Precalculus

Write your questions and thoughts here!

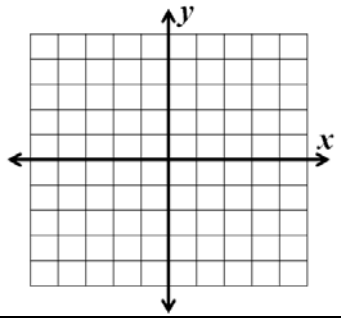
3.3 Piecewise Functions

Name:_____

Recall:

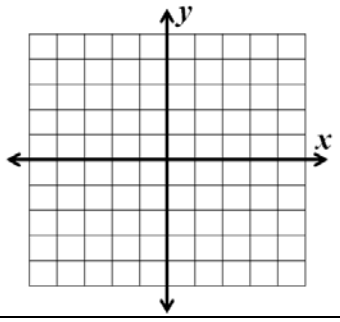
Quadratic Function:

$f(x) = (x-2)^2 + 1$



Absolute Value Function

$f(x) = -|x+3| + 2$



Finding the Value

1. $f(x) = \begin{cases} -x^2 - 2x + 8, & x \le -3 \\ 3x + x^3, & -2 < x < 5 \\ -|x-8|, & x \ge 5 \end{cases}$

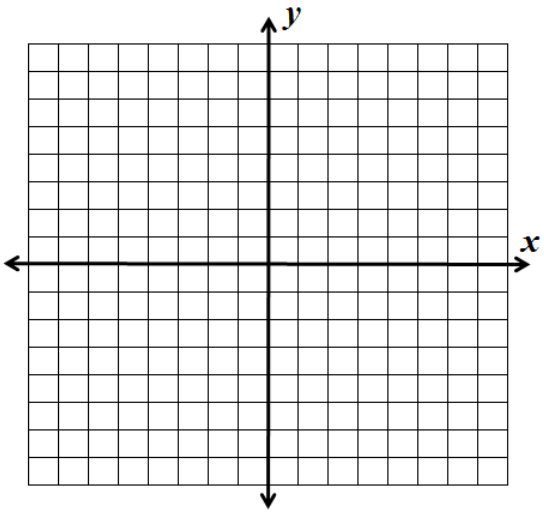
$f(-1) =$

$f(5) =$

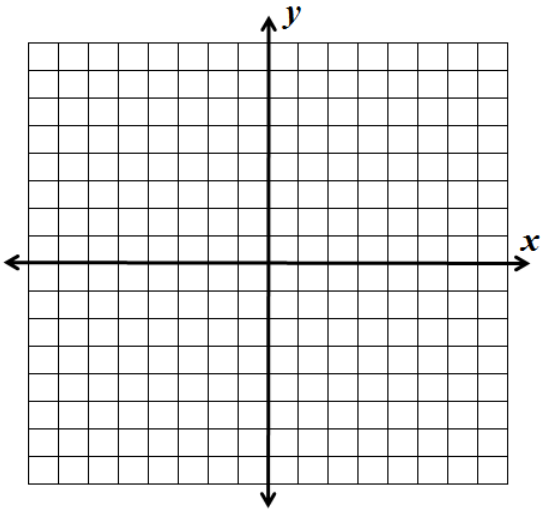
$f(-2.5) =$

Graphing a Piecewise Function

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



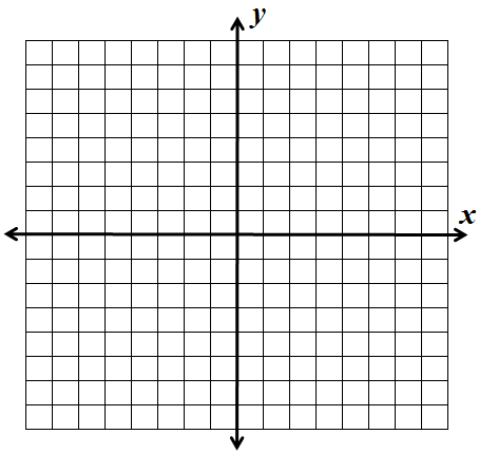
3. $h(x) = \begin{cases} -(x+1)^2 + 7, & x < 2 \\ -\frac{1}{3}x, & x > 4 \end{cases}$



3.3 Piecewise Functions

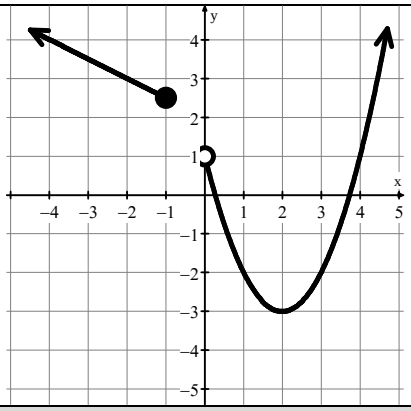
Write your questions and thoughts here!

