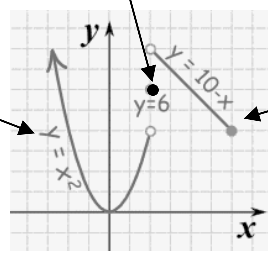
Name: Date: Period:

Piecewise functions are functions that are represented by more than one equation. Each equation corresponds to a different part of the domain. To evaluate a Piecewise Function, you would need to determine part of the domain (x-values) you are evaluating it for.

when x = 2 it gives 6

when x < 2, it gives x^2

when $2 < x \le 6$ it gives the line 10 - x



Reminder: a solid dot means "including"
an open dot means "not including"

This is how the **PIECEWISE FUNCTION** would be written:

$$f(x) = \begin{cases} x^2 & \text{if } x < 2 \\ 6 & \text{if } x = 2 \\ 10 - x & \text{if } 2 < x \le 6 \end{cases}$$

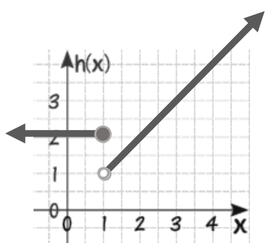
Your Domain (written three different ways):

- The Domain is all Real Numbers up to and including 6 — ***In Words***
- $(-\infty, 6]$ — ***Interval Notation***
- $\{x \mid x \text{ is all real \#s} \le 6\}$ — ***Set Notation***

The following are four examples of different **PIECEWISE FUNCTIONS**:

Example 1:

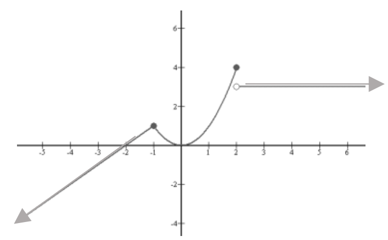
$$h(x) = \begin{cases} 2 & \text{if } x \le 1 \\ x & \text{if } x > 1 \end{cases}$$



- For all values of x that are 1 or less, we use the line y = 2. We stop at the point (1, 2) since for x-values greater than 1, we use a different line.
- For values of x that are strictly greater than 1, we use the line y = x.

Example 2:

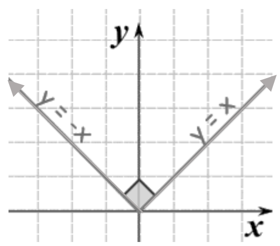
$$f(x) = \begin{cases} x + 2 & \text{if } x < -1 \\ x^2 & \text{if } -1 \le x \le 2 \\ 3 & \text{if } x > 2 \end{cases}$$



- For all values of x that are less than -1, we use the line y = x + 2.
- For all values of x between -1 & 2 (including -1 &2), we use $y = x^2$.
- For values of x that are strictly greater than 2, we use the line y = 3.

Example 3: The Absolute Value Function is a **Piecewise Function**.

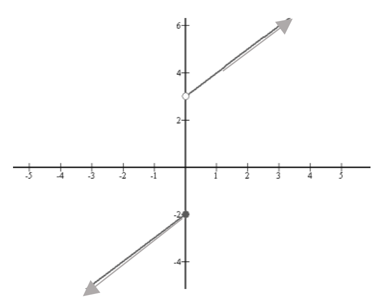
$$f(x) = \begin{cases} -x & \text{if } x < 0 \\ x & \text{if } x \ge 0 \end{cases}$$



- For all values of x that are less than 0, we use the line y = -x. We stop at the point (0, 0) since for x-values greater than 0, we use a different line.
- For values of x that are greater than or equal to 0, we use the line y = x.

Example 4:

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



- For all values of x that are 0 or less, we use the line y = x – 2. We stop at the point (0, -2) since for x-values greater than 0, we use a different line.
- For values of x that are strictly greater than 0, we use the line y = x + 3.

<u>Graphing Piecewise Functions:</u> The best way to graph a piecewise function to make a table for **<u>each piece of the function</u>** using the boundary points as your x-values and graph each piece to the appropriate boundary using proper notation.

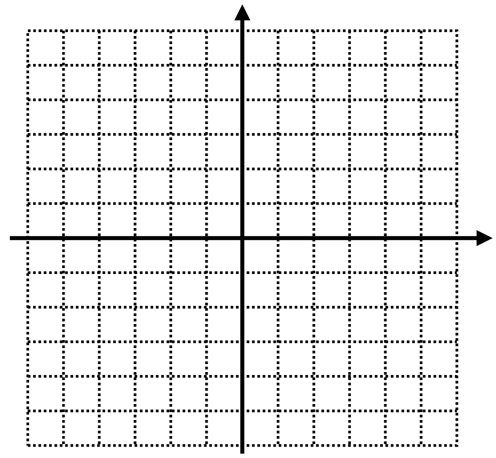
○ Use when the interval is $<$ or $>$ sign. Boundary is **<u>NOT</u>** included.	● Use when the interval is a $\leq$ or $\geq$ sign. Boundary **<u>IS</u>** included.	When there is no beginning or end

1.

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

x	- x
-3	
-2	
-1	
0	

x	x + 1
0	
1	
2	
3	

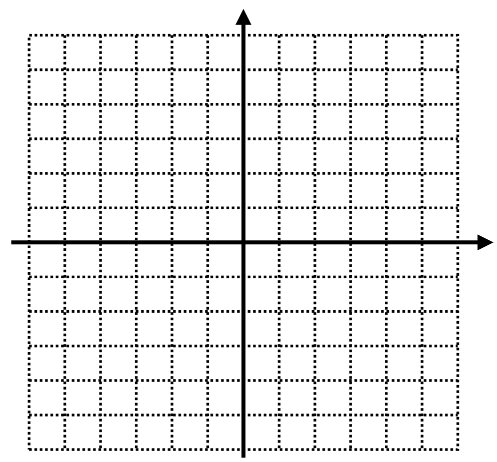


2.

$$f(x) = \begin{cases} -x - 2 & \text{if } x < 0 \\ x + 4 & \text{if } x \geq 0 \end{cases}$$

x	- x - 2
-3	
-2	
-1	
0	

x	x + 4
0	
1	
2	
3	



3.

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

x	x + 4

x	$x^2 - 3$

x	5