Your Name

Mrs. Theo

9/28/2020

Notes

Lesson 1.2

PIECEWISE FUNCTIONS

Math Skill Objective:

To be able to identify the parent function given a function. To be able to describe transformations of functions.

HSF.BF.B.3

HSF-IF.C.7b

Life Lessons:

Situations have different view points, and at different times can be looked back upon and understood and appreciated differently. Also, our talents and purpose and goals change through out our life, we are on one track only for a certain number of years, and then we make a switch and begin a new track for another number of years, growing and falling, and we may switch again. Life is not a single function, but different pieces.

REMEMBER?!.....

Domain

All the possible x values that can exist in points for the function.

ex. ~~$f(x) = x^2$~~

Verbally	Bracket	Interval Notation
all ℝ greater than or equal to 0	$[0, \infty)$,	$0 \leq x < \infty$

Range

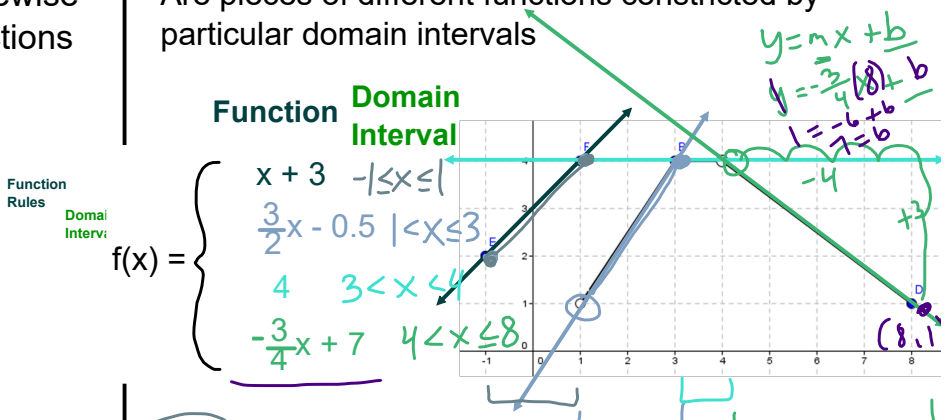
All the possible y values that can exist in points for the function.

ex. $f(x) = x^2$

Verbally	Bracket	Interval Notation

Piecewise Functions

Are pieces of different functions constricted by particular domain intervals



Domain Intervals

○ < is an open point, that value is not included

● ≤ is a closed point, that value is included

Rules	Domains

f(x) =

Given a Graph

Write the Piecewise Function

Step 1: Start at the left of the graph and work right. Determine the function rule

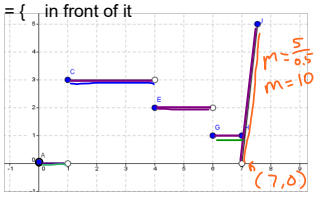
Step 2: Determine the x domain for which it exists and write it next to the function rule.

Remember: < is for open excluded bounds,

and ≤ is for closed included bounds

Step 3: Repeat for each broken up interval

Step 4: Write f(x) = { in front of it



	Rules	Domains
f(x) = {	0	$0 \le x < 1$
	3	$1 \le x < 4$
	2	$4 \le x < 6$
	1	$6 \le x < 7$
	$10x - 70$	$7 < x < 7.5$

$y = mx + b$

$y = 10x + b$

Plug in (7,0)

$0 = 10(7) + b$

$0 = 70 + b$

$-70 \quad -70$

$-70 = b$

$y = 10x - 70$

Evaluating a Piecewise Function

The x value is only plugged in to the function that has it in its restricted domain. Find the x-value in the domain section and then use that function only to determine the y-value for it.

$$f(x) = \begin{cases} 2|x|-1 & x \le 0 \\ 6 & 0 < x < 4 \\ x^2 - 3 & 4 \le x \end{cases}$$

ex. f(9) = ?

