Piecewise Functions

Vocabulary

piecewise function - a function with different rules for different parts of its domain.

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

Step function – a function that pairs every number in an interval with a single value.

$$f(x)=\begin{cases}2, & x\leq 0\\ -3, & x>0\end{cases}$$

Greatest integer function – a step function $y=[\![x]\!]$ where $[\![x]\!]$ represents the greatest integer less than or equal to x.

$$f(3.2)=3.2=3$$

$$f(0.7)=$$

$$f(-1.4)=$$

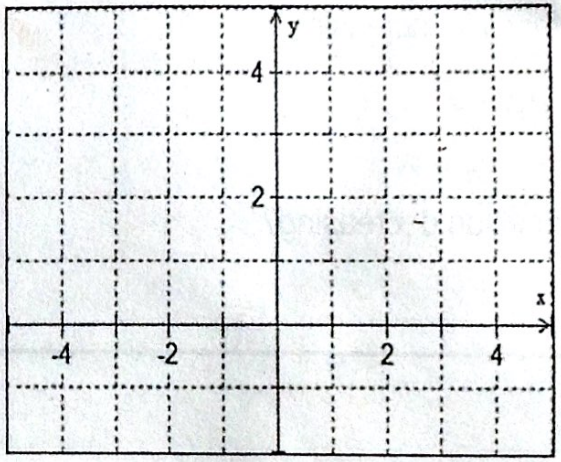
Graphing Piecewise Functions

EX #1: Graph the absolute value function.

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

Do you recognize this graph?

Can you write a different rule for this function?



Is the function above continuous?

State the domain.

State the range.

Where is the function increasing?

Where is the function decreasing?

Evaluating Piece-Wise Functions

C

EX #2: Evaluate $f(x)=\begin{cases} -2|x+1| & x<1 \\ 2 & 1\le x<3 \\ 5-\frac{1}{2}x & x\ge 3 \end{cases}$

A. $f(12)$

B. $f(2)$

C. $f(-5)$

D. $f(0)$

Evaluating Piece-Wise Functions

EX #3: Evaluate. $f(x)=\begin{cases}3x-7, & x>2\\ x^2-1, & x\le 2\end{cases}$

A. $f(6)$

B. $f(-3)$

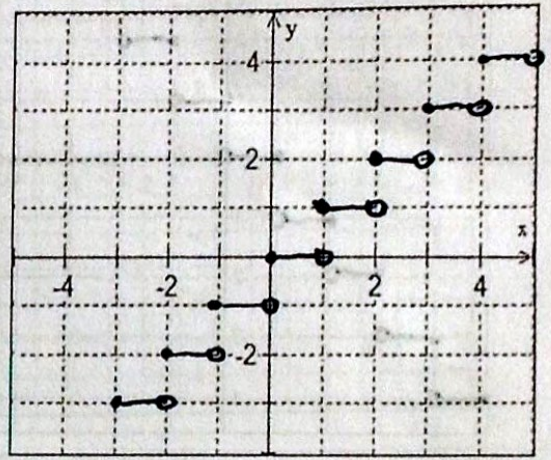
C. $f(2)$

$-(x)7$

Graphing Step Functions

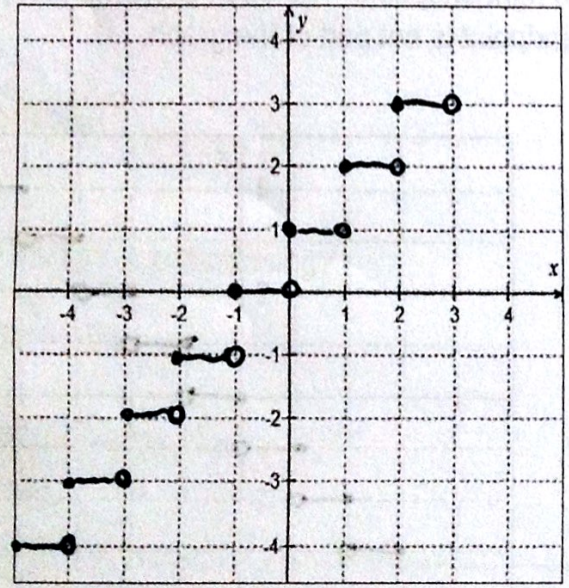
EX #4: Graph $f(x)=[\![x]\!]$

Each piece of the graph is a horizontal segment that is missing its right endpoint. The open circle indicates that the right endpoint is not part of the graph.