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



5. Write out the function of the graph to the right.

$f(x) =$



Tell if the functions are continuous. Show any work that leads to your conclusion.

6. $f(x) = \begin{cases} 2x^2 - x + 1, & x < -1 \\ x^3 + 6x^2 + 12x + 11, & x \ge -1 \end{cases}$

7. $f(x) = \begin{cases} -x^2 + 8, & x \le 3 \\ -2 - 3\sqrt{3 - x}, & x > 3 \end{cases}$

Now summarize what you learned!

Skillz Review: Solve or evaluate.

1. $\sqrt{-24}$	2. $x^2 - 2 = -100$	3. $(x+4)^2 - 7 = 57$	4. $2(x-9)^2 + 11 = -25$

3.3 Practice – Piecewise Functions

Name: _____

Pre-Calculus

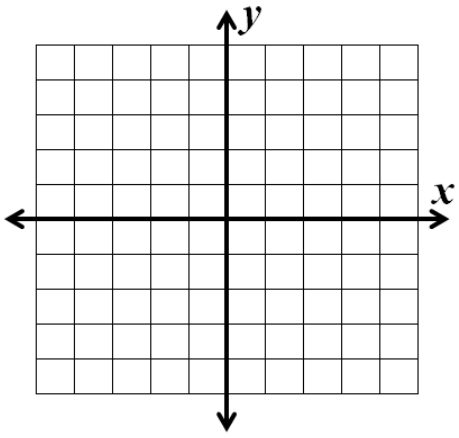
Find the value of the given function at the indicated domain value.

$$g(x)=\begin{cases}-x^2-5x+2, & x<1\\ x^3-5x, & 1\le x<11\\ -\sqrt{3x-16}, & x>11\end{cases} \qquad h(x)=\begin{cases}2x^2-2x+1, & x\le -6\\ 3x-x^3, & -3<x\le 1\\ 2x-|x-10|, & x>1\end{cases}$$

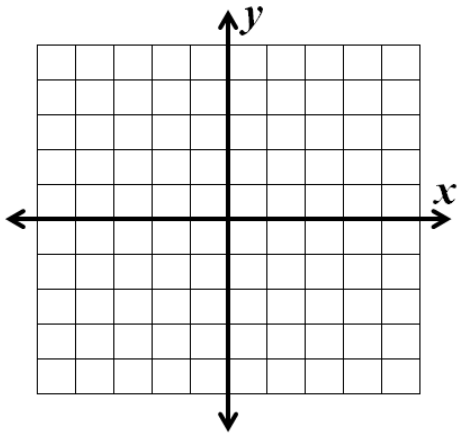
1. $g(1)=$	2. $g(11)=$	3. $h(5)=$	4. $h(-10)=$
5. $g(-1)=$	6. $h(0)=$	7. $g(20)=$	8. $h(-4)=$

Graph the following piecewise functions.

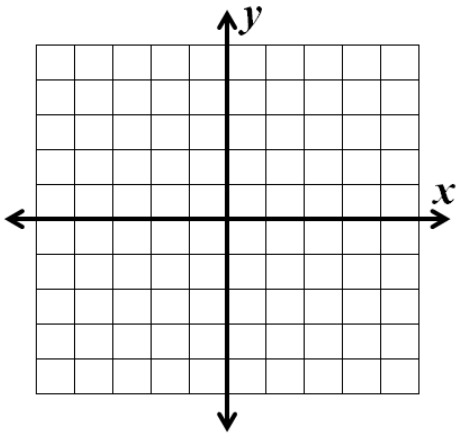
9. $f(x)=\begin{cases}-2x-1, & x<-2\\ -2, & -2\le x\le 3\\ -x+5, & x>3\end{cases}$



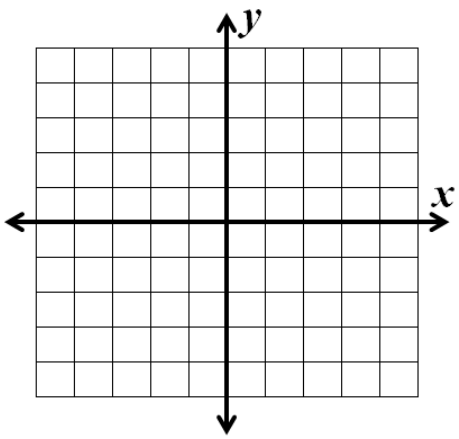
10. $f(x)=\begin{cases}-4, & -5\le x\le -3\\ -1, & -3<x\le 0\\ 2, & 0<x\le 1\\ 5, & 2<x\le 4\end{cases}$



