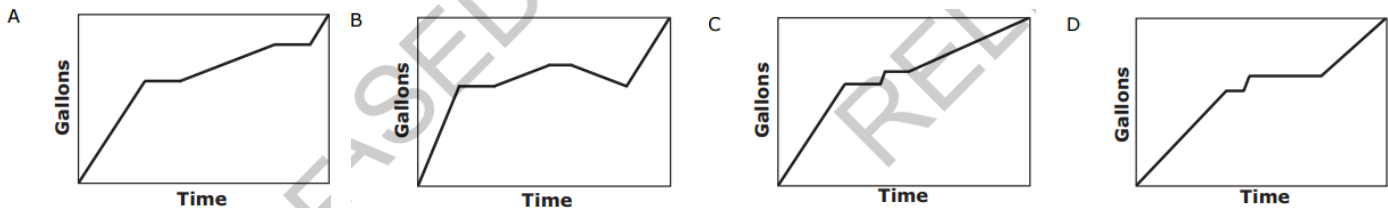
Speed / Time

D. Toy Car Speed

Speed / Time

21. _____

22. Mr. Jones filled his swimming pool with water.
- Mr. Jones began filling the pool at a constant rate.
- He turned off the water for a while.
- He then turned the water back on at a slower constant rate.
- Mr. Jones turned off the water again for a while.
- He then turned the water back on at the first rate.

