Introduction to Piecewise

Piecewise Functions:

Continuous: **Discontinuous:**

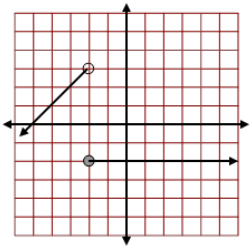
Evaluating Piecewise Functions

Evaluate the following function at $x = -2, 1, 2, and\ 3$

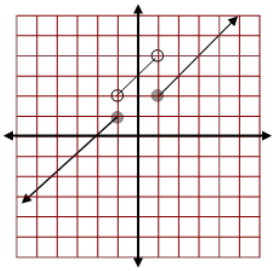
$$f(x) = \begin{cases} 1 - x, if\ x \leq 1 \\ x^2, if\ x > 1 \end{cases}$$

Evaluate the following functions

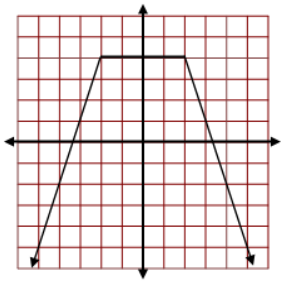
1. (a) Find the domain and range of the graph
   (b) Find the values for h(-2), h(0), h(-3)



2. (a) Find the domain and range of the graph
   (b) Find the values for h(-1), h(1), h(2)



3. (a) Find the domain and range of the graph
   (b) Find the values for h(-5), h(-2), h(2), h(4)



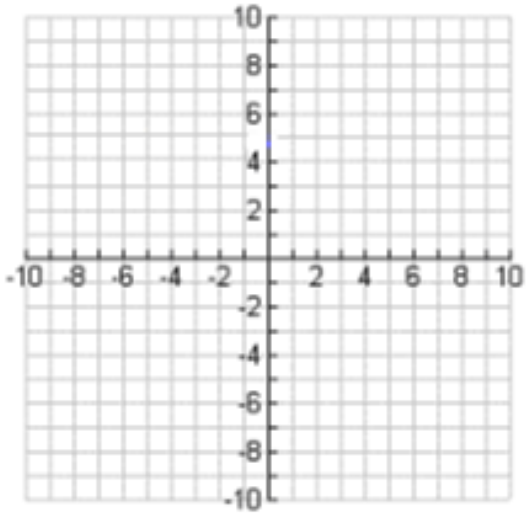
Graphing Piecewise Functions

Both of the following notations can be used to describe a piecewise function over the function's domain:

$$f(x) = \begin{cases} 2x & if\ [-5,2) \\ 5 & if\ [2,6] \end{cases} \quad \text{or} \quad f(x) = \begin{cases} 2x & ,-5 \le x < 2 \\ 5 & ,2 \le x \le 6 \end{cases}$$

3. Complete the following table of values for the piecewise function over the given domain.

x	f(x)
-5	
-3	
0	
1	
1.7	
1.9	
2	
2.2	
4	
6	



4. Graph the ordered pairs from your table to Sketch the graph of the piecewise function.

5. How many pieces does your graph have? Why?

6. Are the pieces rays or segments? Why?

7. Are all the endpoints solid dots or open dots or some of each? Why?

8. Were all these x values necessary to graph this piecewise function, or could this have been graphed using less points?

9. Which x values were "critical" to include in order to sketch the graph of this piecewise function?

10. Can you generalize which x-values are essential to input into your table to make a hand sketched graph of a piecewise linear function?

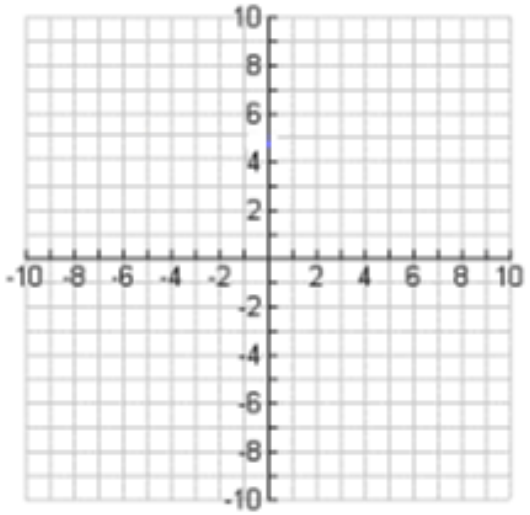
11. Now graph this piecewise function: $f(x) = \begin{cases} x+3 & ,-8 \le x < 1 \\ 10-2x & ,1 \le x \le 7 \end{cases}$

by completing a table of values for the piecewise function over the given domain.