1. x = 9 is in the domain $4 \le x$ so use the function $y = x^2 - 3$

2. Plug 9 in for x and solve for y. $f(9) = (9)^2 - 3 = 78$ So, f(9) = 78 means (9,78) is a point on this piecewise function.

Your turn!

y is 6 no matter the x

$f(-3) = 2|-3|-1$

$f(-3) = 2(3) - 1$

$f(-3) = 6 - 1$

$f(-3) = 5$ (-3,5)

$f(0) = 2|0|-1$

$f(0) = 2(0) - 1$

$f(0) = 0 - 1$

$f(0) = -1$ (0,-1)

$f(0.3) = 6$

(0.3,6)

$f(3.5) = 6$ (3.5,6)

3.5 and 0.3 are in $0 < x \le 4$

$f(4) = (4)^2 - 3$

$f(4) = 16 - 3$

$f(4) = 13$

(4,13)

$f(5.4) = (5.4)^2 - 3$

$f(5.4) = 29.16 - 3$

$f(5.4) = 26.13$

(5.4,26.13)

Evaluate the function for the stated values.

$$f(x) = \begin{cases} 5x - 1, & \text{if } x < -2 \\ x + 3, & \text{if } x \geq -2 \end{cases}$$

$$g(x) = \begin{cases} -x + 4, & \text{if } x \leq -1 \\ 3, & \text{if } -1 < x < 2 \\ 2x - 5, & \text{if } x \geq 2 \end{cases}$$

work space:

3. $f(-3) = -16$
4. $f(-2) = 1$
5. $f(0)$
6. $f(5)$
7. $g(-4) = 8$
8. $g(-1)$
9. $g(0)$
10. $g(1)$
11. $g(2)$
12. $g(5)$

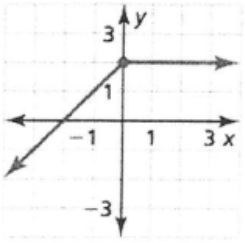
$f(-3) = 5(-3) - 1$
$f(-3) = -15 - 1$
$f(-3) = -16$
$(-3, -16)$

$f(-2) = (-2) + 3$
$f(-2) = 1$

$g(-4) = -(-4) + 4$
$g(-4) = 4 + 4$
$g(-4) = 8$

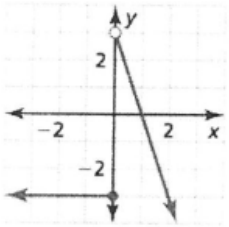
Write a piecewise function for the graph shown.

23.



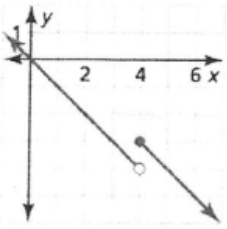
f(x) = { }

24.



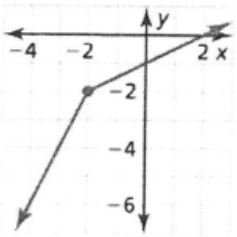
f(x) = { }

25.



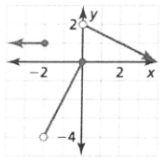
f(x) = { }

26.



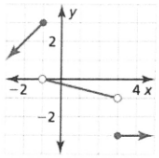
f(x) = { }

27.



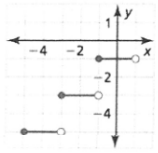
f(x) =

28.



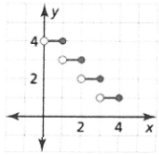
f(x) =

29.



f(x) =

30.



f(x) =

Answer Key:

3) f(−3) = −16
4) f(−2) = 1
5) f(0) = 3
6) f(5) = 8
7) g(−4) = 8
8) g(−1) = 5
9) g(0) = 3
10) g(1) = 3
11) g(2) = −1
12) g(5) = 5

23. $f(x) = \begin{cases} x+2, & \text{if } x < 0 \\ 2, & \text{if } x \geq 0 \end{cases}$