Which graph best represents Mr. Jones filling the pool?   22. _____

A
Gallons / Time
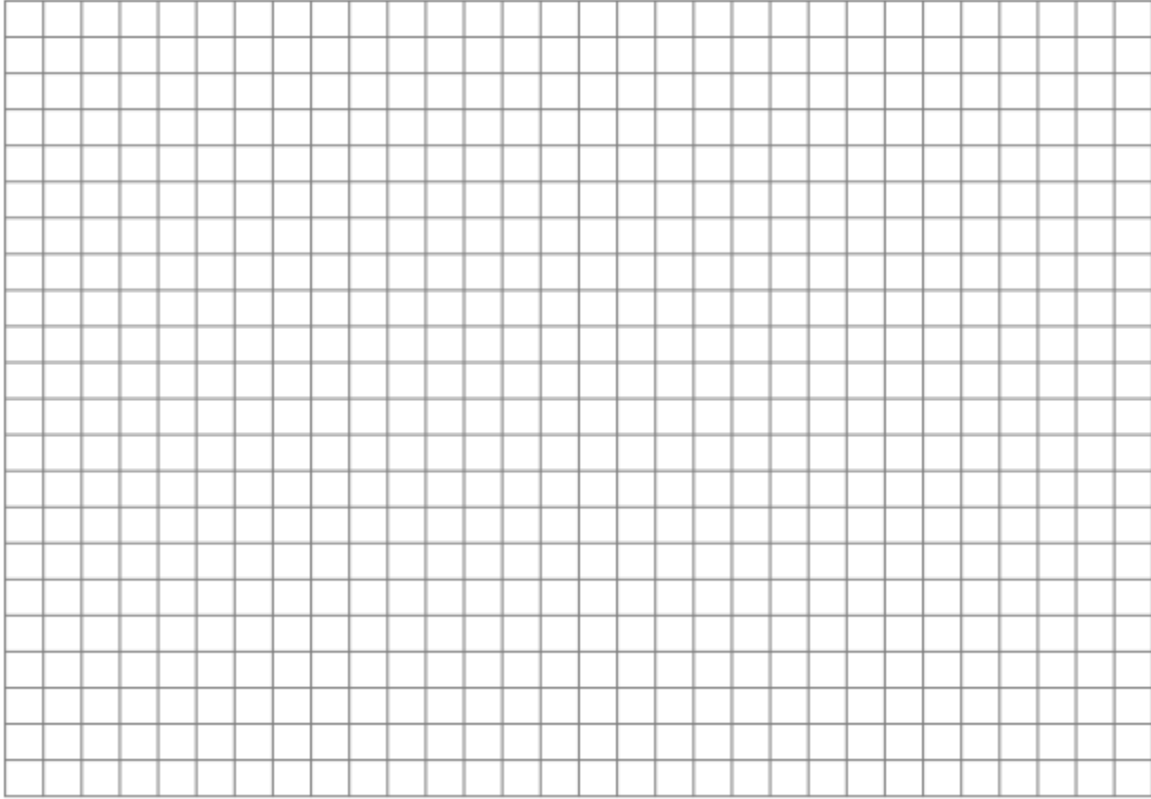
B
Gallons / Time

C
Gallons / Time

D
Gallons / Time

23. The number of questions a student has answered on a test, Q, after m minutes is represented by function Q(m). Explain what each mathematical statement below represents in everyday language.

a. Q(1) = Q(5)_____

b. Q(60) > Q(45) _____

c. Q(25) < Q(26) _____

d. Q(27) < Q(26) _____

24. A tire factory just got a new part for their machine to produce tires. The part must go through a trial run to ensure it can withstand immense pressures. In its trial run, the machine produced 2 tires. By the end of the first day, the part produced 12 more tires. By the end of the second day, the part produced 12 more tires. By the end of the third day, the part produced 12 more tires.

Assuming the pattern continues, at the end of the seventh day, how many tires will the tire factory have produced given there are a_n tires at the end of every n days?

_____

25. Larry started riding his bike at a rapid pace. He got tired and stopped to rest. When he started again, he was going at a slower rate. Draw a graph showing Larry's distance over time. For full credit, make sure to include proper labels.

26. Evaluate the following using the function graphed to the right.

a.   f(3)   a. _____

b.   f(1.5)   b. _____

c.   f(x)= 4, then find x.   c. _____

d.   f(x)= 8, then, find x.   d. _____ or _____ or _____

e.   What is the y-intercept of the function graphed?   e. _____

f.   What is the maximum vertex of the function?   f. _____

g.   What is the domain of the graph?   g. _____

h.   What is the range of the graph?   h. _____

i.   What is the average rate of change for the function over the interval
$3 \le x \le 4.5$

i. _____
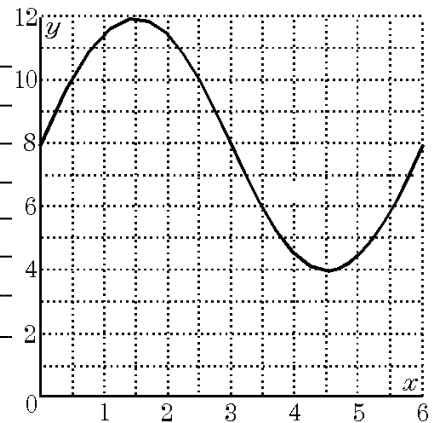
27. For the function f(x) to the left, answer the following:
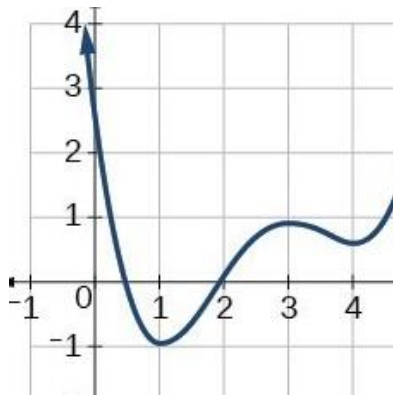
a. What is the minimum value for the function?   _____

b. How many x-intercepts are on the function?   _____

c. Give an x-intercept for the function.   _____

d. Evaluate f(1) for the function.   _____

e. Given f(x) = 2.5, what is x?   _____

f. Approximately what is the average rate of change for the function over the
interval $1 \le x \le 3$?