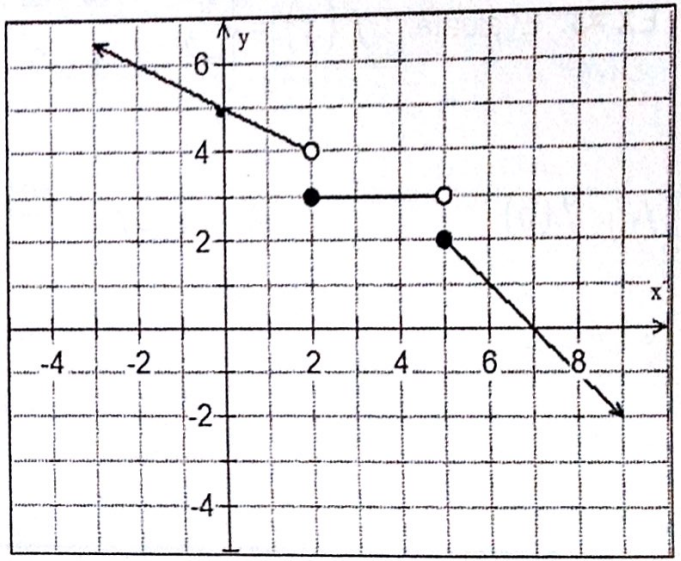
Graphing Step Functions

EX. #5: Graph $f(x) = [\![x+1]\!]$



Name That Graph

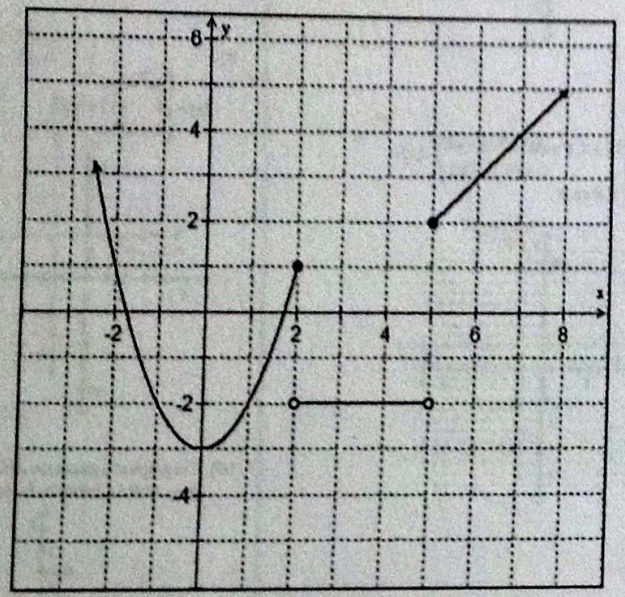
EX #6: Write the piecewise function that represents the graph.



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

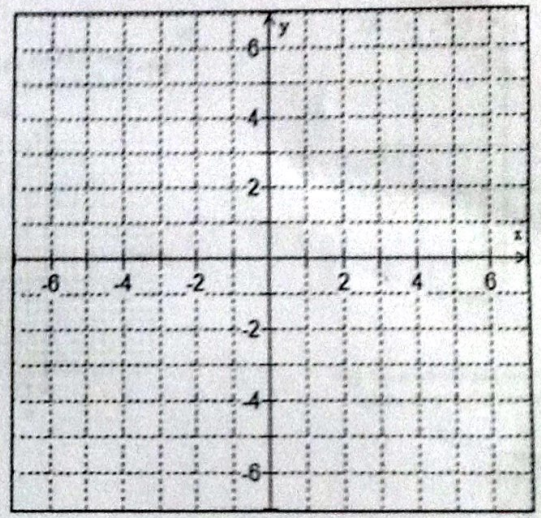
Another Name That Graph

EX #7: Write the piecewise function that represents the graph.