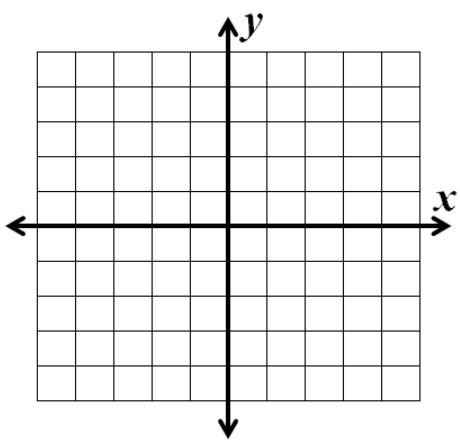
11. $h(x)=\begin{cases}\frac{2}{3}x+2, & x<-1\\ (x-1)^2-4, & x>0\end{cases}$



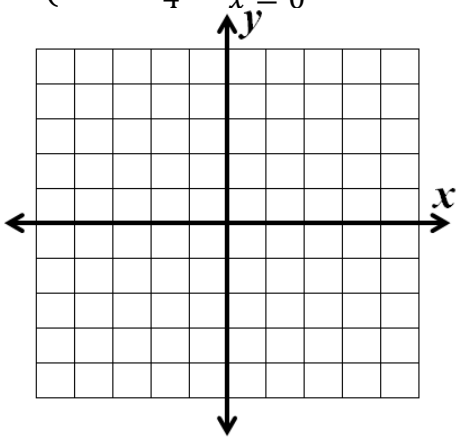
12. $f(x)=\begin{cases}-|x+2|+1, & x<-1\\ -x, & -1\le x\le 2\\ x, & x>2\end{cases}$



13. $h(x)=\begin{cases}3x+10, & x<-3\\ -x^2+5, & -3\le x<1\\ 2, & x=1\\ |x-3|-3 & x>1\end{cases}$



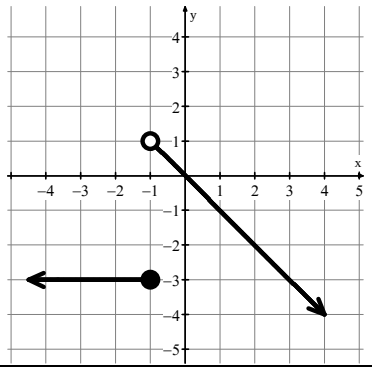
14. $g(x)=\begin{cases}-3, & x<-3\\ 2x+3, & -3\le x<0\\ -2x+3, & 0<x\le 3\\ -3 & x>3\\ 4 & x=0\end{cases}$



Given the graph of f, write out the function's equation. Use a linear expression ($mx + b$) for straight lines, absolute values if there is a "V" graph.

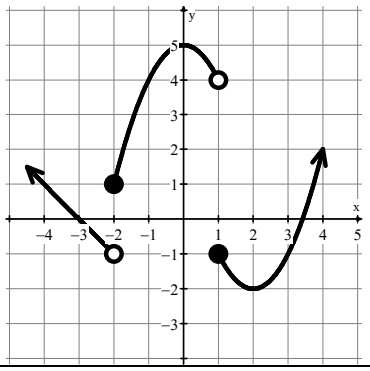
15.

$f(x) =$



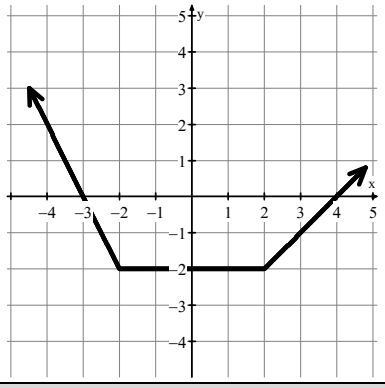
16.

$f(x) =$



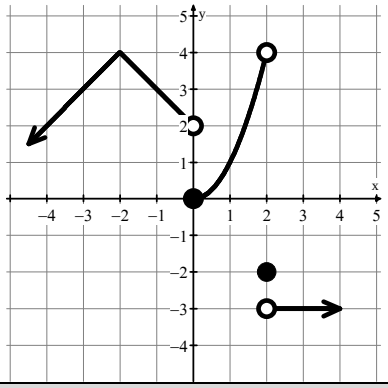
17.

$f(x) =$



18.

$f(x) =$



Tell if the function is continuous. Show any work that leads to your conclusion.

