

### Graphing Piecewise Functions

**EXAMPLE**

$$f(x) = \begin{cases} 4x + 32, & -9 \leq x < -7 \\ 2, & -7 < x < 1 \\ -2x^2 + 8x, & x \geq 1 \end{cases}$$

The first equation was

$y = 4x + 32$ , with limits at  $-9 \leq \bullet$   
&  $\circ \leftarrow < 7$

$y = 4(-9) + 32 = -36 + 32 = -4$   
(-9, -4)

$y = 4(-7) + 32 = -28 + 32 = 4$   
(-7, 4)

The second equation was

$y = 2$ , with limits at  $-7 < \circ$  &  $\circ \leftarrow < 1$

$y = 2$   
(-7, 2)

$y = 2$   
(1, 2)

The third equation was a quadratic, so I will need more points to see the shape.

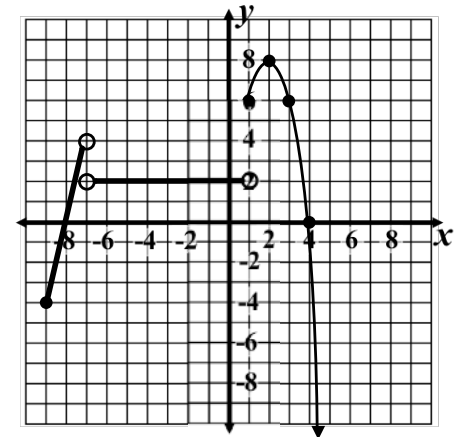
$y = -2x^2 + 8x$ , with a lower limit at  $\bullet \leftarrow \geq 1$

$y = -2(1)^2 + 8(1) = -2(1) + 8(1)$   
 $y = -2 + 8 = 6$  (1, 6)

If  $x = 2$ ,  
 $y = -2(2)^2 + 8(2) = -2(4) + 8(2)$   
 $y = -8 + 16 = 8$  (2, 8)

If  $x = 3$ ,  
 $y = -2(3)^2 + 8(3) = -2(9) + 8(3)$   
 $y = -18 + 24 = 6$  (3, 6)

If  $x = 4$ ,  
 $y = -2(4)^2 + 8(4) = -2(16) + 8(4)$   
 $y = -32 + 32 = 0$  (4, 0)



	x	y
Lower Limit:	-9	-4
• or •?	•	
Upper Limit:	-7	4
• or •?	•	

	x	y
Lower Limit:	-7	2
• or •?	•	
Upper Limit:	1	2
• or •?	•	

	x	y
Lower Limit:	1	6
• or •?	•	
	2	8
	3	6
	4	0

1.  $g(x) = \begin{cases} -5, & -8 < x \leq -4 \\ x^2 + 6x + 5, & -4 < x \leq -2 \\ -2x, & x > -2 \end{cases}$

$y = -5$  with limits  $-8 < x \leq -4$

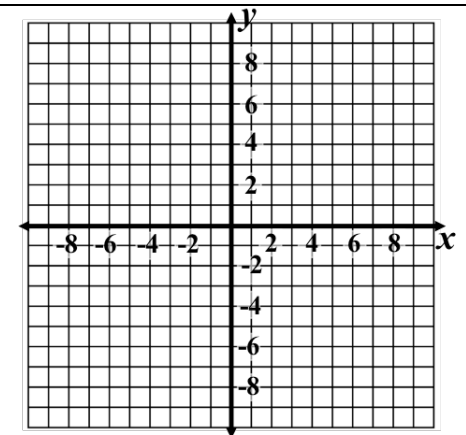
	x	y
Lower Limit:		
• or •?		
Upper Limit:		
• or •?		

$y = x^2 + 6x + 5$  with limits  $-4 < x \leq -2$

	x	y
Lower Limit:		
• or •?		
Upper Limit:		
• or •?		

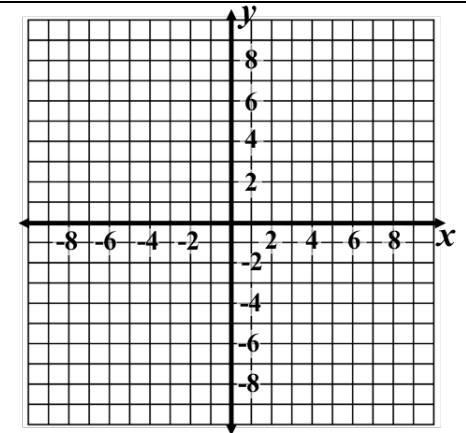
$y = -2x$  with limit  $x > -2$

	x	y
Lower Limit:		
• or •?		



$$2. h(x) = \begin{cases} -2, & -10 < x \leq -4 \\ 1, & -4 < x \leq 2 \\ 4, & 2 < x \leq 8 \end{cases}$$

This type of piecewise is also called a **Step Function**. Why do you think they call it that?



$$y = -2 \text{ when } -10 < x \leq -4$$

	x	y
Lower Limit:		
◦ or •?		
Upper Limit:		
◦ or •?		

$$y = 1 \text{ when } -4 < x \leq 2$$

	x	y
Lower Limit:		
◦ or •?		
Upper Limit:		
◦ or •?		

$$y = 4 \text{ when } 2 < x \leq 8$$

	x	y
Lower Limit:		
◦ or •?		
Upper Limit:		
◦ or •?		

$$3. j(x) = \begin{cases} 3x + 24, & -10 < x \leq -5 \\ -x + 3, & -5 < x \leq -1 \\ 2x^2, & x > -1 \end{cases}$$

$$y = 3x + 24$$

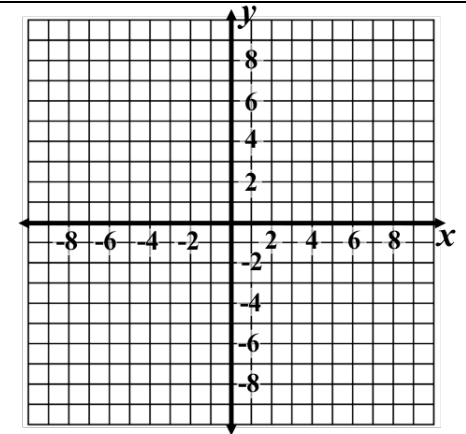
	x	y
Lower Limit:		
◦ or •?		
Upper Limit:		
◦ or •?		

$$y = -x + 3$$

	x	y
Lower Limit:		
◦ or •?		
Upper Limit:		
◦ or •?		

$$y = 2x^2$$

	x	y
Lower Limit:		
◦ or •?		
Upper Limit:		
◦ or •?		



$$4. k(x) = \begin{cases} -9, & x < -3 \\ 3x, & -3 \leq x \leq 2 \\ -3x + 12, & x > 2 \end{cases}$$

$$y =$$

	x	y
Lower Limit:		
Upper Limit:		

$$y =$$

	x	y
Lower Limit:		
Upper Limit:		

$$y =$$

	x	y
Lower Limit:		
Upper Limit:		