x	f(x)

12. Why did you choose the x values you placed into the table?

13. Graph the ordered pairs from your table to Sketch the graph of the piecewise function.



14. How many pieces does your graph have? Why?

15. Are the pieces rays or segments? Why?

16. Are all the endpoints filled circles or open circles or some of each? Why?

17. Was it necessary to evaluate both pieces of the function for the x-value 1? Why or why not?

18. Which x values were "critical" to include in order to graph this piecewise function? Explain.

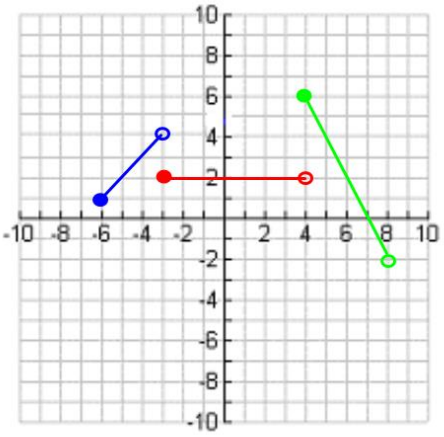
Lesson 2: Writing piecewise functions given a graph.

19. Can you identify the equations of the lines that contain each segment?

    a. Left segment equation=

    b. Middle equation=

    c. Right equation=



20. Next, list the domain of each segment.

    a. Left segment domain=

    b. Middle domain=

    c. Right domain=

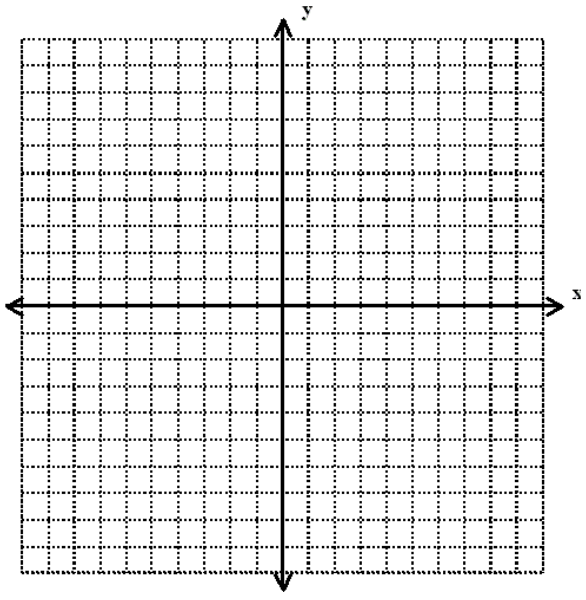
21. Now, put the domain together with the equations to write the piecewise function for the graph.

$$f(x) = \begin{cases} \\ \\ \end{cases}$$

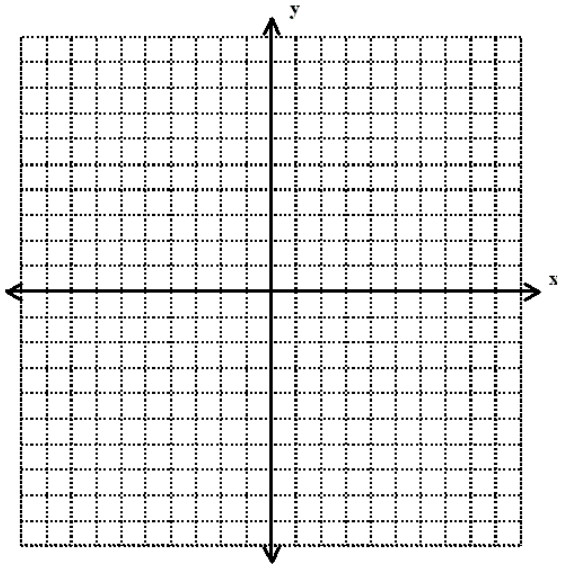
Practice: Graph the following (on the same graph)