24. $f(x) = \begin{cases} -3, & \text{if } x \leq 0 \\ -3x+3, & \text{if } x > 0 \end{cases}$

25. $f(x) = \begin{cases} -x, & \text{if } x < 4 \\ -x+1, & \text{if } x \geq 4 \end{cases}$

26. $f(x) = \begin{cases} 2x+2, & \text{if } x \leq -2 \\ \frac{1}{2}x-1, & \text{if } x > -2 \end{cases}$

27. $f(x) = \begin{cases} 1, & \text{if } x \leq -2 \\ 2x, & \text{if } -2 < x \leq 0 \\ -\frac{1}{2}x+2, & \text{if } x > 0 \end{cases}$

28. $f(x) = \begin{cases} x+4, & \text{if } x \leq -1 \\ -\frac{1}{4}x-\frac{1}{4}, & \text{if } -1 < x < 3 \\ -3, & \text{if } x \geq 3 \end{cases}$

29. $f(x) = \begin{cases} -5, & \text{if } -5 \leq x < -3 \\ -3, & \text{if } -3 \leq x < -1 \\ -1, & \text{if } -1 \leq x < 1 \end{cases}$

30. $f(x) = \begin{cases} 4, & \text{if } 0 < x \leq 1 \\ 3, & \text{if } 1 < x \leq 2 \\ 2, & \text{if } 2 < x \leq 3 \\ 1, & \text{if } 3 < x \leq 4 \end{cases}$

Math Skill Objective:

To be able to graph linear and absolute value and Quadratic Piecewise functions using a table. Graph Piecewise-defined functions, including step and absolute value functions

HSF.BF.B.3

HSF-IF.C.7b

Life Lessons:

When life gives you problems, break them up piece by piece and take care of business.

Given a Function

Graph the Piecewise Function

Step 1: Evaluate the first function at the lower domain bound and plot point,

Step 2: Evaluate the first function at the upper domain bound and plot the point

Step 3: Connect the two points. If the function is not linear, reference it's parent function and graph more points to more accurately sketch the curve. You can always draw more and erase.

Step 4: Repeat for each function piece

$$f(x) = \begin{cases} 2|x+1| & x \le 0 \\ 5 & 0 < x < 4 \\ -x^2 + 21 & 4 \le x \le 6 \end{cases}$$

Let's Practice the Steps!

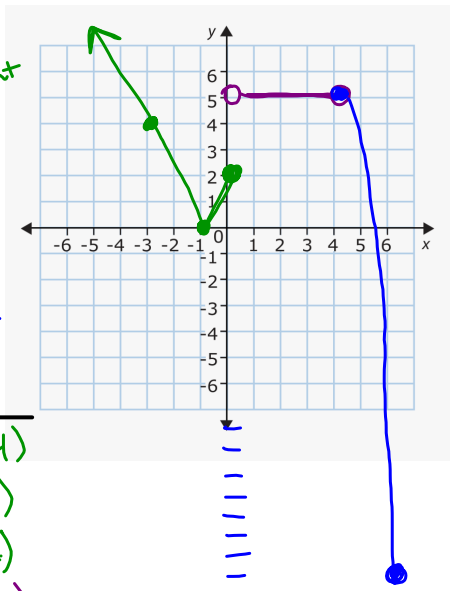
$$f(x) = \begin{cases} 2|x+1| & x \le 0 \\ 5 & 0 < x < 4 \\ -x^2 + 21 & 4 \le x \le 6 \end{cases}$$