_____

Functions Study Guide

Name _____Key_____

Give the BEST classification for each function: <u>relation</u> or <u>function</u>. Explain why.

1.

X   Y
1   7
2   9
3
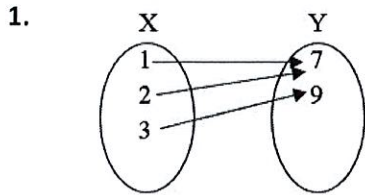
Function, each input maps to one output.

2. $\{(4,-2), (5,-7), (-8,2), (1,-1)\}$

Function, each inputs maps to one output.

3. $f(x) = 7x + 8$
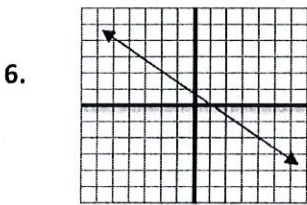
Function, written using function notation.

4.

x	-3	1	3	8
$f(x)$	3	3	3	3

Function, each input maps to one output.

5.

x	3	3	3	3
$f(x)$	-3	1	3	8

Relation, 3 maps to many outputs.

6.

Function, graph passes the vertical line test.

7. What is the range of the function $y = -8x + 4$ for the domain $\{-4, 0, 9\}$?

7. $R: \{-68, 4, 36\}$

x	y
-4	36
0	4
9	-68

$-(8)$ $-8(-4) + 4 = 36$
$-8(0) + 4$
$-8(9) + 4 = -68$

8. Janie slides down a steep slide into a sandbox.

- Let t be the number of seconds Janie slides down the slide.
- Let $h(t)$ be the height of Janie off the ground in feet.
- The function that models this scenario is $h(t) = -t^2 + 10$.
- Janie slides down the slide for 3 seconds before falling into the sandbox.

Answer each question below using proper set notation.

a. What is the domain that models Janie's adventure?

D: $0 \le x \le 3$

b. What is the range that models Janie's adventure?

$-0^2 + 10 = 10$ $-3^2 + 10 = 1$

R: $1 \le y \le 10$

c. BONUS: How high is the sandbox off the ground?

c. 1 foot

9.

x	-3	1	3	8
$f(x)$	23	3	-7	-32

a. BONUS: What is the function rule for the table?

a. $f(x) = -5x + 8$

b. What is the domain for the table? Use proper notation.

b. $D: \{-3, 1, 3, 8\}$

c. What is the range for the table? Use proper notation.

c. $R: \{-32, -7, 3, 23\}$

d. List the ordered pairs for the function using function notation.

d. $f(-3) = 23, f(1) = 3, f(3) = -7, f(8) = -32$

e. Evaluate f(1).

e. $f(1) = 3$

f. If f(x) = -32, what is the value of x?

f. $x = 8$

g. If f(x) = 23, what is the value of x?

g. $x = -3$

h. What is the average rate of change from $1 \leq x \leq 8$?

$\dfrac{-32-3}{8-1} = \dfrac{-35}{7} = -5$

h. -5

10. Given the table below, write a recursive equation and evaluate for a_{15}. Make sure to use proper notation.

n	4	5	6	7
a_n	-10	-9.2	-8.4	-7.6

Recursive Equation: $a_1 = -12.4; a_n = a_{n-1} + 0.8$

$a_{15} = -1.2$

11. BONUS: Given the table below, write a recursive equation and evaluate for a_{15}. Make sure to use proper notation.

n	1	2	3	4 ...	n
a_n	2	6	18	54 ...	