$f(x) = 1 - x, if -2 \leq x \leq 1$

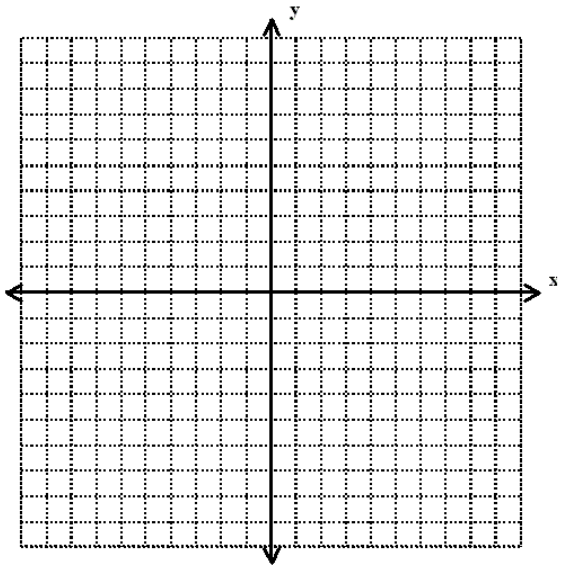
$f(x) = x^2, if\ x > 1$



1. Graph $f(x)=\begin{cases}2x-1, if\ \ x\le 1\\ 3x+1, if\ \ x>1\end{cases}$



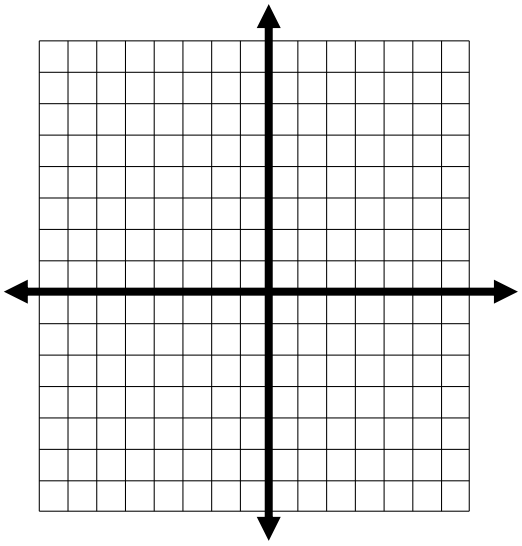
2. Graph $f(x)=\begin{cases}x^2-1 & x\le 0\\ 2x-1 & 0<x\le 5\\ 3 & x>5\end{cases}$