absolute value V shape; no lower bound keep left arrow; closed point

$a|x-h|+k$; constant; horizontal line; open point

quadratic; U shape

$a(x-h)^2+k$

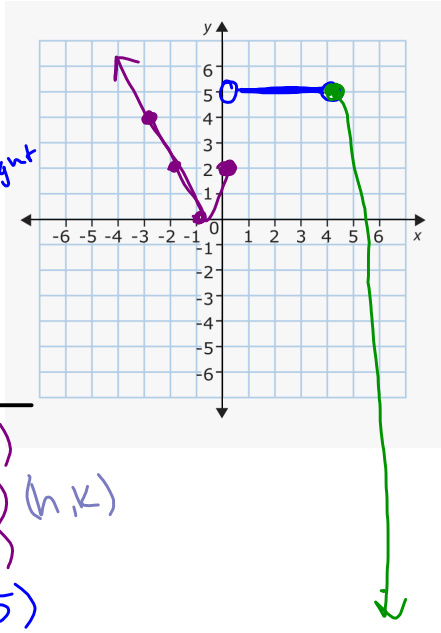


x	y = one of the three functions	(x, y)
-3	$2\|(-3)+1\| = 2\|-2\| = 4$	(-3, 4)
Vertex -1	$2\|(-1)+1\| = 2\|0\| = 0$	(-1, 0)
0	$2\|(0)+1\| = 2\|1\| = 2$	(0, 2)
0	5	(0, 5)
4	5	(4, 5)
4	$-(4)^2+21 = -16+21 = 5$	(4, 5)
6	$-(6)^2+21 = -36+21 = -15$	(6, -15)

Let's Practice the Steps!

$$f(x) = \begin{cases} 2|x+1|+0 & x \le 0 \\ 5 & 0 < x < 4 \\ -x^2 + 21 & 4 \le x \le 6 \end{cases}$$

$a|x-h|+k$ (closed point; left; open point; right)



	x	y = one of the three functions	(x, y)
V shape	-3	$2\|(-3)+1\| = 2\|-2\| = 4$	(-3, 4)
vertex	-1	$2\|(-1)+1\| = 2\|0\| = 0$	(-1, 0) (h, k)
	0	$2\|(0)+1\| = 2\|1\| = 2$	(0, 2)
do again	0	5	(0, 5)
	4	5	(4, 5)
curve V shape vertex (0, 21)	4	$-(4)^2+21 = -16+21 = 5$	(4, 5)
	6	$-(6)^2+21 = -36+21 = -15$	(6, -15)

2.6 Piecewise Functions Day 2 **ASSIGNED PRACTICE** Name:_____

Part I. Carefully graph each of the following. Identify whether or not the graph is a function. Then, evaluate the graph at any specified domain value.

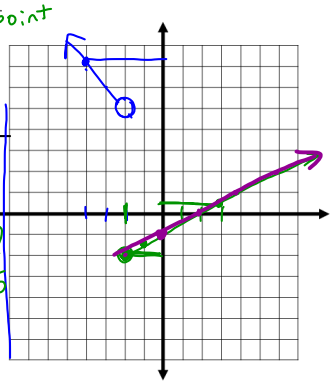
1. $f(x) = \begin{cases} -x+3 & x < -2 \\ \frac{1}{2}x - 1 & x \ge -2 \end{cases}$ (open point; closed point)

x	y
-3	$-(-3)+3 = 6$
-2	$-(-2)+3 = 5$
-2	$\frac{1}{2}(-2)-1 = -2$
-1	$\frac{1}{2}(-1)-1 = -1.5$

$f(3) =$

$f(-4) =$

$f(-2) =$



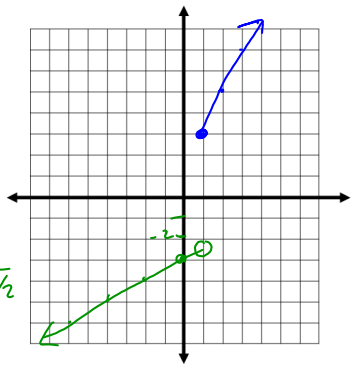
2. $f(x) = \begin{cases} 2x+1 & x \ge 1 \\ \frac{x}{2} - 3 & x < 1 \end{cases}$ $\frac{1}{2}x - 3$