Create Your Own Function

EX #9: Create your very own piecewise function that contains three parts. Then, sketch your function on the grid below. Find a shoulder partner and trade functions to check your work.



Piecewise Defined Functions

Name_____
Class_____ Date_____

1)

$$f(x)=\begin{cases}3x+2 & \text{if } x<0\\ -5x+5 & \text{if } x\geq 0\end{cases}$$

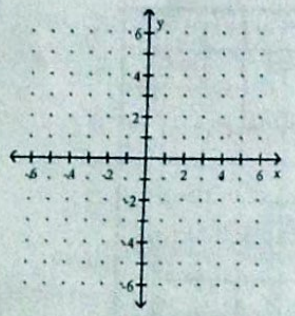
Determine f(-4). _____

2)

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

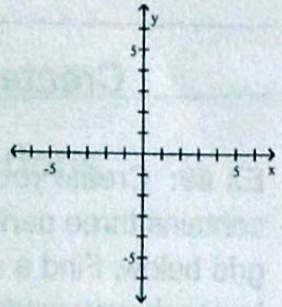
Determine f(3). _____

3) $f(x)=\begin{cases}x-2, & \text{if } x>0\\ 4, & \text{if } x\leq 0\end{cases}$



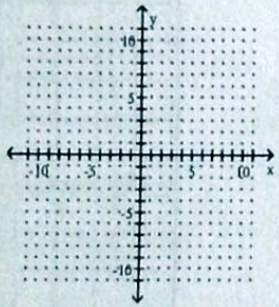
4)

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



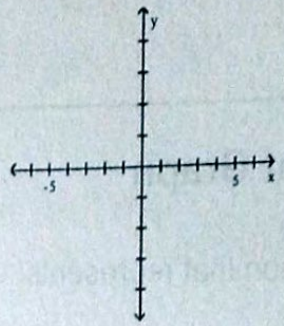
5)

$$f(x)=\begin{cases}2x+7, & \text{if } x<0\\ 3x^2-3, & \text{if } x\geq 0\end{cases}$$



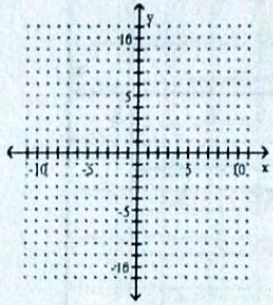
6)

$$f(x)=\begin{cases}-x+2, & x<0\\ \sqrt{x+3}, & x\geq 0\end{cases}$$



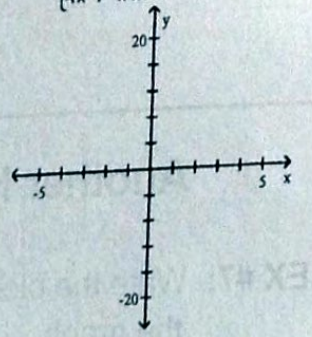
7)

$$f(x)=\begin{cases}|x|+1, & \text{if } x<0\\ 1, & \text{if } x\geq 0\end{cases}$$



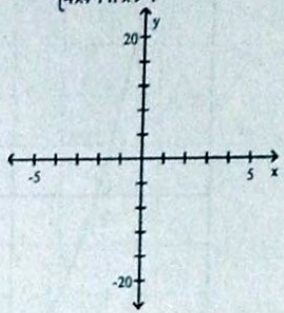
8)

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

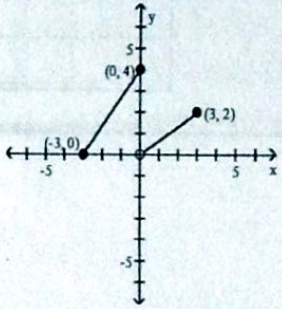


9)

$$f(x)=\begin{cases}4x^2 & \text{if } x\leq -1\\ 4 & \text{if } -1<x\leq 1\\ 4x+1 & \text{if } x>1\end{cases}$$



10) The graph of a piecewise-defined function is given. Write a definition for the function.



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