Recursive Equation: $a_1 = 2; a_n = 3a_{n-1}$

$a_{15} = $ _____

Evaluate each of the following if $f(x) = x^2 + 5x$ **and** $g(x) = -2x + 11$

12. $g(-5)$ $-2(-5) + 11$

12. 21

13. $f(-2) + g(4)$ $(-2)^2 + 5(-2) + -2(4) + 11$

13. -3

14. $f(-3) + 1$ $(-3)^2 + 5(-3) + 1$

14. -5

15. $g(n + 1)$ $-2(n+1) + 11 = -2n - 2 + 11$

15. $-2n + 9$

16. $g(x) + f(x)$ $-2x + 11 + x^2 + 5x$

16. $x^2 + 3x + 11$

17. $f(x) - g(x)$ $x^2 + 5x - (-2x + 11) = x^2 + 5x + 2x - 11$

17. $x^2 + 7x - 11$

18. BONUS $g(f(x))$ $-2(x^2 + 5x) + 11 = -2x^2 - 10x + 11$

18. $-2x^2 - 10x + 11$
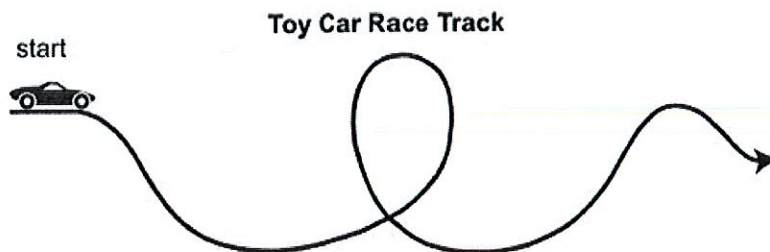
19. Find $f(-5)$ if $f(x) = -10x + 4$ $-10(-5) + 4$

19. 54

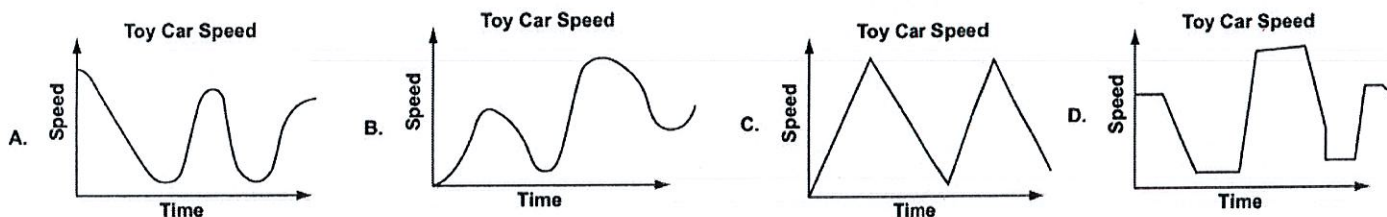20. If $f(x) = -14$, find the value for x in the function $f(x) = -3x + 1$

$-14 = -3x + 1$
$-15 = -3x$

20. $x = 5$

21. Use the picture to answer the question below. The picture shows the beginning of a racetrack for a toy car.

Toy Car Race Track

start

Which graph models the estimated speed of the toy car as it moves through the racetrack.

A. Toy Car Speed — Speed vs. Time

B. Toy Car Speed — Speed vs. Time

C. Toy Car Speed — Speed vs. Time
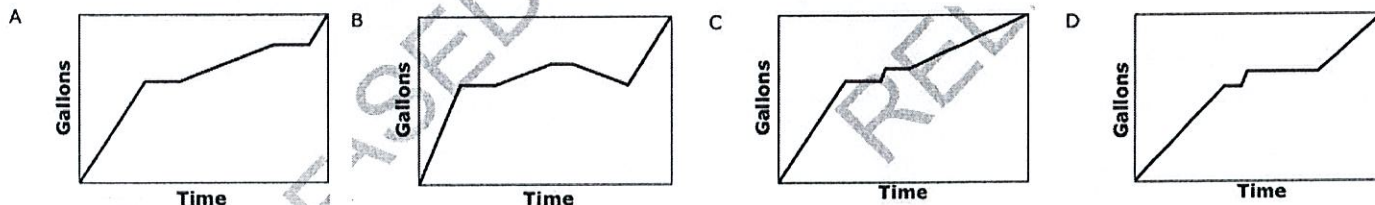
D. Toy Car Speed — Speed vs. Time

21. **B.**

22. Mr. Jones filled his swimming pool with water.
- Mr. Jones began filling the pool at a constant rate.
- He turned off the water for a while.
- He then turned the water back on at a slower constant rate.
- Mr. Jones turned off the water again for a while.
- He then turned the water back on at the first rate.