$f(-2) =$

$f(6) =$

$f(1) =$

x	y
1	$\frac{1}{2}(1)-3 = -2\frac{1}{2}$



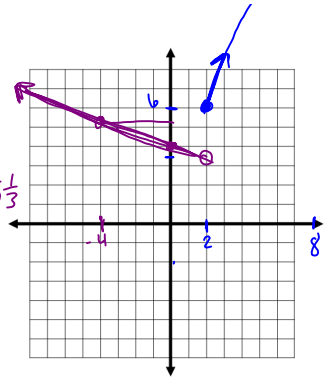
3. $f(x)=\begin{cases}4x-2 & x\geq 2\\ \frac{x}{3}+4 & x<2\end{cases}$

$-\frac{1}{3}x+4$

$f(-4)=-\frac{1}{3}(-4)+4=5\frac{1}{3}$

$f(8)=4(8)-2=30$

$f(2)=4(2)-2=6$



4. $f(x)=\begin{cases}-x+4 & x\leq 0\\ x^2-5 & 0<x\leq 3\\ 2 & x>3\end{cases}$

closed point

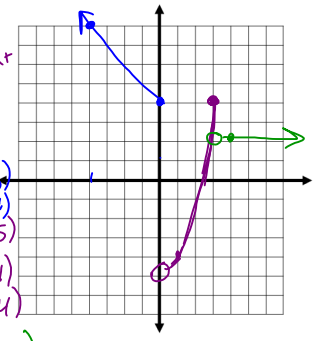
open point

U shape

chosen from domain

X	
-4	$-(-4)+4=8$
0	$-(0)+4=4$
0	$(0)^2-5=-5$
3	$(3)^2-5=4$
1	$(1)^2-5=-4$
3	2
4	2

(-4,8)
(0,4)
(0,-5)
(3,4)
(1,-4)
(3,2)
(4,2)

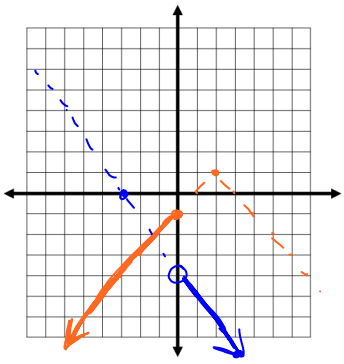


5. $f(x)=\begin{cases}-|x-2|+1 & x\leq 0\\ -\frac{4x}{3}-4 & x>0\end{cases}$

$f(-2)=$

$f(0)=$

$f(5)=$



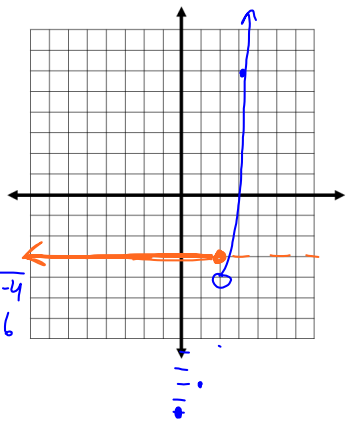
6. $f(x)=\begin{cases}-3 & x\leq 2\\ 2x^2-12 & x>2\end{cases}$

$f(-4)=$

$f(0)=$

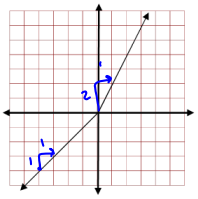
$f(3)=$

X	
2	$2(2)^2-12=2\cdot 4-12=-4$
3	$2(3)^2-12=2\cdot 9-12=6$



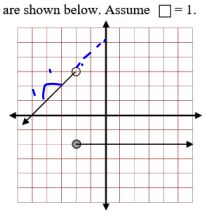
Part II. Write equations for the piecewise functions whose graphs are shown below. Assume □ = 1.

7.



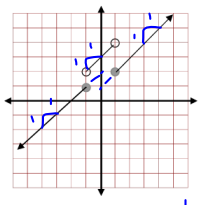
$$f(x)=\begin{cases} x & x<0 \\ 2x & x\geq 0 \end{cases}$$

8.