19. $h(x) = \begin{cases} x + 1, & x < 2 \\ 2x - 1, & x \geq 2 \end{cases}$

20. $g(x) = \begin{cases} x + 3, & x < -1 \\ x^2 - x, & x > -1 \\ 3 & x = -1 \end{cases}$

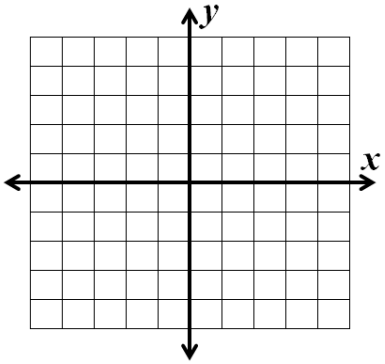
21. $f(x) = \begin{cases} 4x^2 - 2x, & x < 3 \\ 10x, & x = 3 \\ 30, & x > 3 \end{cases}$

22. $f(x) = \begin{cases} 21 - 3x, & x < 5 \\ 2x - 4, & x > 5 \end{cases}$

3.3 Application and Extension

1. Change the following absolute value function into a piecewise function by following the steps.

a) Graph $f(x) = 2|x + 1| + 2$



b) Change the "absolute value" symbols to parentheses, and simplify the function

This is the "positive slope" side of the function.

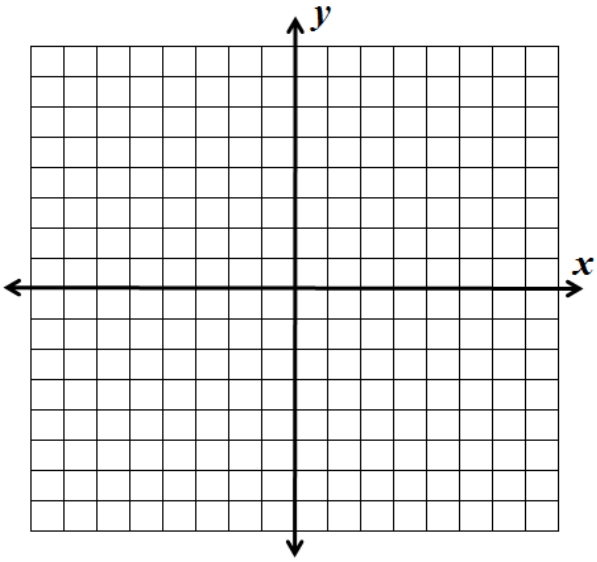
c) Do the same thing you did in step *b* above, but change the slope to the opposite sign.

This is the "negative slope" side of the function.

d) Using steps *b-c* to help, write the function from step *a* as a piecewise function.

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

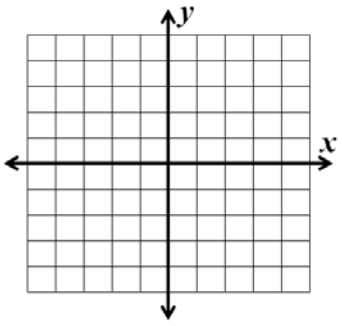
2. Rewrite the function $f(x) = -\frac{5}{3}|x - 3| + 4$ as a piecewise function and graph it.



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

3. The Greatest Integer Function (also called a "step" function) is modeled by the equation $f(x) = [\![x]\!]$. When you plug in a value for x, it returns the largest integer less than or equal to x. To the right is a table of a few input and output values. Finish the table and plot the points. Then graph and write a piecewise function for the domain $-2 \leq x < 2$.

x	*f(x)*
-2	-2
-1.78	-2
-1	-1
-0.5	-1
-0.01	-1
0.3	0
0.8	
1	
1.4	
1.9999	



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

What value(s) of k would make the following functions **continuous**.

4. $g(x) = \begin{cases} x+1, & x \le 2 \\ kx+6, & x > 2 \end{cases}$

5. $h(x) = \begin{cases} 2x+3, & x < -1 \\ 7x-k, & x \ge -1 \end{cases}$

6. $f(x) = \begin{cases} 3x^2 - 11x - 4, & x \le 4 \\ kx^2 - 2x - 1, & x > 4 \end{cases}$

7. $w(x) = \begin{cases} -6x - 12, & x < -3 \\ k^2 - 5k, & x = -3 \\ 6, & x > -3 \end{cases}$

8. Kelly and Sullivan are planning their trip to the annual Star Trek convention. They need to rent a car to get there and find one car rental agency that charges \$0.25 per mile if the total mileage does not exceed 100. If the total mileage exceeds 100, the agency charges \$0.25 per mile for the first 100 miles and only \$0.15 per mile for each mile over 100. If *m* represents the number of miles a rented vehicle is driven, express the mileage charge $C(m)$ as a function of *m*. Find $C(50)$ and $C(150)$, and graph C. (*This is not as easy as it first appears! The 2nd piece is challenging to figure out.)*

$C(m) = \begin{cases} \\ \\ \end{cases}$

$C(50) =$

$C(150) =$