Which graph best represents Mr. Jones filling the pool?

22. **A.**

A — Gallons vs. Time

B — Gallons vs. Time

C — Gallons vs. Time

D — Gallons vs. Time

23. The number of questions a student has answered on a test, Q, after m minutes is represented by function Q(m). Explain what each mathematical statement below represents in everyday language.

a. $Q(1) = Q(5)$ The student has answered the same # of questions at 1 minute and 5 mins.

b. $Q(60) > Q(45)$ The student has answered more questions after an hour than after 45mins

c. $Q(25) < Q(26)$ The student has answered more questions after 26mins than 25 mins.

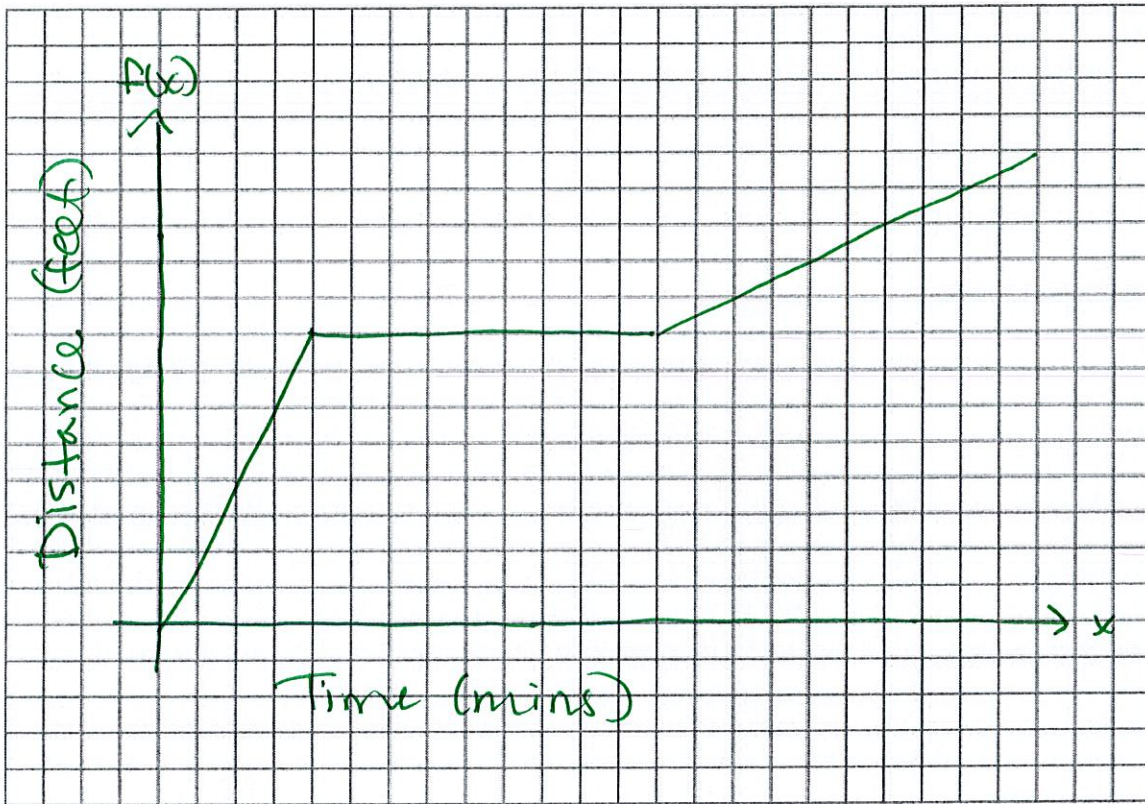d. $Q(27) < Q(26)$ The student has less questions answered at 27 mins than he/she did after 26 mins.