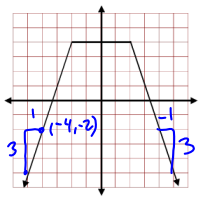
$$f(x)=\begin{cases} x+5 & x<-2 \\ -2 & x\geq -2 \end{cases}$$

9.



$$f(x)=\begin{cases} x+2 & x\leq -1 \\ x+3 & -1<x<1 \\ x+1 & x\geq 1 \end{cases}$$

10.



$$f(x)=\begin{cases} 3x+10 & x<-2 \\ 4 & -2\leq x\leq 2 \\ -3x+10 & x>2 \end{cases}$$

$y=3x+b$

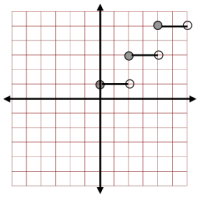
$-2=3(-4)+b$

$-2=-12+b$

$10=b$

$y=3x+10$

11.



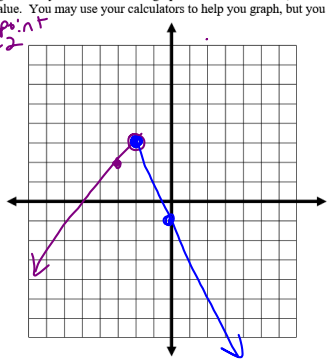
$$f(x)=\begin{cases} 1 & 0\leq x<2 \\ 3 & 2\leq x<4 \\ 5 & 4\leq x\leq 6 \end{cases}$$

Worksheet Graphing Piecewise Functions Name:_____
Algebra 2

Part I. Carefully graph each of the following. Identify whether or not he graph is a function. Then, evaluate the graph at any specified domain value. You may use your calculators to help you graph, but you must sketch it carefully on the grid!

1. $f(x)=\begin{cases} x+5 & x<-2 \\ -2x-1 & x\geq -2 \end{cases}$ open point at -2

x	y	(x,y)
-3	$(-3)+5=2$	$(-3,2)$
-2	$(-2)+5=3$	$(-2,3)$
-2	$-2(-2)-1=3$	$(-2,3)$
0	$-2(0)-1=-1$	$(0,-1)$



Function? Yes or No

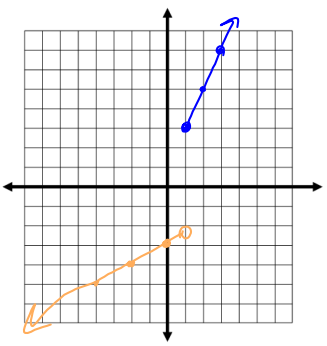
$f(3)=-7$

$f(-4)=1$

$f(-2)=3$

2. $f(x)=\begin{cases} 2x+1 & x\geq 1 \\ x-3 & x<1 \\ 2 & \end{cases}$

x	y	(x,y)
0		
1		
1		
2		



Function? Yes or No

$f(-2)=-4$

$f(6)=13$

$f(1)=3$

3. $f(x)=\begin{cases} -x+4 & x\le 0 \\ 2x-1 & 0<x\le 5 \\ 3 & x>5 \end{cases}$

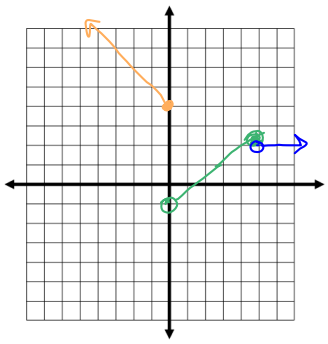
x	y	(x,y)
-2		
0		
0		
5		
5		
7		

Function? Yes or No

$f(-2)=$ 6

$f(0)=$ 4

$f(5)=$ $7/3 = 2\frac{1}{3}$



4. $f(x)=\begin{cases} -3 & x\le 3 \\ 2x-5 & x>3 \end{cases}$

x	y	(x,y)

Function? Yes or No

$f(-4)=$ -3

$f(0)=$ -3

$f(3)=$ -3