Day 5 Classwork

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



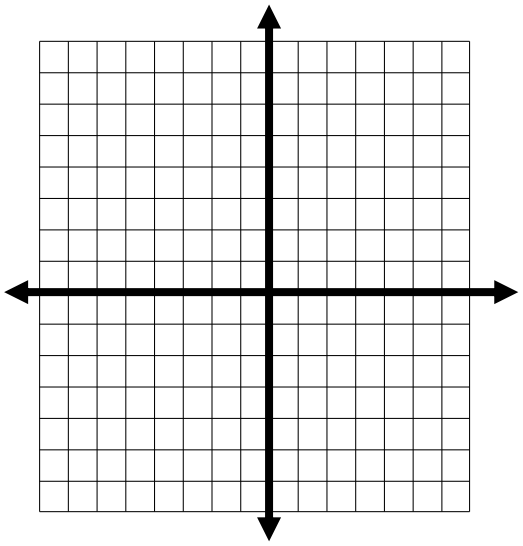
Function? Yes or No

$f(3)=$

$f(-4)=$

$f(-2)=$

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



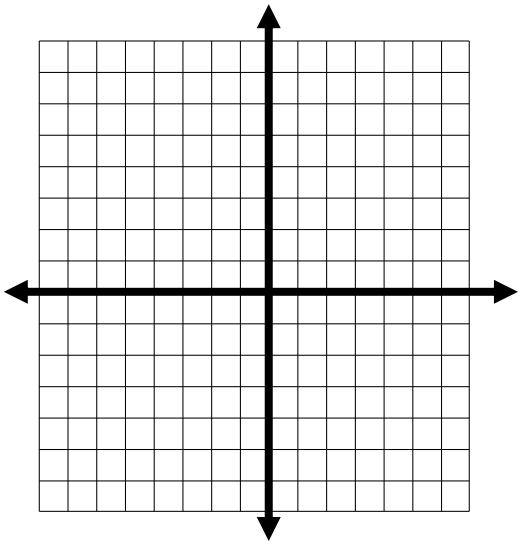
Function? Yes or No

$f(-2)=$

$f(6)=$

$f(1)=$

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



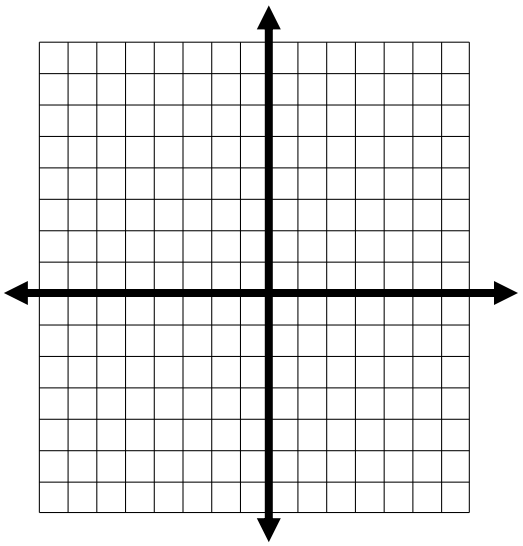
Function? Yes or No

$f(-4)=$

$f(8)=$

$f(2)=$

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



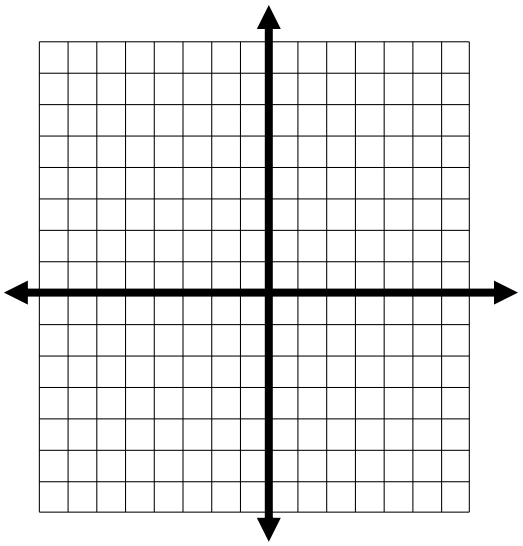
Function? Yes or No

$f(-2)=$

$f(0)=$

$f(5)=$

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



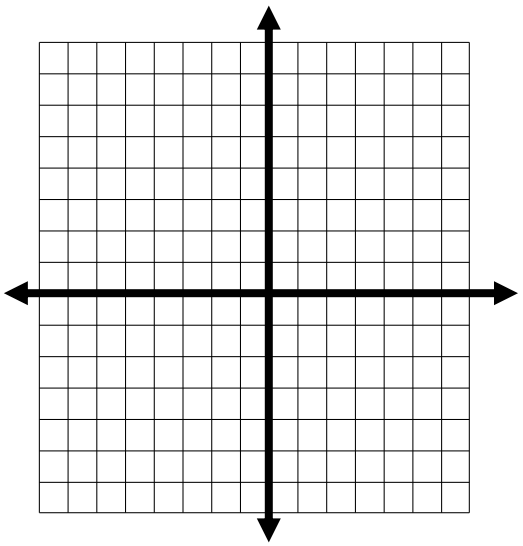
Function? Yes or No

$f(-4)=$

$f(0)=$

$f(3)=$

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



Function? Yes or No

$f(-4)=$

$f(0)=$

$f(3)=$