24. A tire factory just got a new part for their machine to produce tires. The part must go through a trial run to ensure it can withstand immense pressures. In its trial run, the machine produced 2 tires. By the end of the first day, the part produced 12 more tires. By the end of the second day, the part produced 12 more tires. By the end of the third day, the part produced 12 more tires.

Assuming the pattern continues, at the end of the seventh day, how many tires will the tire factory have produced given there are a_n tires at the end of every n days?

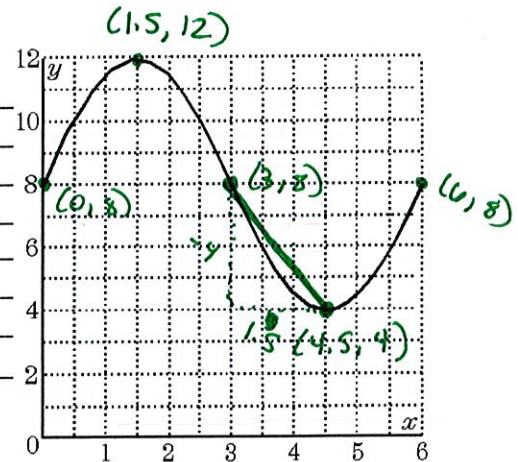| n	0	1	2	3	4	5	6	7
a_n	2	14	26	38	50	62	74	86

$a_7 = 86$ tires

25. Larry started riding his bike at a rapid pace. He got tired and stopped to rest. When he started again, he was going at a slower rate. Draw a graph showing Larry's distance over time. For full credit, make sure to include proper labels.
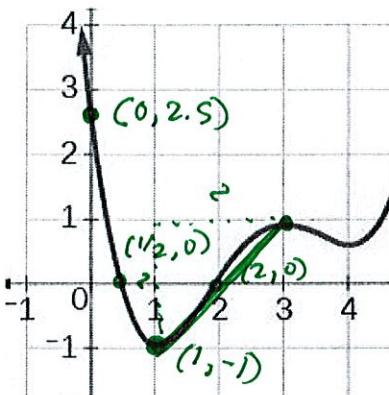
f(x)

Distance (feet)

Time (mins)

26. Evaluate the following using the function graphed to the right.

a. f(3) — a. _8_

b. f(1.5) — b. _12_

c. f(x)= 4, then find x. — c. _x = 4.5_

d. f(x)= 8, then, find x. d. $X = 0$ or $X = 3$ or _X = 6_

e. What is the y-intercept of the function graphed? — e. _(0,8)_

f. What is the maximum vertex of the function? — f. _(1.5, 12)_

g. What is the domain of the graph? [0,6] — g. _$0 \le x \le 6$_

h. What is the range of the graph? [4,12] — h. _$4 \le y \le 12$_

i. What is the average rate of change for the function over the interval

$3 \le x \le 4.5$ $-4/1.5 = -4 \div 1\frac{1}{2}$ -4.2
    $-4 \div 3/2$ $\frac{2}{3}$ i. _$-8/3$_

(1.5, 12)

(0,8) (3,8) (6,8)

(4.5, 4)

27. For the function f(x) to the left, answer the following:

(0, 2.5)

(½,0)

(2,0)

(1,-1)

y

a. What is the minimum value for the function? _-1_

b. How many x-intercepts are on the function? _2_

c. Give an x-intercept for the function. _(½,0); (2,0)_

d. Evaluate f(1) for the function. _-1_

e. Given f(x) = 2.5, what is x? _X = 0_

f. Approximately what is the average rate of change for the function over the interval $1 \le x \le 3$? $2/2 \approx 1$ _1_